

УДК 004.9, 91, 94:378.1

Aleksandr I. Baturin

Senior Lecturer at the Department of Programming and Mathematics
Volodymyr Dahl East Ukrainian National University, Severodonetsk, Ukraine
ORSID ID 0000-0003-2350-4036
aibaturin1973@gmail.com

Vladimir O. Lyfar

Doctor of Technical Sciences, Associate Professor, Head of the Department of Programming and Mathematics,
Volodymyr Dahl East Ukrainian National University, Severodonetsk, Ukraine
ORSID ID 0000-0002-7860-9663
lyfarva61@ukr.net

Oleg I. Zakhzhay

PhD of Technical Sciences, Associate Professor at the Department of Programming and Mathematics,
Volodymyr Dahl East Ukrainian National University, Severodonetsk, Ukraine
ORSID ID 0000-0002-9078-3242
zakhzhay.oleg@gmail.com

Vitaly H. Ivanov

PhD in Project Automation Systems, Associate Professor at the Department of Programming and Mathematics,
Volodymyr Dahl East Ukrainian National University, Severodonetsk, Ukraine
ORSID ID 0000-0002-8698-0972
vetgen75@gmail.com

A UNIFORM INTERACTION MODEL OF EDUCATIONAL PROCESS AGENTS IN THE UNIFIED MANAGEMENT SYSTEM OF A HIGHER EDUCATION INSTITUTION

Abstract. One of the most popular classes of educational systems is LMS - Learning Management System, which gives a possibility to implement support for the learning process through E-learning technology. However, such systems do not have sufficient functionality to automate other aspects of the activities of an educational institution. This situation has led to the fact that modern educational institutions are forced to use a whole set of different information systems, each of which solves a certain, strictly specialized range of tasks and complicates the effective use of automation. Thus, the aim of this research is to develop an approach to building a management system for a higher education institution based on a single hardware and software platform, which allows combining all areas of administrative and educational activities within a single system, as well as organizing the management of the educational process and monitoring of the quality of educational services. To achieve this goal, the paper addresses the task of creating a computer system for managing a higher education institution on the basis of a single, widely known platform LMS MOODLE. To accomplish this task, a unified model of interaction between the agents of the educational process has been proposed. This model makes it possible to complement the learning functions of the most popular platform with the solution of organizational tasks in managing a higher education institution and performance of workflow functions. The developed model of interaction between the agents of the educational process was used for processing the system of roles for the users of the system, which made it possible to expand the functionality of work with the database system, as well as to develop a computer based management system for an educational institution on the basis of a single platform. The proposed new technical solutions were introduced during the creation of information systems in such higher education institutions of Ukraine as Donbass State Technical University and Volodymyr Dahl East Ukrainian National University. In addition, the proposed solutions have been successfully applied to create information management systems for several general secondary schools in Lysychansk, Ukraine.

Keywords: information systems of education process control; document management systems; information technologies.

I. INTRODUCTION

Recently, considerable attention has been paid to the application of information technologies in various fields of human activity [1]. The field of education, as one of the priorities in the development programs of various countries, is not an exception [1-3]. Today, attention is paid to the informatization of all activities in scientific and educational organizations, from supporting financial and organizational management to ensuring the proper flow of the educational process, creating arranged databases and repositories of research papers, courseware, e-courses, etc. A modern higher education institution is a complex automation object with multi-level system interactions of its individual elements.

Informatization of such a complex object with diverse and wide functionality is far from being a trivial scientific and technological challenge, for which there is no universal solution today. There is a tendency to solve this problem for particular cases [3-11]: for a specific, single institution or to support individual functions, such as financial management information systems, workflow, learning management systems (LMS), cataloging and creating electronic repositories, etc. [12-24].

In Ukraine, which is integrating into the world educational space and introducing modern information technologies in the educational process, great attention is also paid to the creation of information management systems for the educational process and its quality control [9, 25-27].

Along with nationwide information systems and resources, such as the Unified State Electronic Database on Education and Electronic Entry, virtually every higher education institution creates its own information systems to support various areas of activity – from ordinary information resources and websites to accounting systems, personnel management, automation of the dean's office, etc.

The problem statement. The diversity and number of such systems is constantly growing, due to the lack of a universal solution. Thus, education institutions are forced to use a whole set of specialized systems that implement various functions, and their compatibility with each other is often difficult to implement [2], [3], [5], [7], [25], [26].

In addition, the use of a set of diverse information systems to support the activities of higher education institutions has a number of disadvantages:

- there is a necessity to create and manage multiple accounts for each user to authorize in different systems of the higher education institution;
- it is very complicated to administer and maintain a large number of diverse systems, differing in functionality, which, as a rule, have a different structural organization;
- duplication of the same information in different systems, which causes an unjustified complication of the databases of these systems and, as a result, creates an additional load on the hardware of the servers hosting the system.

Based on the foregoing, it can be concluded that at the current stage of the development of automated educational management systems there emerged a rather important scientific and technical problem, which is defined by the following three aspects:

1. Information management systems for educational activities are designed to automate management functions in order to simplify the solution of educational and organizational tasks.
2. The complexity of the organizational structure of a higher education institution and the diversity of its functions leads to the need to use simultaneously a large number of separate specialized information systems to solve a strictly defined range of tasks.
3. The presence of a large number of information systems used creates additional difficulties for the effective implementation of organizational tasks by the staff of higher

education institutions, which, to a large extent, reduces the efficiency of performing tasks and eliminates the advantages of using information processing automation tools.

Analysis of recent studies and publications. Recently, considerable success has been achieved in the field of creation and research of approaches, methods, models, and algorithms of automated management of the educational process. R. Arnold, C. Geyer, G. Preib [12] - [14] made a significant contribution to this process. Fundamental studies of information technology training were conducted by M. Minsky, V. Bepalko, A. Aleksyuk [15], [27], [28]. Modern practical developments were performed by I. Ajayi, A. Bashmakov, V. Mokin, J. Hernad [3], [18], [26], [29]. The analysis of work on this topic revealed fragmentation of approaches to the construction of automated systems of organizational management of higher education institutions, as well as the organization of training and ensuring quality control of educational services.

Most of the work is aimed to solve a particular aspect of the problem, but there is no integrated approach to organization of the entire educational process, from setting educational and administrative tasks to evaluating and monitoring their implementation.

Formulation of the aim and hypothesis. The possibility of solving the identified problem is seen by the authors in reducing the number of information systems supporting organizational activities of higher education institutions, and in the best case, in using a single information system that would include support of management functions, organization of the educational process, management and quality control tools, and the provision of educational services.

The use of a single platform for the implementation of all these functions will effectively eliminate data redundancy and the need to implement specific means of intersystem and inter-platform data synchronization.

The solution of the main task becomes possible in the case of applying a general unified model of interaction between the agents of the educational process. This approach will allow the use of a single structural implementation and algorithmic base for various system functionalities within a single platform.

Thus, the aim of this research is to develop an approach to building a management system for a higher education institution based on a single hardware and software platform, which allows combining all areas of administrative and educational activities within a single system, as well as organizing the management of the educational process and monitoring the quality of educational services.

Solution of the highlighted problem involves addressing the following research tasks:

- to define a single software platform for the implementation of a computer management system of a higher education institution, which will combine functions of organizational management, arrangement of the educational process, as well as monitoring its quality;

- to develop a unified model of interaction between the agents of the educational process, which would allow combining the implementation of organizational management and educational process functions within a single software platform;

- to implement a computerized system for managing a higher education institution on the basis of a single software platform using a unified model of interaction between the agents of the educational process.

II. MATERIALS AND METHODS

The choice of software platform for the implementation of the system depends on the following main criteria:

- availability of advanced functionality for the organization of the educational process in both asynchronous and synchronous modes;
- availability of opportunities for using e-learning technologies and creating e-learning courses;
- ability to monitor students' progress and control their level of knowledge;
- well-known, intuitive interface for scientific and teaching staff, which does not require special skills and knowledge in the field of computer systems and programming;
- free of charge terms of use, as well as an open source code for easy modernization and development of the system.

These criteria are most consistent with the so-called LMS (Learning Management System), which is mostly focused on creating electronic courses, organizing training in an asynchronous mode and monitoring progress. However, in order to fully support the educational process, it is necessary to introduce synchronous training mode. This can be achieved through the use of an additional video conferencing server, and the client part should be built into the learning management system. It makes possible to use all the modules of the system as a whole and one common user account for working with the system.

The most common LMSs are MOODLE, SAKAI, ATutor and ILIAS. MOODLE is proposed as a single platform for the implementation of a computer based learning management system. Moodle satisfies the above stated requirements.

In addition, this learning management system is the de facto standard for educational institutions in Ukraine and many other countries. The interface and principles of operation of this system are well known both to scientific and teaching staff, as well as to students. It gives an opportunity to simplify the implementation of the system and reduces training time.

This platform has sufficient functionality for the implementation of e-learning in an asynchronous mode, and also does not impose special hardware requirements on server equipment and client computer systems. MOODLE is a classic web-based system written in PHP. Consequently, desktop computer systems, laptops, netbooks, tablets, phablets, smartphones operating on any operating system that is widely used today can be used as client computer systems: GNU/Linux (Android), iOS, macOS or Microsoft Windows. Access to the system on client devices can be done either through a standard web browser or a special application that is ported to all popular operating systems. Such platform independence allows the use of any modern hardware and software systems that operate with web applications, including SMART TV and TV mediabox, as client devices. This aspect only increases the flexibility, efficiency, and convenience of working with the system.

It is required to install a web server, a database server, a PHP interpreter for server software, as well as an email server, as the most convenient tool for organizing prompt notification of system users about all activities, events and tasks. Mailing setups can be done either through a specially installed mail server or through any email account on a third-party mail server, which allows connection to the account and sending messages by third-party applications. To solve this task, free accounts from popular email services Google, Yahoo and Microsoft can be used. The most successful server for organizing video conferencing and supporting the synchronous learning mode is BigBlueButton, which easily integrates with the MOODLE system. For MOODLE, there is a ready-made plug-in client for BigBlueButton, which allows organizing video conferencing in the webinar mode as part of any electronic course. All users who have access to the course can participate in the webinar. Accordingly, the built-in MOODLE account is used for authentication in the video conferencing system. Thus, the joint use of MOODLE and BigBlueButton gives a possibility to organize a full-fledged and universal learning management system with performance monitoring and the possibility of training in asynchronous and synchronous modes. However, to build a full-fledged computer system for managing a higher education institution in such a system, the

functions of organizational management and document management of an educational institution are required. The classical MOODLE platform is not initially focused on this range of tasks, since it involves the interaction of two main agents of the educational process. To implement the functions of workflow and create the organizational structure of an educational institution, a hierarchical system of user roles is required, arranged by levels of subordination. In accordance with this, it will be possible to formulate a task for processing documents, construct a route for a document, and also monitor task execution.

A unified model of interaction between agents of the educational process is proposed to adapt the MOODLE system in order to implement the workflow functions and organizational management of higher education institutions. Thus, MOODLE can be used not only as a learning management system, but also as a document management complex and supervise over the activities of structural units of higher education institutions, as well as individual officials. An additional function of interoperability and informing the agents of the educational process within framework of the implementation of individual tasks will also be addressed.

Figure 1 presents the proposed unified model of interaction between the agents of the educational process of a higher education institution.

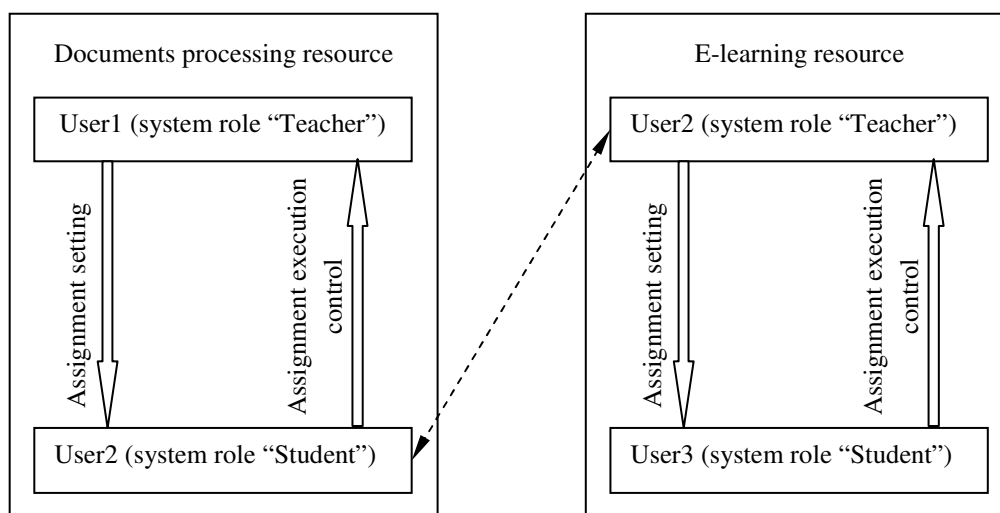


Fig. 1. A unified model of interaction between the agents of the educational process in the computer system of higher education institution management

The proposed model is based on bringing the informational processes of performing organizational and educational tasks to one mechanism. So, the process of working on a training task in an E-learning resource is similar to the process of performing an organizational task in a "Document processing resource". Both information processes are organized by two agents - the task director and the performer. In the most general case, both of these agents can represent individual users of the system or specific groups of users. In both cases, the task director will formulate the task and provide the initial data for its execution, and the task performer must provide the result for verification in a certain period. The proposed model is based on the use of two basic standard roles of the MOODLE platform – "Teacher" and "Student". Thus, the same agent of the educational process (User2, according to Fig. 1) in the "E-learning resource" will have the role "Teacher", and in the "Document processing resource" - the role "Student". Thus, the MOODLE system role "Teacher" actually becomes the universal role of the task manager (used for teachers in "E-learning resource" and administrative personnel in "Document processing resources"), and the system role "Student" is used for task performers (students who study at the higher education institution

or subordinate employees performing organizational tasks for managers at various levels). In accordance with the model in Fig. 1, User 3 is a student and has the role of “Student”, but in other resources he/she may have the role of “Teacher”, for example, if he/she is a member of the students` self-government and can set the task for other users of the system. Thus, the classical role system, developed in MOODLE, can be used without changes to support the organizational activities and workflow in higher education institutions. The proposed unified model of interaction between the agents of the educational process also allows using MOODLE toolkit for the implementation of workflow resources. For example, for the processing of workflow, routine activity “Assignment” can be used. The leader who forms the task acts as the “Teacher”, and the subordinates who perform the task act as the “Student”.

Therefore, in a computer system for managing a higher education institution, each user may have different roles for different information resources (for E-learning or Document processing). It gives the possibility to determine information flows in the system and to distribute access rights and subordination of users according to their official rights and duties. Effective use of the proposed unified model of interaction between the agents of the educational process is possible only in case of fully coordinating MOODLE system of roles. We should take into account the fact that the computer based management system of a higher education institution should contain mandatory management and accounting functions for scientific and teaching staff and monitoring their performance. To deal with current licensing and accreditation standards, MOODLE database, that contains information about users, should be updated by introducing additional fields containing the necessary data and indicators. It should be noted that the classical MOODLE system allows the users with the role of “Manager” to function with this database. Thus, the database of users of the system, in the traditional version, is only available to perform the functions of system administration, add and delete users, and also correct their credentials. For a broader application of a modified database, it is proposed to introduce an additional system role “Personnel”, which is a service role that can be additionally delegated to certain users of the system, in order to be able to access and work with the users` database system. Such a role can additionally be used for system user accounts whose job responsibilities include work with personnel (personnel department staff, administration of a higher education institution, deans' office managers or heads of departments). The “Personnel” role is based on the “Authenticated user” role and contains permissions solely for functions that operate on the system`s user database. Accordingly, the use of the “Personnel” role in addition to any primary role of the system user leads to the expansion of the capabilities of this account solely in terms of working with the database. No other system administration functions are added to ensure the safety and reliability of the system. The modernized role system of the MOODLE platform for the implementation of a unified model of interaction between the agents of the educational process is given in Table 1.

The proposed system of roles is universal, fully consistent with the unified model of interaction between the agents of the educational process and facilitates the integration of training functions and organizational management within a single computer system.

For example, the MOODLE element “Assignment” can be used by “Teacher” to issue a task to a “Student”, as well as by the head of a department with the role of “Teacher” to assign a teacher with the role of “Student”. According to the model in Fig. 1, the head of a department is “User1”, the teacher is “User2”, and the student is “User3”.

III. RESULTS

The choice of MOODLE as a unified platform for building a computer system for managing a higher education institution, the proposed unified model of interaction between

agents of the educational process and the system of user roles allowed developing a computer system for managing a higher education institution, the structure of which is shown in Fig. 2. In accordance with the presented structure, the developed computer system for managing a higher education institution is three-level. It is implemented at such levels as: administration, faculty, chair. Administration functions are implemented at the level of individual MOODLE categories: “Administration”, “Faculty”, “Chair”. The number of “Faculty” and “Chair” categories corresponds to the structure of a higher education institution. It should be noted that the availability of flexible category management functions in MOODLE makes it possible to easily change the structure of the system in accordance with changes in the administrative structure of a higher education institution. All levels have a clear subordination, which ensures the effective distribution of access rights to information at the user level and levels of user groups, divisions, groups of divisions, etc.

Table 1

Modified system of users` roles

Role	Functions
Non- authenticated user (guest)	can view system home page, any system resources are denied.
Authenticated user	can view general resources of the system: main system news, system blogs, courses with free access, may participate in discussions within system-wide resources.
Student	able to access content, take part in discussions (within the limits of established competencies), and also participate in webinars using BigBlueButton, download content within the elements with open access.
Teacher	a restriction is imposed only on adding a new course and deleting an existing one; category management is prohibited; can connect and disconnect groups of students in their courses; may monitor students' current and final performance as part of their courses.
Category administrator	Category administrator has full control within a specific category, has the right to add and remove items to/from categories, to monitor and correct all the resources of the courses in the category; gives access to general reporting on student performance (current, as well as for the entire period of study) for an individual student, a specific academic group, a stream, a specialty. This functionality is especially important for administrators of faculty-level categories, it also makes it possible to automate and streamline reporting on the progress for dean's offices. The user with this role has the ability to monitor the educational process within the category, conduct ongoing quality control of educational materials in electronic courses and in the resources of workflow.
Personnel	adds functions to work with the database system users. Can be used in conjunction with any primary user role of the system.
Manager	has unlimited access to all system resources, can carry out technical operations on system maintenance, making changes to the system core.

The category “Administration” contains information resources of the main structural units of a higher education institution, as well as other structural elements: “Academic Council”, “Methodological Council”, “Information department”, “Education department”,

“Personnel department”, “Students government” etc. The number of these elements can be adjusted in an arbitrary mode by each higher education institution in terms of preferences, specifics, and production needs.

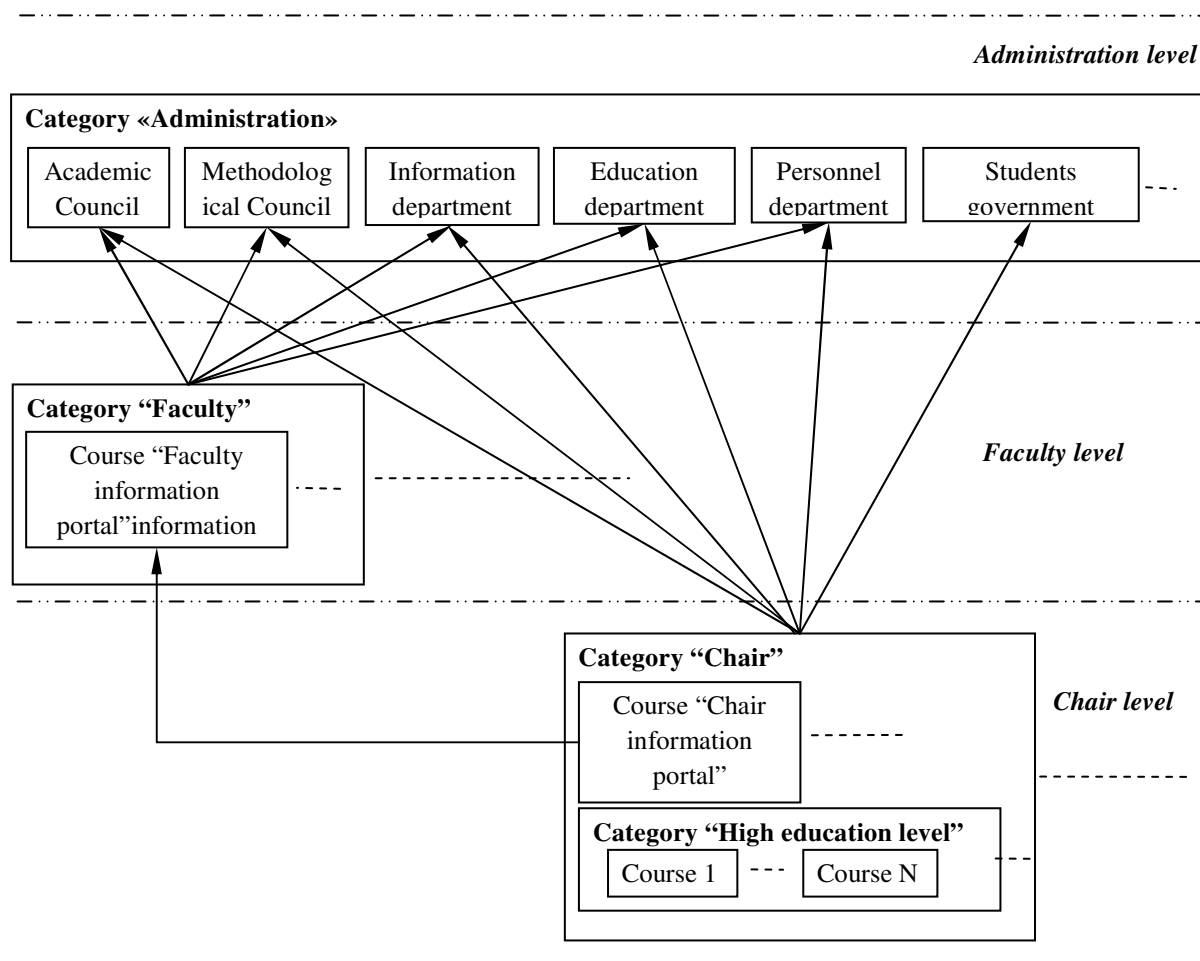


Fig. 2. The structure of the computer system for managing a higher education institution based on a single platform using the developed model

Elements of category “Administration” are available with different rights substructure developers of different levels of workers, who are delegated special duties (for example, members of Academic or Methodological Councils, financially liable persons etc.). Each element of the “Administration” category is a separate module for organizing the orderly placement of documents, instructions for execution and monitoring results. In addition, each element can be used to organize online meetings of various levels with an arbitrary number of participants. Thus, the BigBlueButton service is used not only for organization of the educational process in a synchronous mode, but also for the organizational activities of the structural units of a higher education institution. The system also has functions for scheduling meetings and automatic notification of participants. Faculty level is coordination between chair level and administration level. The main element of this category is the course “Faculty information portal”, which is the base for the organization of workflow level of the faculty. This portal can be used for faculty councils, faculty methodological councils and other meetings. If necessary, the hierarchy of elements of the faculty level can be supplemented (for example, issues relating to the faculty council can be moved to a separate portal created for this purpose, or new elements can be created, for example, the portal “Faculty Students government” etc.).

Chair level combines both educational elements (E-learning courses) and elements of workflow. The document level platform at the chair level is the course “Chair information portal”, which, by analogy with the “Faculty information portal”, can be used for conducting online meetings of the department, as well as processing documents and their automated submission to higher level elements (faculty and administration levels). It is advisable to group training courses by specialties and levels (steps) of higher education: first (bachelor), second (master), third (PhD). This will allow each student to have access exclusively to the courses within his/her current program (personal study plan). This is facilitated by the use of the user 's personal account, which aggregates all information (educational and organizational) that concerns each student. The additional courses for the convenience of research and teaching staff are not required. The presented approach solves the problem of educational and organizational management at the level of faculties and chairs.

IV. CONCLUSIONS

As a result of research and practical development, the following main scientific and technological results were obtained.

1. MOODLE was chosen as the unified platform for the implementation of the computer system for managing a higher education institution, as the most common system known to students and teachers, especially in the educational sphere around the world. This platform is the most universal tool for combining the functions of the educational process and the organizational activities of higher education institutions.

2. In the article a unified model of interaction between the agents of the educational process has been proposed. This model provides combination of both educational and organizational activities of higher education institutions within one system.

3. In accordance with the developed model, the system of user roles of the MOODLE system has been reworked. It provides the demarcated interaction of the agents of the educational process not only within the educational process mode, but also in administrative activities and workflow.

4. A computer management system for the educational process of higher education institutions has been developed. This system is based on the developed model.

Thus, all the research tasks have been completed. As the next step, a subsystem of education process quality control may be developed, which can be used to automate calculation of current indicators and make-decision support for correcting education and administrative management strategies.

REFERENCES (TRANSLATED AND TRANSLITERATED)

- [1] Akram Jalal Karim. The significance of management information systems for enhancing strategic and tactical planning. *JISTEM J.Inf.Syst. Technol. Management*, 2011, vol. 8 no. 2. doi: 10.1590/S1807-17752011000200011
- [2] Nurzhan Abishov, Dosmahanbet Asan, Amirtayev Kanat, Zhazira Erkishevad. Development of an Automated Information System University Management. *Procedia - Social and Behavioral Sciences*, 2014, vol. 143, pp. 550-554. doi: 10.1016/j.sbspro.2014.07.434
- [3] I. A. Ajayi, F. Omirin Fadekemi, The Use of Management Information Systems (MIS) In Decision Making In the South-West Nigerian Universities. *Educational Research and Review*, 2007, vol. 2(5), pp. 109-116.
- [4] E. Trahtengerts, *Computer methods of implementation of economic and information management solutions*. Moscow, SINTEG Publishing, 2009. 224p.
- [5] Z. Tukubaev, System analysis activities IKTU named A. Yasawi as a control object and its integrated automation. *ISSN 2073-0071*, 2010, vol. 4, pp. 31-48.
- [6] J. K. Dhillon, Challenges and strategies for improving the quality of information in a university setting: a case study. *Total Quality Management*, 2001, vol. 12(2), pp. 167-177.

- [7] J. Guan, W. Nunez, H. F. Welsh, Institutional strategy and information support: the role of data warehousing in higher education. *Campus-Wide Information Systems*, 2002, vol. 19(5), pp. 168-174.
- [8] D. Allen, T. D. Wilson, Information systems strategy formulation in higher education. In: I. Rowlands, (Ed.) *Understanding information policy: proceedings of a British Library funded Information Policy Unit Workshop, Cumberland Lodge*, 1997, 22-24 July, pp. 178-190.
- [9] M. Z. Zgurovsky, *Bolon process: the main principles of Ukrainian high school reforming*. Kiev, NTU KPI, 2006, 543p.
- [10] Ana-Ramona Lupu, Razvan Bologa, Gheorghe Sabau, Mihaela Muntean. Integrated Information Systems in Higher Education. *WSEAS Transactions on Computers*, 2008, vol. 7(5), pp. 473-482.
- [11] Ana-Ramona Lupu, Razvan Bologa, Gheorghe Sabau, Mihaela Muntean. *The Romanian Universities in the Process of Data and Information. The Proceedings of The 7th WSEAS International Conference on Artificial WSEAS Transactions on Computers*, 2008, issue 5, vol. 7, pp. 527-532.
- [12] R. Arnold, M. Lermen, Die Unzeitgemäßheit der eLearning-Didaktik. *eLearning-Didaktik. Grundlagen der Berufs- und Erwachsenenendidaktik*, 2006, band 48, pp.11-29.
- [13] C. Geyer, E-Learning an der Hochschule. *Professionell lehren und lernen. Ein Praxisbuch*, 2004, 183 p., pp. 70-80.
- [14] G. Preiß, *Ziele und Hintergründe. Didaktische Innovation durch Blended Learning. Leitlinien anhand eines Beispiels aus der Hochschule*. [Online]. Available: <http://www.zahlenland.in-fo/de/leitgedanken>. Accessed on: Sept. 06, 2017
- [15] M. Dertouzos, J. Moses, *Marvin Lee Minsky Computer Science and the Representation of Knowledge in The Computer Age: A Twenty-Year View*, MIT Press, 1979. 491 p.
- [16] R. Isopescu, G. Dinu, V. Pleşu, P. Iancu, M. Bercaru, I. Arsene, New Developments for Electronic Document Management in University. *Chemical Engineering Transactions*, 2010, vol. 21, pp. 1063-1068. doi: 10.3303/CET1021178
- [17] S. Gilani, J. Ahmed, M. A. Abbas, Electronic document management: a paperless university model. In *Computer Science and Information Technology, 2009. ICCSIT 2009 2nd IEEE International Conference*, 2009, pp. 440-444. [Online]. Available: http://www.basbakanlik.gov.tr/genelge_pdf/2008/2008-0010-006-08467.pdf. Accessed on: Jul. 12, 2018
- [18] J. Hernad, C. Gaya, Methodology for implementing document management systems to support ISO 9001: 2008 quality management systems. *Procedia Engineering*, 2013. vol. 63, pp. 29-35.
- [19] M. Başbüyük, A. Ergüzen, Electronic Document Management System for Kırıkkale University. *Unified Journal of Computer Science Research*, 2015, vol. 1(2), pp. 008-015.
- [20] A. H. Sequeira, Pai B. Swathi, V. Surekha, Financial Management Information System. *SSRN Electronic Journal*, 2012. [Online]. Available: https://www.researchgate.net/publication/256018179_Financial_Management_Information_System. (accessed 11.01.2017)
- [21] Ouadoud Mohammed, Mohamed Yassin Chkouri, Amel Nejjari. Learning Management System and the Underlying Learning Theories: Towards a new Modeling of an LMS. *International Journal of Information Technology*, 2018, vol. 2(1), pp. 25-33.
- [22] S. Graf, B. List, An evaluation of open source e-learning platforms stressing adaptation issues. *Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)*, 2005, pp. 163–165. doi: 10.1109/ICALT.2005.54
- [23] M. Ouadoud, M. Y. Chkouri, A. Nejjari, K. E. El-Kadiri, Exploring a Recommendation System of Free E-learning Platforms: Functional Architecture of the System. *International Journal of Emerging Technologies in Learning (iJET)*, 2017 vol. 12, no. 02, p. 219-226. doi: 10.1109/CIST.2016.7804953
- [24] L. Peer, A. Green, Building an open data repository for a specialized research community: Process, challenges and lessons. *The International Journal of Digital Curation*, 2012, vol. 7, no.1, pp. 151-162.
- [25] N. N. Kosiyuk, A.Yu. Mazarchuk, K. E. Belevsky Integrated information system “Electronic University. *Analysis of the state of university management information systems in project partner countries*, 2013, vol. 2, pp. 62-90.
- [26] V. B. Mokin, S. V. Bevz, S. M. Burbelo, Development and implementation document management systems of education process for master’s degree obtain. *Optyko-electronni informatsijno-energetychni tekhnologiji – Optical-electronic information-energetic technologies*, 2006, vol. 2. pp. 5-12.
- [27] V.P. Bepalko, *Education and training with computers using (pedagogic of new millennium)*. Moscow, 2002. 352 p.
- [28] A. M. Aleksyuk, *High school pedagogic of Ukraine: history, theory*. Kiev, 1998. 560 p.
- [29] A. I. Bashmakov, I. A. Bashmakov, *Computer textbook and training programs developing*. Moscow, 2003. 616 p.

Text of the article was accepted by Editorial Team 17.05.19

УНІФІКОВАНА МОДЕЛЬ ВЗАЄМОДІЇ УЧАСНИКІВ ОСВІТНЬОГО ПРОЦЕСУ В ЄДИНІЙ СИСТЕМІ УПРАВЛІННЯ ЗАКЛАДОМ ВИЩОЇ ОСВІТИ

Батурін Олександр Іванович

старший викладач кафедри програмування та математики

Східноукраїнський національний університет імені Володимира Даля, м. Северодонецьк, Україна

ORSID ID 0000-0003-2350-4036

aibaturin1973@gmail.com

Лифар Володимир Олексійович

доктор технічних наук, доцент, зав. кафедри програмування та математики

Східноукраїнський національний університет імені Володимира Даля, м. Северодонецьк, Україна

ORSID ID 0000-0002-7860-9663

lyfarva61@ukr.net

Захожай Олег Ігорович

кандидат технічних наук, доцент кафедри програмування та математики

Східноукраїнський національний університет імені Володимира Даля, м. Северодонецьк, Україна

ORSID ID 0000-0002-9078-3242

zakhozhay.oleg@gmail.com

Іванов Віталій Геннадійович

кандидат технічних наук, доцент кафедри програмування та математики

Східноукраїнський національний університет імені Володимира Даля, м. Северодонецьк, Україна

ORSID ID 0000-0002-8698-0972

vetgen75@gmail.com

Анотація. Інтенсивний розвиток інформаційних технологій створює сприятливі вимоги для запровадження методів і засобів автоматизованої обробки даних і управління в різних сферах життєдіяльності людини. Сфера освіти є однією з передових в цій галузі. Останнім часом розроблена достатня кількість різних інформаційних систем, які дозволяють автоматизувати той чи інший аспект діяльності сучасних закладів вищої освіти. Одним з найбільш популярних класів освітніх систем є LMS – Learning Management System, які дозволяють реалізувати підтримку процесу навчання завдяки технології E-learning. Але такі системи не мають достатнього функціоналу для автоматизації інших аспектів діяльності закладів вищої освіти. Така ситуація призвела до того, що сучасні заклади вищої освіти мають використовувати цілу сукупність різних інформаційних систем, кожна з яких вирішує певне строго спеціалізоване коло завдань. Така ситуація унеможливує ефективне використання засобів автоматизації. У роботі розв'язується актуальна науково-практична проблема створення комп'ютерної системи управління закладом вищої освіти на базі єдиної платформи. Для розв'язання цієї проблеми запропонована уніфікована модель взаємодії суб'єктів освітнього процесу, яка дозволяє в найбільш популярній LMS-платформі, крім функцій навчання, додати розв'язування організаційних завдань з управління закладів вищої освіти, а також реалізує функцію документообігу. З метою перевірки достовірності запропонованих розв'язків була перероблена система ролей користувачів системи, яка дозволила додати гнучкості і розширити функціональні можливості по роботі з базою даних системи, а також розроблена комп'ютерна система управління закладом вищої освіти на базі єдиної платформи із застосуванням запропонованої уніфікованої моделі взаємодії суб'єктів освітнього процесу. Розроблена система не має особливих вимог до апаратно-програмного комплексу як серверної, так і клієнтської частини та може бути розгорнута на практично на будь-якому вебсервері.

Ключові слова: інформаційні системи управління навчальним процесом; системи управління документообігом; інформаційні технології.

УНИФИЦИРОВАННАЯ МОДЕЛЬ ВЗАИМОДЕЙСТВИЯ УЧАСТНИКОВ ОБРАЗОВАТЕЛЬНОГО ПРОЦЕССА В ЕДИНОЙ СИСТЕМЕ УПРАВЛЕНИЯ УЧРЕЖДЕНИЕМ ВЫСШЕГО ОБРАЗОВАНИЯ

Батурин Александр Иванович

старший преподаватель кафедры программирования и математики
Восточноукраинский национальный университет имени Владимира Даля, г. Северодонецк, Украина
ORSID ID 0000-0003-2350-4036
aibaturin1973@gmail.com

Лыфарь Владимир Алексеевич

доктор технических наук, доцент, зав. кафедрой программирования и математики
Восточноукраинский национальный университет имени Владимира Даля, г. Северодонецк, Украина
ORSID ID 0000-0002-7860-9663
lyfarva61@ukr.net

Захожай Олег Игоревич

кандидат технических наук, доцент кафедры программирования и математики
Восточноукраинский национальный университет имени Владимира Даля, г. Северодонецк, Украина
ORSID ID 0000-0002-9078-3242
zakhozhay.oleg@gmail.com

Иванов Виталий Геннадиевич

кандидат технических наук, доцент кафедры программирования и математики
Восточноукраинский национальный университет имени Владимира Даля, г. Северодонецк, Украина
ORSID ID 0000-0002-8698-0972
vetgen75@gmail.com

Аннотация. Интенсивное развитие информационных технологий создает благоприятные условия для внедрения методов и средств автоматизированной обработки данных и управления в различных сферах жизнедеятельности человека. Сфера образования является одной из передовых в этой области. Последнее время создано достаточное количество различных информационных систем, которые позволяют автоматизировать тот или иной аспект деятельности современных учреждений высшего образования. Одним из наиболее популярных классов образовательных систем является LMS – Learning Management System, которые позволяют реализовать поддержку процесса обучения через технологию E-learning. Однако такие системы не имеют достаточного функционала для автоматизации других аспектов деятельности учреждения высшего образования. Такая ситуация привела к тому, что современные учебные заведения вынуждены использовать целую совокупность различных информационных систем, каждая из которых решает определенный строго специализированный круг задач. Такая ситуация усложняет эффективное использование средств автоматизации. В работе решается актуальная научно-практическая проблема построения компьютерной системы управления учреждением высшего образования на базе единой платформы. Для решения этой проблемы предложена унифицированная модель взаимодействия субъектов образовательного процесса, которая позволяет в наиболее популярной LMS-платформе, кроме функций обучения, добавить решение организационных задач по управлению учреждением высшего образования, а также реализовать функции документооборота. С целью проверки достоверности предложенных решений была переработана система ролей пользователей системы, которая позволила добавить гибкости и расширить функциональные возможности по работе с базой данных системы, а также разработана компьютерная система управления учреждением высшего образования на базе единой платформы с применением предложенной унифицированной модели взаимодействия субъектов образовательного процесса. Разработанная система не имеет особенных требований к аппаратно-программному комплексу как серверной, так и клиентской части и может быть развернута на практически на любом web-сервере.

Ключевые слова: информационные системы управления процессом обучения; системы управления документооборотом; информационные технологии.

