UDC 004.9:35.078.3

Kasatkin Dmytro, PhD, an assistant professor of social pedagogy and information technology in education, National University of Life and Environmental Sciences of Ukraine;

Kasatkina Olga, a senior lecturer in Information Systems, National University of Life and Environmental Sciences of Ukraine

Organization of electronic documents by improving information provision in higher education

The article reviewed examples of university information and communication system for the organization and management of electronic documents in institution. Illustrated with examples the problems that may arise in the process of creating electronic documents. Features of the work of employees who use the system of electronic document and the errors and problems that arise should be to be tracked, analyzed and considered. Described implementation of documents circulation in information and communication systems of the institution.

Keywords: *electronic document management, information and communication systems, document management, informational support*

Talking about the management and development of complex social and economic systems, including higher education institutions based on information technology, it should be noted that when they are used governance and development become dynamic and optimal. In this respect, the main problem of optimal learning management and business activity of the institution in the market environment is a choice of analytical methods and numerical algorithms for finding the most efficient solution, wherefore the widespread use of information and communication technologies promotes.

We should mention that a large number of domestic and foreign research scientists devoted to the problem of governance improvements of the quality of the educational process and efficiency of education management in the current economic conditions. Notable works of famous scientists: A. Alexeev, A. Andreev, Barannik M., V. Bykov, Alexander Verbitsky, M. Volkova, Halahina A., N. Goncharova, A. Dohalina, Dzhuryn A. Zabolotny E. Kirilinskoyi Yu, J. Kuz'minov, Melehyna V., N. Malikov, Maysakova D. Pankruhina A. Pishchulina S., M. Rogov, V. Sidorenko, Tverezovskoyi N. Chentsova A. Shchetinina V. and others.

However, despite the achieved results in the industry, there still remain a number of neglected issues. In particular, the problem of efficient management of spendings to improve the quality of educational process and evaluation of the implementation results and operation of information technology in the management system of the institution. Use of electronic documents in higher education institutions (HEIs) can significantly increase staff productivity, reduces the time it takes to process documents. In most HEIs a workflow system is formed and with growth of the institution it expands, resulting in the need of its analysis. Largely, productivity depends on the particular workflow in HEI, but we can not rule out the human factor. Features of the work of employees who use the system of electronic document and the errors and problems that arise should be to be tracked, analyzed and considered.

It turns out that improving the efficiency of electronic document management systems is impossible without analyzing specific enterprise workflow features and events of the system in use.

So inefficient use of electronic documents hinders the development of enterprises. Because information or document that was not received in time often leads to loss of time, money or new opportunities.

Consequently, the task was to develop software that can detect existing problems and monitor workflow works in electronic document management system.

The software solution of the problem is developed as a supplement to university information and communication system (hereinafter UIKS). University information and communication system (UIKS) [1] - a project developed for 6 years at the Center of New Information Technologies Novosibirsk State University (NSU TSNYT). The system provides automation of internal processes of the institution, and is responsible for handling electronic documents.

At the heart of any system of electronic document flow is a document. But lurking behind every document flow processes and, most importantly, people who carry out these processes. Let us illustrate the example of the problems that may

arise during the workflow. The document usually passes through several people, if the document is funnels responsible person who holds it for unnecessarily long period of time for documents of this type, the system allows to detect this and based on these data take administrative measures. The following possible problems were allocated for the analysis:

- delays in the approval and registration of documents
- errors in the content of the documents leading to their frequent cancellation
- load of the system in the presence of seasonally created documents
- incorrect load distribution on staff

For a visual display of the problems in the records management associated with the human factor, and monitoring work in electronic documents, it was decided to allocate the necessary cuts in their data and develop reporting based presentation. When you add new documents or change order workflow it may require the new reporting data, because the tasks of the exploration and allocation pattern most typical for the reporting processes of document management and creation of universal interface to work with them. This interface must provide equal representation of existing reports and provide easy, quick and convenient way of adding new statistics.

Submission of data sets in a graph provide better understanding of the results of statistical observations, interpret them correctly, greatly facilitate the understanding of statistical material, make it visible and accessible.

Graphic representation, primarily allow to control the reliability of statistical indicators, as presented in the chart, they show more clearly the existing uncertainties associated with the availability or collection and calculation errors, or features of a particular organization. Graphical displays will help to examine patterns of use of electronic documents, figure out existing relationships.

It is therefore necessary to have a graphical and tabular presentation of statistical data and obtain various forms printed on them.

In the system of electronic document management, provided by UIKS for university, are more than 47 types of documents for various purposes, including

official documents data on which is not revealing and can not be used to increase the efficiency of document management. In this regard, there is a task of configuration data collection.

First of all, the idea of reporting on various statistical data management system is necessary for staff that work directly with documents and for the management of the University; in same time the information provided should have a different amount, for example if for the employees it will be sufficient to see reports only those documents which they are working, manager of personnel need to see reports on all documents system. On the other hand it is necessary to restrict access to view reporting information, including the staff involved in the workflow.

Consider the general scheme document flow, shown in Fig. 1.

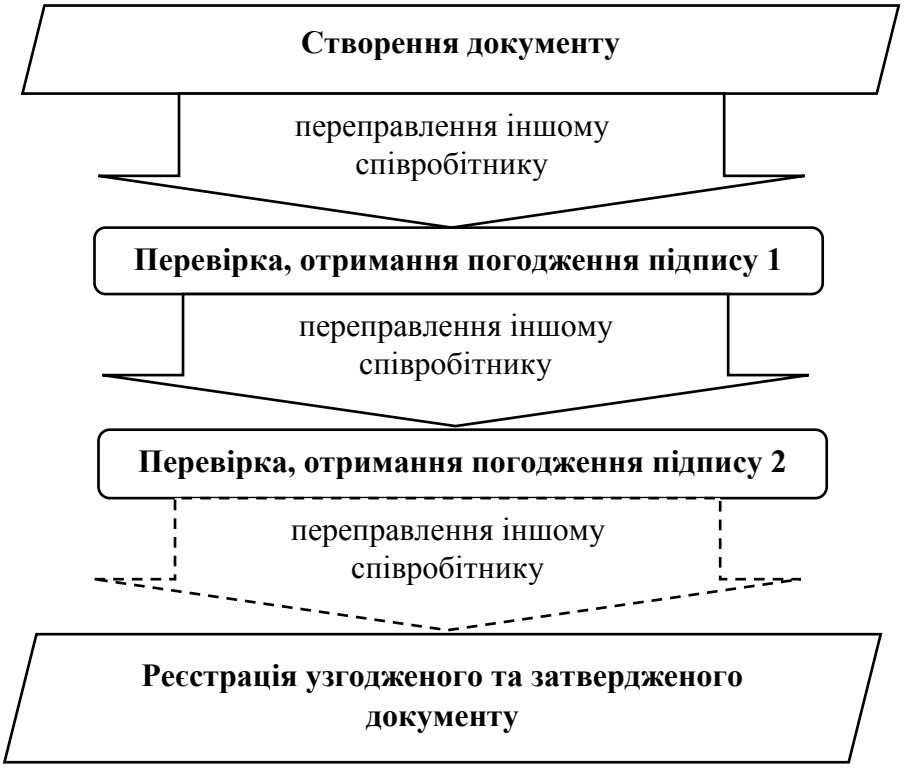

Fig. 1: General scheme documents

The document created by one person, redirected for matching signatures of one or more persons, after which the document is recorded.

Thus, the paper passes through several people, and hold of it by one of these persons drawn to stale of the entire processing of this document or even for the entire system.

Statistics of the documents flow. In UIKS one can establish regulated

document workflow, while the document may be reviewed by few persons. Calculate the average time spent on each site of document way. This information is needed to determine the delay in the document processing. On this basis we can change the way a document, for example, to remove the phase that delays the way, or take administrative measures to the staff. The same report estimates the average time spent on the document, which is useful when employee planning time of the beginning a document review.

Delays in the document flow. The report contains information about employees who caused major delays in the document flow and on what documents. Based on these data load is distributed to a specific person, or to change the way for some documents. The data are used to optimize and minimize processing time for the documents.

Quantitative statistics for the documents in time periods. Information about the number of new registered and canceled documents for a period of time - year, month or semester. Based on the data Seasonal documents are determined and optimally distributed processing of documents by month. Also, based on data from different years, changes in the number of documents processed by the system of electronic document are being observed.

Statistics of time spent on various documents. For the selected person the percentage of time spent on each type of document is calculated. The report based on this data allows to control the business process workflow, making a positive impact on the administrative discipline of the organization. Based on the data load is distributed among employees. The report is aimed at minimizing the time working with documents.

For each slice of data data developed reporting idea, tabular and graphical form, most graphically depicts statistics.

Universal interface of analytics of the workflow.

Set of various sections of the data presented in the form of reports, will help to notice when problems arise in the office and take the necessary measures. For easy analysis of the results of these reports and develop new reports a universal

interface was developed.

In the analysis of selected data requirements for the submission of their interface and functionality were identified common features of reports on documents. Given the selected features, template of idea was developed , which is schematically shown in Fig. 2. The interface breaks the user workspace into two main parts.

Fig. 2: template reporting

Left constantly displays a list of available user statistics. The right part changes according to the selected statistics. Scalability is available for both parts , up to hide the list of reports for easy reporting of results. The idea of using this interface was borrowed from other interfaces UIKS.

The right side, in its turn, is divided into 3 parts.

1. Report options

2. The main space contains two tabs, which display graphical and tabular presentation of the report

3. A panel of available operations on the data.

Such splitting has several advantages.

1. The user always has visiblility of parameters, which carried out the data collection.

2. There are reports, for which there is a graphic representation, and with such a partition there will be no "graph" tab in the report which will maintain uniformity in the mapping.

3. Operations with data are always available.

4. Graph and tabular data spaced so that they do not interfere with each other and watching at the same time between them can quickly change.

Electronic Document Management System in UIKS configured through XML configuration files, this idea was also borrowed for the configuration interface developed.

Reports available in the interface are set as a configuration parameter of the interface.

For each report,its parameterization and calculation are specified same as the method of reporting data. Then, based on the configuration , parameters and results of the report are put in the interface analytics workflow.

To build a graphical display JFreeChart library was used . This library allows to create graphics of any complexity, here are some benefits that contribute to its choice:

- the ability to create various types of charts and graphs, manage slogans, colors and other graphic elements
- receiving graphics in different formats, eg, JPEG or PNG, so, just use the results to display in a browser or to save a file
- Detailed records available
- Library is a free open source product

Using *System permissions* is performed as follows. For each document in its UIKS defined template, the template is defined in configuration, which contains general information about the document, about the role, possessing which users can work with this document, and the way the document.

To provide flexible access rights configuration template flags were added to allow or prohibit data collection on this document for the user that has a certain role.

This access control allows you to:

- for each document separately to allow them to collect certain data reporting
- for each user to define a set of reports available to them to collect documents and accounting data

For users not involved in the management of documents in UIKS created a special right of access, allowing them to view specific system statistics.

Statistical reports. Using developed universal interface for working with reports, reports have been implemented on the dedicated sections for these documents NSU.

Data are collected based on the information about the documents and about committed transactions with them, which is stored and kept in UIKS.

Each report has a graphical and tabular presentation that are displayed in the interface. And a hard copy of tabular data available in a format MS Excel, and schedule increases, opening a separate window and affordable graphics file format JPEG.

Data collection is conducted in the time period selected by the user. Data are collected separately by type of document that was specified by the user to help identify the necessary information at a particular point.

Implemented statistics of the documents flow determines detain stretch of track documents. The report calculated the average time spent on each site of the documents way, for different types of documents. It is used to analyze the configuration document workflow for different document types. Report gives estimate of the the average time spent to conduct a document at each stage of his journey, and of the whole document.

The program allows to graphically display a report representation on data collected for about 4 years on selected types of documents.

In the reports managment there are documents, work on which is active during certain periods of the year, let us call them "seasonal Documents". It is important to define "seasonal documents" and the season in which they occur, as these periods require quick turaround in documents workflow. Control of the

"seasonal documents" will let us to finalize them at the right time, and to distribute the load on the staff during the year.

The report shows the percentage of registered documents to not registered, produces control over documents tht are in the document processing. This information will allow us to monitor the progress of implementation of the document, and to assess the time to the end of what could be useful, for example, for "seasonal documents."

Program allows graphical representation of the results of this report, the data collected for the month of January for the document "Instructions dean in charge."

Quantitative statistics on the documents for the period shows how many and which documents were created, registered and canceled for a certain period of time. The report will analyze the dynamics of the documents based of their shared time with documents by month or quarter. Also, this report defines "Seasonal documents" in the office.

In conclusion we note that we have set out an analysis of the software that can detect problems of documents workflow and managment, related to the quality of duties performance of employees.

While working on the task datasets that allows you to monitor changes in the number of documents to analyze delays on their basis a model business processes for information about the progress of the work on the document were highlighted. Also the characteristics of the data and developed their stereotyped idea of reporting were identified .

Based on this model was created interface in the automated university management system (UIKS), which provides universal graphical representation reporting to identify systemic problems and document workflow.

Currently interface adopted to the industrial operation.

The main directions of further research and development will be focused on the provision of new sections of data to improve performance of electronic documents workflow.

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Марченко П. М., Ковтанюк Ю. С. Порядок організації електронного документообігу із застосуванням електронного цифрового підпису в органах виконавчої влади: схвалено рішенням Методичної комісії УНДІАСД від 29.08.2011 р. протокол № 7. – Рукопис.

ОРГАНИЗАЦИЯ ЭЛЕКТРОННОГО ДОКУМЕНТООБОРОТА ПУТЕМ СОВЕРШЕНСТВОВАНИЯ ИНФОРМАЦИОННОГО ОБЕСПЕЧЕНИЯ В ВЫСШЕМ УЧЕБНОМ ЗАВЕДЕНИИ.

Касаткин Дмитрий Юрьевич, доцент кафедры социальной педагогики и информационных технологий в образовании, Касаткина Ольга Михайловна, старший преподаватель кафедры информационных систем НУБиП Украины.

В статье рассмотрены примеры использования университетской информационно-коммуникационной системы для организации и управления электронным документооборотом в высшем учебном заведении. Проиллюстрировано на примерах проблемы, которые могут возникнуть в процессе создания электронного документооборота. Описана реализация пути документов в информационно-коммуникационной системе учебного заведения.

***Ключевые слова**: электронный документооборот, информационно-коммуникационные системы, управление документами, информационное обеспечение.*

ОРГАНІЗАЦІЯ ЕЛЕКТРОННОГО ДОКУМЕНТООБІГУ ШЛЯХОМ ВДОСКОНАЛЕННЯ ІНФОРМАЦІЙНОГО ЗАБЕЗПЕЧЕННЯ У ВИЩОМУ НАВЧАЛЬНОМУ ЗАКЛАДІ.

КАСАТКІН Дмитро Юрійович, доцент кафедри соціальної педагогіки та інформаційних технологій в освіті, КАСАТКІНА Ольга Михайлівна, старший викладач кафедри інформаційних систем НУБіП України

В статті розглянуті приклади використання університетської інформаційно-комунікаційної системи для організації та управління електронним документообігом у навчальному закладі. Проілюстровано на прикладах проблеми, які можуть виникнути в процесі створення електронного документообігу. Описана реалізація шляху документів в інформаційно-комунікаційній системі навчального закладу.

***Ключові слова**: електронний документообіг, інформаційно-комунікаційні системи, управління документами, інформаційне забезпечення*