TÍTULO: Metodología de mejora de la calidad de la gestión de la organización de procesos educativos por implementación de software.

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RESUMEN: El artículo trata sobre los temas de intercambio de información entre profesores, alumnos y departamentos de organizaciones educativas. Revelaron la necesidad de abordar los problemas asociados con la publicación de eventos: los principales anuncios administrativos de las organizaciones educativas, que son visibles para todos los usuarios y se establecen en una fecha determinada. El enfoque para la publicación de eventos se propone en el marco de un módulo separado del sistema. Consideraron el mecanismo de correo masivo que permite a los usuarios transmitir información a dos o más destinatarios y garantiza el intercambio de información disponible solo para los destinatarios, a diferencia del "muro". Se propone un enfoque para

aumentar la calidad de la organización del proceso educativo, lo que permite un intercambio rápido.

PALABRAS CLAVES: Organización de procesos educativos, paquete de software, tecnologías de nube.

TITLE: Management quality improvement methodology of educational process organization by software implementation.

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ABSTRACT: The article deals with the issues of information exchange between teachers, pupils and educational organization departments. They revealed the need to address the problems associated with the publication of events - major administrative announcements of educational organizations, which are visible to all users and set to a certain date. The approach to publication of events is proposed within the framework of a system separate module. They considered the mechanism of mass mailings which allows users to transmit information to two or more recipients and ensures the exchange of information available only to recipients, unlike the "wall". An approach is proposed to increase the quality of the educational process organization, which allows a rapid exchange.

INTRODUCTION.

In this paper, a software package was developed and studied using cloud technologies. The program package includes information systems: "Electronic schedule", "Social network of the educational organization". The set of information systems influences the quality of the educational process organization positively, without additional loads on the IT department of the educational organization. This became possible due to their implementation with the use of WEB technologies, and the distribution of systems within the framework of SaaS (software as a service) approach. The article considers the functions of information systems, analyzes their influence on the educational process organization quality improvement, and the results of an empirical experiment are provided.

Educational process quality improvement due to the implementation of the electronic schedule system in the educational organization.

At present, a considerable attention is paid to the automation of educational activity management. This is due to the development of computer technology, especially mobile platforms, and to the requirements for the prompt implementation of management decisions.

The availability of WEB - technologies and the development of systems that allow their use by nonprofessional users provided the opportunities for the wide involvement of educational institution employees who do not have IT competencies traditionally to work with information communication channels directly. For example, the application of CMS allows to edit site pages without the involvement of IT experts.

Besides, a widespread use of SaaS technology, which allows to transfer the problems of information system and equipment maintenance for specialized organizations [1].

All this makes it possible to implement a fundamentally new approach to the automation of compilation and the provision of an electronic timetable in INTERNET.

Intermediate elements are formed between the elements - information providers, such as administration and site support group. This entails the information placement time increase by 30%. Traditionally, the placement of information about the curriculum on an information site of an educational organization [2], and in the overwhelming majority of other organizations, institutions and enterprises is built according to the scheme shown on Figure 1.
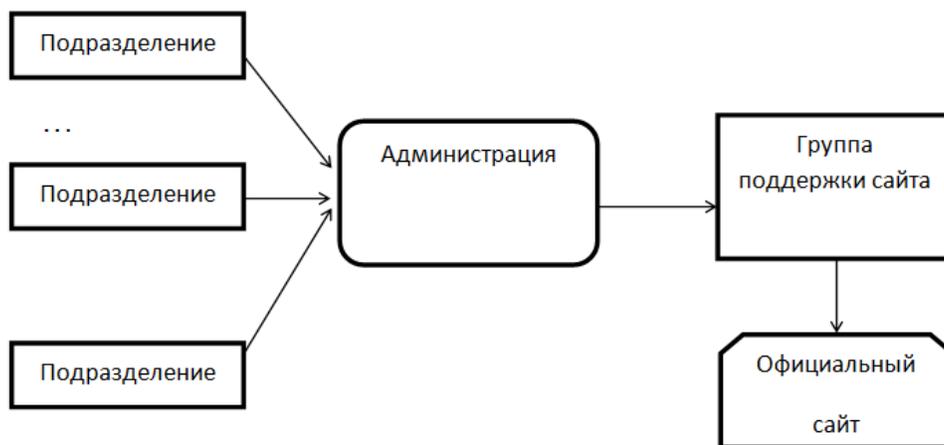
Подразделение - department / Администрация - authority / Группа поддержки сайта - site support group / Официальный сайт - official website

Fig. (1). – The traditional scheme of information placement organization concerning the training schedule on the organization official website.

This scheme was widely spread due to the fact that on the one hand newly created INTERNET resources contained a small amount of information and represented, so-called promo sites. Such sites, as a rule, contain contact information, several pages and pictures describing the main activities of the organization [3]. The traditional resource management scheme is quite acceptable to ensure the operability and the relevance of a corporate site. First of all, this is due to the small volumes of information being posted, a low dynamics of updates, the possibility of information coverage and

control by the first level representatives of an organization management, the existence of a specialized structure, for example, the information department or the editorial department of a site.

This configuration of the information distribution system, in particular the schedule of classes on the training organization website has confirmed its effectiveness and viability. However, such a scheme does not meet the requirements for prompt placement of materials. Consequently, it became necessary to implement a completely different approach to the organization of an educational organization information portal [9,10].

The traditional scheme of abovementioned training organization website work provision, proved to be incapable of solving the tasks for the support of the training schedule relevance. Modern educational organizations began to make the demands of relevance, not even at the level of days, but at the level of hours. This made it impossible to use the traditional layout of materials, in particular the schedule of classes, on the website of the training organization.

As one of the solutions to the problem of information prompt placement, the "Electronic Schedule" system was considered [4]. The scheme of information placement organization using the "Electronic Schedule" system is shown on Figure 2.
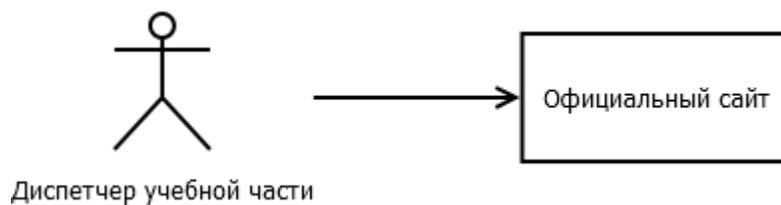
диспетчер учебной части - educational department controller / официальный сайт - official website

Fig. (2). – Information placement organization scheme using the "Electronic Schedule" system.

When the system is used, such nodes as the administration and the site support group are excluded. This gives the increase of 30% to the data update rate. There is the ability to edit the schedule from

any device quickly, since the system is the WEB service, which allows dispatchers to maintain the relevance of the training schedule without technical personnel involvement. The problem of a timetable design in an educational institution appeared long ago. Large and well-known systems solve the problem of scheduling and planning successfully. But the problem of timetable placement and accessibility has appeared relatively recently and has no general solution due to the increased availability of mobile technologies in society.

The economic effect forms the introduction of the system under consideration is the reduction of the administration and the support group labor costs for the site of a training organization and, as a consequence, the reduction of wage costs.

The large training organizations solved the problem of placement and the maintaining of actual timetable privately, but the problem has not been solved so far in small organizations, for example, in the organizations of secondary vocational education.

The considered system solves the following tasks in the framework of the educational process organization:

- a training schedule creation and editing;

- a session schedule creation and editing;

- the display of free teachers and audiences;

- quantitative accounting of lessons for each teacher;

- the ability to find a timetable for a teacher and a training group;

- the accounting of employment among part-time teachers;

- the analysis of classroom capacities;

- the analysis of planned classes for the compliance with curricula;

- the system adaptation for its use on mobile devices.

The flexibility of the system during a training schedule planning is the factor that influences the educational process quality. The ability to hide training groups, for example, from correspondence department, provides a quick search and the display of information for a student or a teacher by information amount reduction displayed to a user.

The group accounting page is shown on Figure 3.

Fig. (3). – Group accounting page.

The closest analogue of the "Electronic Schedule" system does not take into account the possibility of three or more subgroups in one cell of the schedule grid. This entails an additional burden on the training part of the organization, increases the time for a training schedule creation, the process of overlap elimination becomes more complicated for teachers and classrooms. In the system considered within the framework of the work, it is possible to schedule several subgroups in one cell of a schedule.

The grid of the training schedule is shown on Figure 4.

Fig. (4). – Schedule grid page

A mandatory requirement for scheduling systems is the accounting of "overlays" in a schedule [5].

The information about free classrooms and teachers is displayed interactively.

System users: students and teachers impose restrictions on the information display time and its structure. Within the constraints imposed on the schedule display structure, the system provides for the grouping of search elements into semantic associations. The structure of a search page is shown on Figure 5.

Fig. (5). – The structure of schedule search page

The grouping of training groups into associations increases the speed of information retrieval, as it provides the clipping of superfluous data at the first stages of the search. This ensures the availability and the structuring of a training schedule for students, improves educational process organization quality in large educational organizations by the reduction of information retrieval complexity.

The system is adapted for the use on mobile devices or information kiosks. The result of the schedule search is a table.

The presence of large controls, such as the "Back" button, ensures the convenience of the system use on mobile devices with a touch screen [6].

During the organization of the educational process, the dispatcher of the training organization is faced with the problem of class arrangement for part-time teachers. Each of these teachers imposes the restrictions on the time and week days for class placement due to the employment in several organizations at once.

Traditionally, the consideration part-timer preferences is performed with the use of paper technologies. A training organization dispatcher has difficulties with the search and the storage of information about teacher wishes. There are common mistakes in planning because of unaccounted restrictions on the time of class conduct by a teacher. This entails missed classes and reduces the quality of the educational process organization.

The system "Electronic schedule" provides for the possibility of wish automated accounting among part-time teachers during the planning of classes. The scheme of teacher wish development is presented on Figure 6.

Fig. (6). – The scheme of teacher wish development

The teachers' wishes are displayed in the form of pop-up windows during a schedule planning. The appearance of a pop-up window is shown on Figure 7.
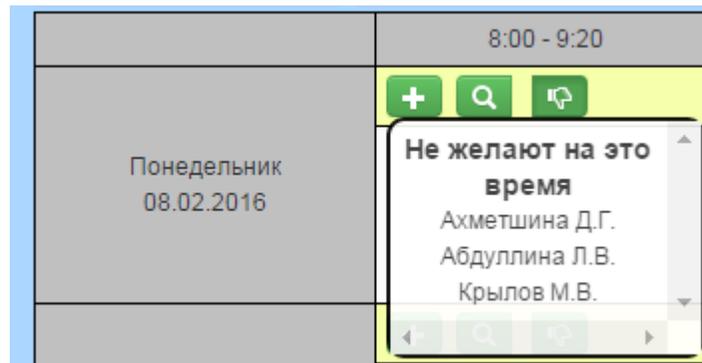

Fig. (7). – The pop-up window of teacher wish consideration

One of the main components of the educational process organization is the record of the lessons conducted by a teacher in the context of the time range.

In many educational institutions, the lessons are recorded on paper or in an Excel file table. This entails the difficulties in the development of a report on the conducted lessons, taking into account the permutations, the replacement of classes and teacher sick-lists.

The system "Electronic schedule" implemented the mechanism for the record of lessons conducted by a teacher with the filtering by time range and by a group. This makes it easier to take into account the conducted actual lessons, during load performance analysis. The appearance of a record page of the lessons held by a teacher is shown on Figure 8.
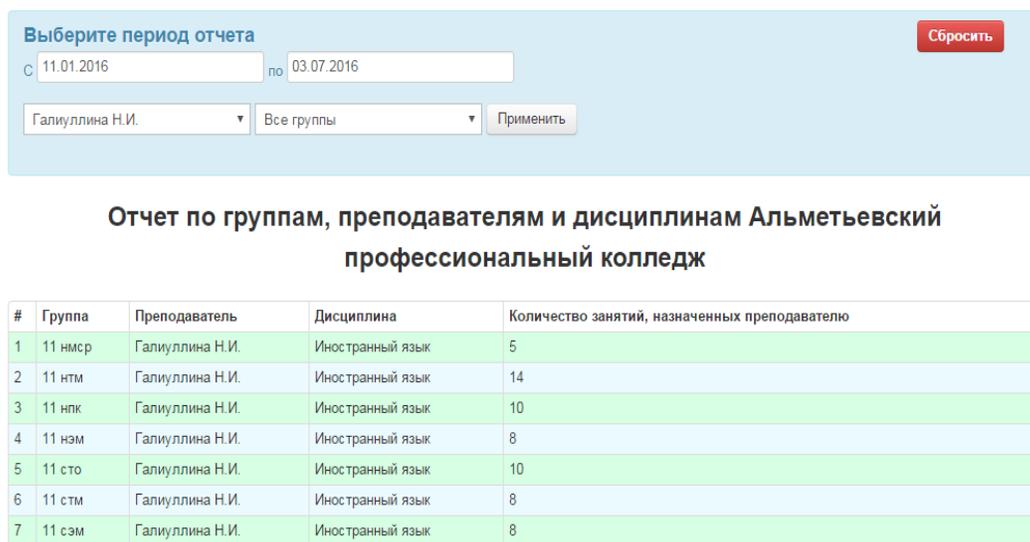
Fig. (8). – The page for the report drawing up on the load performed by teachers.

On the basis of the Armavir State Pedagogical University and Almetyevsk Vocational College, an empirical experiment was conducted within the framework of the work. The experiment was carried out since 1.1.2015 till 31.12.2015. The result of the observations performed by the use of Google Analytics statistics service, it was found that the average value of search query number aimed at the obtaining of information about the schedule of classes from students and teachers over a thirty-day period makes eighty-one thousand seven hundred seventy-five. The number of unique users working in the system during the experiment makes seven thousand eight hundred and seventy-five. The result of the research is shown on Figure 9.
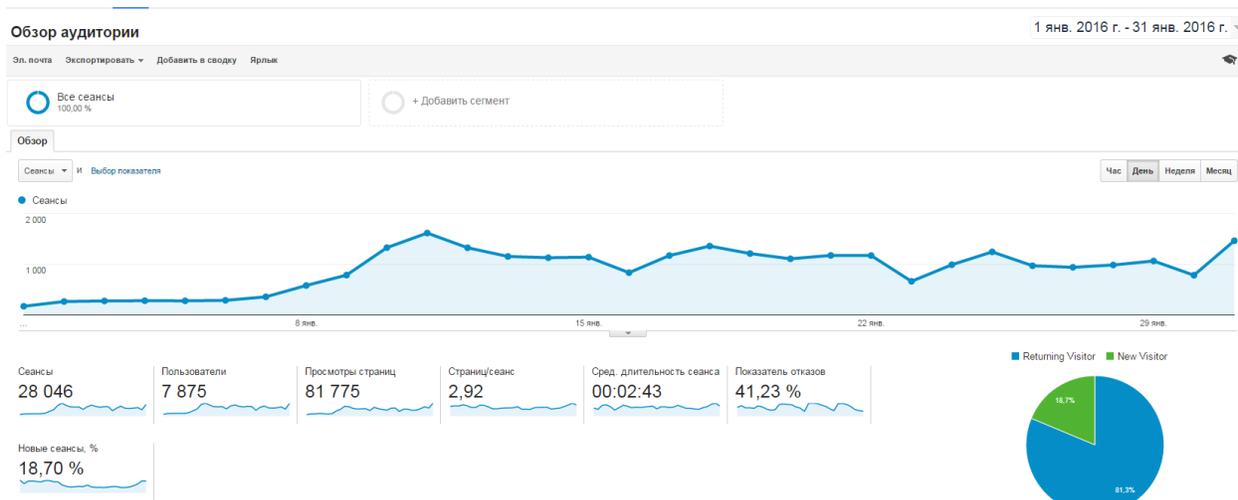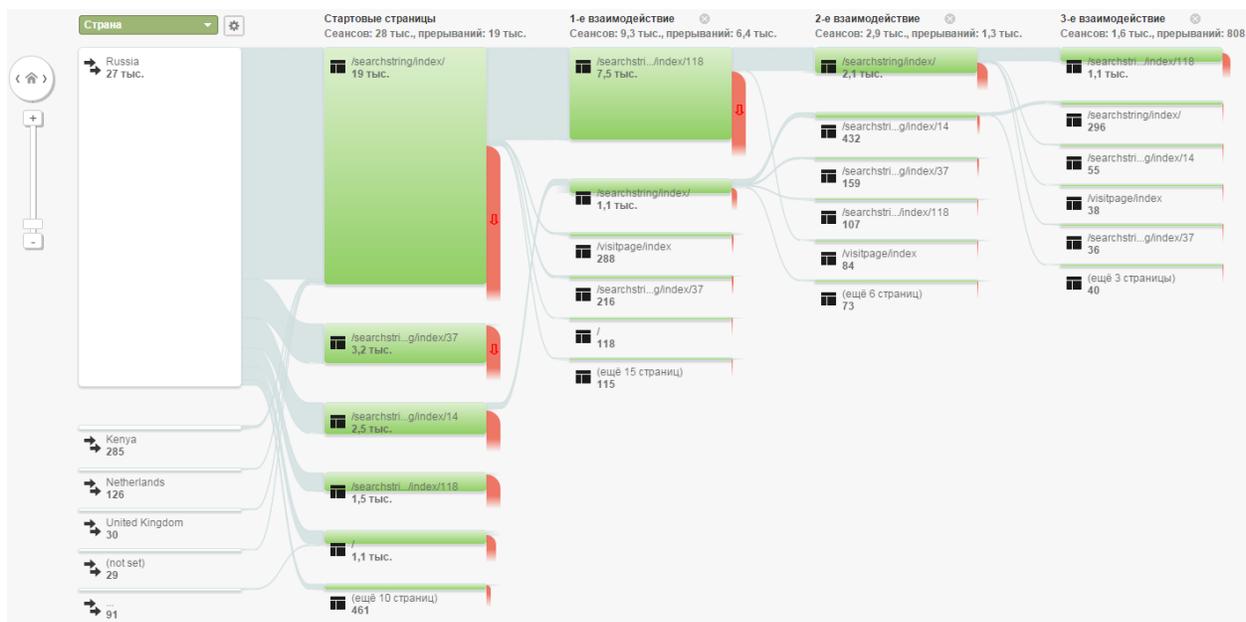
Fig. (9). – The statistics of "Electronic schedule" system attendance in thirty days

Also, they conducted the studies in the framework of device type determination with which the users work with the system. The result of the study is shown on Figure 10.

Fig. (10). – The statistics of "Electronic Schedule" system visits during thirty days in terms of device types.

From the presented statistical data during the observation period of thirty days it follows that there are 52% of desktop personal computer users, 44% of mobile device users and 4% of tablet users. This imposes additional restrictions on the speed and the structure of information display.

The analysis of the "Electronic Schedule" system traffic was also conducted. The diagram with a set of statistical data is presented on Figure 11.

Fig. (11). – The traffic statistics of the "Electronic Schedule" system

Educational process organization quality improvement due to the implementation of "educational organization social network".

An optimal organization of the educational process is the number one task for any educational organization. The educational process organization quality determines not only on the assimilation of the teaching material by students, but also the labor costs of teachers and departments. Although nowadays the availability of computer technology for educational organizations and the society as a whole makes almost 100%, the staffing with software is noticeably behind, in particular, there are no professional software products for the automation of information exchange between teachers and students [5].

The traditional means of information exchange, such as e-mail and telephone communication are used widely, but they have a set of shortcomings. The main disadvantages are the following ones:

- the need to provide the faculty with the information about personal e-mail addresses, telephone numbers, etc.

- the lack of learner verification methods with whom communication takes place.

Large educational organizations solved privately the problem by expensive and specialized software product development [6].

There is no specialized solution for the organizations of secondary vocational education (college, technical school, school, lyceum). Some small educational organizations use social networks to exchange information between teachers and students. This approach contains the problems associated with the need to create separate social network units for training groups in order to separate the information intended for the entire educational organization and intended for individual groups and departments.

The scheme of interaction between teachers and students with typical method use is presented on Figure 12.
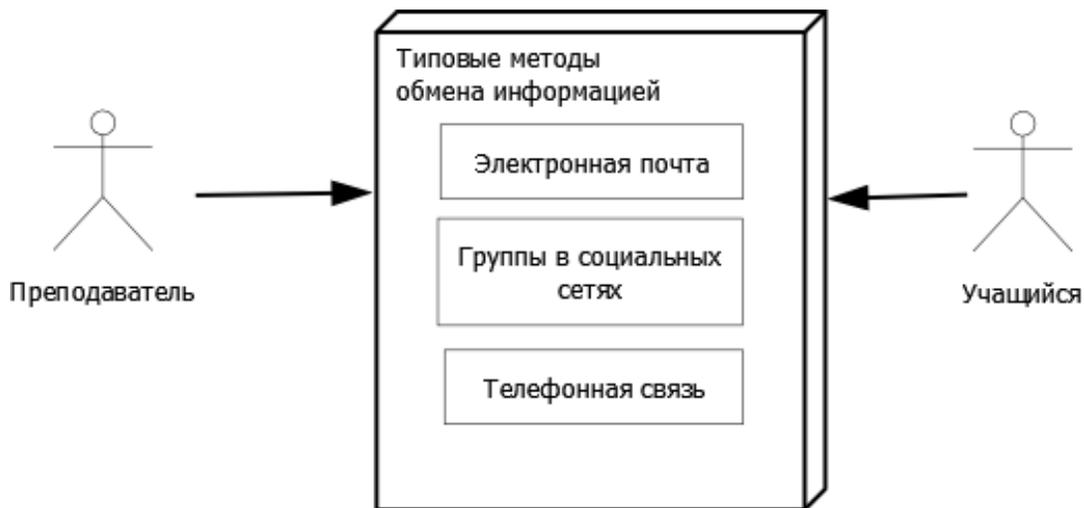
Преподаватель - Teacher / Учащийся - Student / Типовые методы обмена информацией - Typical methods of information exchange / Электронная почта - Email / Группы в социальных сетях - Groups in social networks / Телефонная связь - Telephone communication

Fig. (12). – A typical scheme of interaction between teachers and students using standard methods

Thus, the development of a social network for small educational organizations is an urgent problem.

In order to achieve this goal, it is necessary to solve the following tasks:

- the implementation of personal and group messages in the system of creation mechanism;

- the implementation of users' personal pages;

- the development of user "wall" functions;

- the implementation of additional functionality for a system administrator, a teacher;

- Email notification support;

- the implementation of ignored user accounting subsystem;

- the implementation based on WEB technologies;

- the adaptation of the system to the use on mobile devices.

The system "Social network of an educational organization" was proposed as one of the problem solutions associated with the exchange of information between teachers and students.

Within the framework of the approach, it is proposed to take the ideology of social networks and project it on the specifics and the needs of educational organizations. This will ensure the possibility of an operative exchange between employees, students and units (divisions) of an educational organization [7]. The scheme of system user interaction is presented on Figure 13.
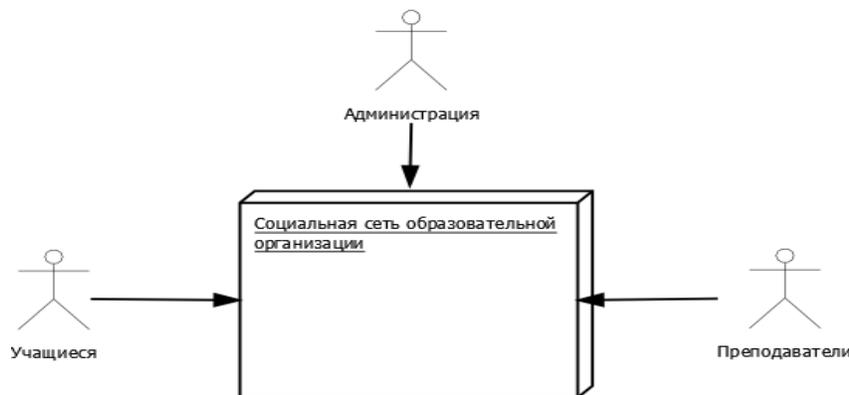
Администрация - Authority / Учащиеся - Students / Преподаватели - Teachers / Социальная сеть образовательной организации - Social network of educational organization.
Fig. (13). - The scheme of information exchange organization in the system "The social network of the educational organization"

In order to improve the level of information protection and verification, the system has implemented the following steps:

- the centralized storage of information;

- the control and protection of users' access to the information about students and teachers;

- user account management by the unit of an educational organization educational part.

The system interface has the following capabilities:

- the availability for each of the users (a teacher or a student) of his profile type;

- the availability of the employment schedule on teacher's profile pages;

- the presence of class schedule on student profile pages;

- there are visual mechanisms to ensure subscription to news on the profile page (of a teacher or a student).

These opportunities meet the requirements and the specifics of educational organizations.

The subscription functionality filters the user information by the utility criterion. The example of an interface that displays the lists of users on which a subscription can be drawn up is shown on Figure 14.
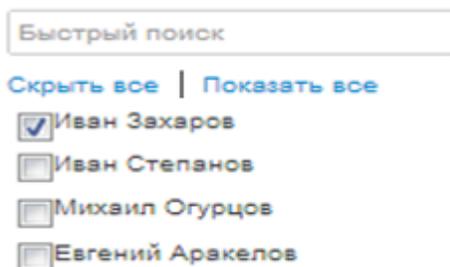
Fig. (14). – The example of an interface that displays the lists of users on which a subscription can be drawn up.

There is a prohibition on the change of personal information about students, as well as his photos in connection with the specifics of educational organizations in the system. An example of a student's page is shown on Figure 15.
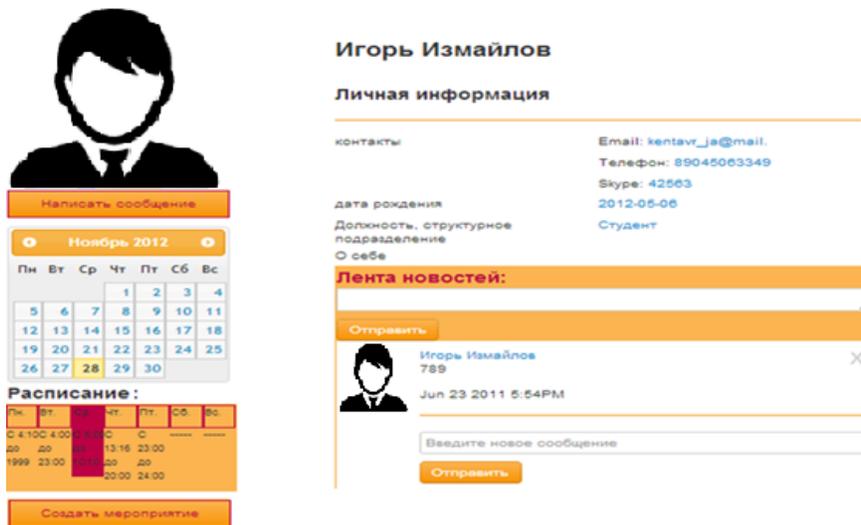
Fig. (15). – The example of a student profile page

The ability to create group ads is entered into the system with the working name "wall" (a page example is shown on Figure 16). The records, which a user places on his "wall", appear in the news "tape" of users who are "subscribed" to him.
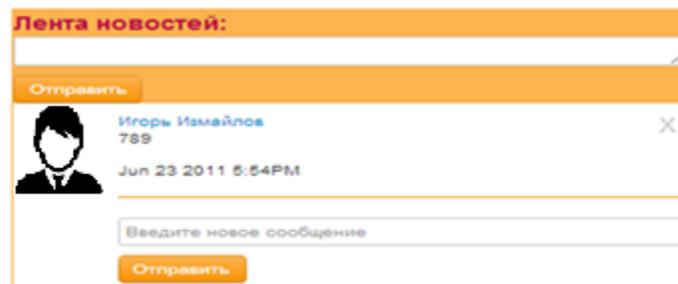

**Fig. (16). – The appearance of system user "wall"**

The system also implemented the possibility of privileged user creation, and it is impossible to cancel the subscription in respect of such users. Such users are the administration of an educational organization.

In order to exchange information between system users, it is possible to send personal messages. The message has one of two statuses: "read", "not read".

The mechanism for mass mailing creation provides users with the ability to transmit information to two or more recipients. This approach ensures the exchange of information available only to recipients, unlike the "wall" [8,9,10].

Another feature of educational organizations is the availability of activities that are visible to all users and are assigned to a certain date. These are large administrative announcements. These features are also implemented in the system within a separate module.

The study analyzed the data on the age of system users for a period of 30 days. The majority of users are students, whose age ranges from 18 to 24 years, which makes 60% of the total number of users. The result of the age analysis of the system audience is shown on Figure 17.
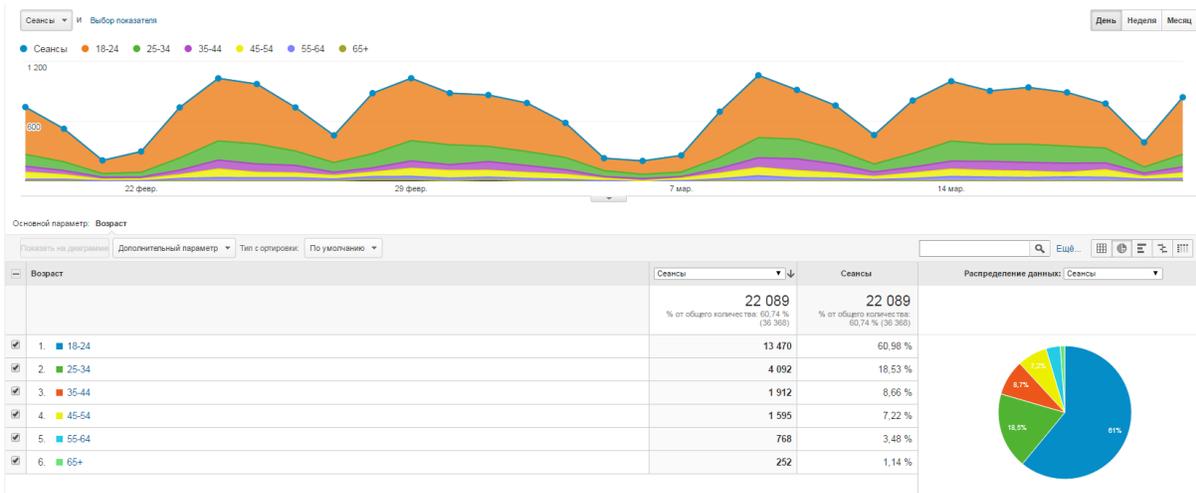
Fig. (17). – Age analysis of the audience within the system "Social network of an educational organization".

CONCLUSIONS.

The result of the software package experimental study is the conclusion that the proposed information systems are more effective indeed than traditional paper technologies and make it possible to use them in various educational organizations.

The results of the empirical experiment show that the audience of the system consists of 52% of desktop personal computer users, 44% of mobile device users, and of 4% of tablet users. This

imposes additional restrictions on the speed and the structure of information display, and also makes it impossible to use desktop information systems.

The result of the study is the methodology development to improve the quality of the educational process by information system software package introduction.

The proposed complex is suitable for the use by both small and large educational organizations due to scalability and extensibility. An adaptive design meets the requirements for mobile device use, which is important in the age of information technology.

Given the diversity of educational organizations, their profiles, the different equipment of computers, the systems are subject to stringent requirements for speed and cross-platform nature. These requirements are met by the considered software package, as it is a WEB application distributed by SaaS technology.

In order to achieve this goal, an empirical experiment was conducted aimed at statistical information obtaining about student visits, the types of client devices, and the analysis of the traffic system was performed.

The described software complex was successfully implemented in Armavir State Pedagogical University, in Almetyevsk Vocational College, in Kalmyk Medical College named after T. Khakhlynova, in Kalmyk State University, in Kalmyk Polytechnic College, in Kalmyk Technological-economic College, Stavropol Regional Multidisciplinary College and proved its consistency and effectiveness. During this time, the appearance and the approach to the system has changed many times, but the effectiveness of the educational process organization has increased.

Conflict of interests.

The author confirms that the presented data do not contain a conflict of interest.

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