



Electronic Document Management Information System for Universities

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Efficient administration of funds and thorough correlation of diverse activities are required in the management of Higher Education institutions, as is the case of University Politehnica of Bucharest. The electronic document management information system implemented in our University is continuously up-graded in order to provide a tool for an efficient management.

A preliminary identification was performed in order to take into account all the aspects referring to the numerous documents in circulation in the University and the problems raised by the necessity that some supported documents should be digitised. The document management platform in University Politehnica of Bucharest, SUNIDOC, is based on customised software created by the company SIVCO Romania, one of the major IT software companies in Romania, with important expertise in this field. The application for document and workflow management develops the following mechanisms (i) integration of the document and workflow management system with an Optical Character Recognition system; (ii) integration of an advanced engine for reports generation; (iii) features for bulk import of documents; (iv) integration of a workflow engine able to provide a process and rules engine.

The document management system was tested for documents specific to Human Resources Department and Research Centres in University Politehnica of Bucharest.

1. Introduction

The implementation of a document management system arises from the necessity to replace the increasingly documents circulating in paper form (Zantout and Marir, 1999) and offer also reliable tools for decision making in a universities and provides rapid communication between departments (Sanchez-Martinez et al., 2008). Once a document management system is implemented in universities, an increase in performance on both education and research tasks will be provided, especially in the case of the Romanian higher education institutions. Such is the case of University Politehnica of Bucharest, when the implementation of an electronic document management system provides the means to efficiently administer the activities and to provide a good overview of the implied tasks. The system was designed in accordance with employees needs in order to make it work despite the general preference of people from public sector to deal with paper supported information (Leikums, 2012). The document management system which has been implemented at University Politehnica of Bucharest is based on a customized software application provided by the company SIVCO Romania, who already has an important experience on the domain of documents and archive management

systems and is one of the major IT software companies in Romania.

2. Software and hardware architecture of the system

While using the document management system, the documents may be created by an author or introduced in the system by means of scanning, automatic import from file systems or other applications, by e-mail or by automatic generation based on forms.

Once in the system, the documents may be accessed in a centralized manner by University's users, from the repository of documents, through the system specific interface, based on the web browser, or through the file system of the operating system. Moreover, the documents receive a registration number from the electronic register scheme. The documents within the repository of documents may also be accessed from other applications used in the University, with the aid of the document path in the document repository. The processing workflow, summarized in Figure 1, also involves the archival of documents, their registration and retrieval based on user rights. One of the first stages in the attempt to implement a document management system was the development of an experimental model. This experimental model has a web-based architecture and is built using open technologies, such as Java J2EE, XML, XSL, OpenOffice, Apache Lucene and others. The model has a number of modules and it is built to allow future extensions and interconnection with other software running in the university. In order to extend the system to save more data, it is only necessary to add new hardware units for Network Area Storage and for the Database.

Based on the experimental model, the full prototype of the system has been created and implemented, considering a centralized topology. The core of the system is installed in the University Rectorate and users from University's faculties and research centres are able to connect to it by means of an Internet browser, since the application is web-based.

3. How does the system work

3.1 General considerations

The document management is a complex operation, which implies not only document accumulation but also managing the set of information about their content and their importance to the organization, providing control on information access and performing specific actions on the documents (Van Hee et al., 2009). Thus, when talking about document management, we shall consider the following aspects:

- The electronic Register;
- Managing common use documents – filing, tracking the version, flow processing, access control, search schemes;
- Managing documents within the organization's archive – conversion into digital data, filing, search schemes, access control, saving interval.

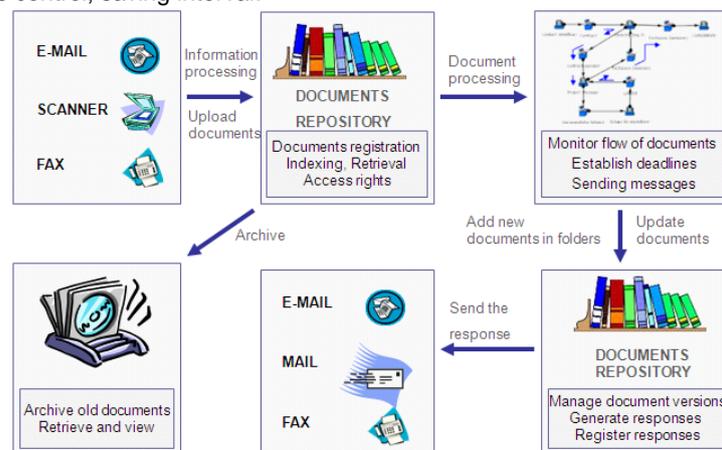


Figure 1: SUNIDOC Document management system – flow for processing documents

The system centralizes all activity based documents and makes them available to the whole organization, irrespective of how documents have entered the system or document type, whether simple text type documents, e-mails, faxes, scanned documents or even images. Figure 2 presents an example of documents list in the frame of the document management system SUNIDOC. As any Document Management System it is necessary to ensure the protection of these resources by managing the access rights and its adequate retrieval (Toledo et al., 2011).

Precise organizing rules and access control to archived documents are defined by restricted access rights, irrespective of the documents type and the way of entering the system, such as:

- by scanning printed documents
- by documents generated inside the organization starting from standard document templates
- by importing from e-mail programs
- by acquiring from other computer systems

The organization documents are ordered in a tree-like structure, in drawers, files and documents, similar to a standard folder system, providing flexibility for perfect adjustment to the users' practical needs and preferences.

3.2 Document archiving

The archiving mechanisms provided by the system work according to the requests expressed by the effective regulations. Converting the documents stored in the organization's archive fund in a digital format is possible, thus providing optionally by realising the following tasks:

- reduction of the storage space;
- optimal safekeeping of the archive documents, with no deterioration risk, while when using the classic document archiving method, under printed form, it is almost impossible to recover the information after a disaster (flood, fire);
- minimal archive destruction risk in electronic archiving due to the possibility of making safety copies and placing them in a different location, thus ensuring the possibility to recover data;
- increase of efficiency due to quick search and access of the documents needed at a certain instant, also available for common use documents.

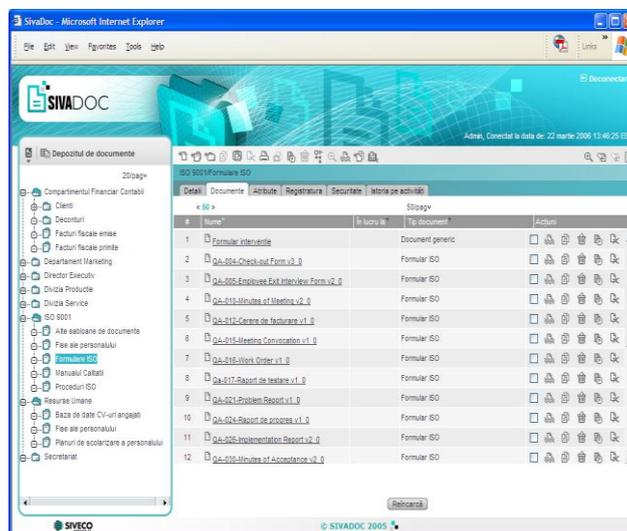


Figure 2: SUNIDOC Document management system – Flow for processing documents

3.3 Generating documents from standard templates

Each organization uses own standard document templates for generating certain documents.

Creating documents, based on these standard templates, is very easy when using the automatic document generation mechanism. In this way, the system is loaded with document templates

corresponding to the various types of documents created during the corresponding activities.

If a user wishes to create a new document based on a certain standard format, he shall simply select the appropriate one from the document list, fill in some information and the system shall automatically generate the new document according to the format which was previously established by the corresponding template. For example, in order to issue a vacation request, one shall choose to create a new document of this type. The system will ask the user to fill in the requester's name, the desired time period and the name of the person to take over his attributions during the vacation period. After this data input, the system will generate a new document according to the vacation request template, in which he inserts automatically the information provided by the user.

This document can be sent afterwards on the corresponding approval flow, by pressing a single button. Hence, the system is adequate for the organizations having certified quality management systems and already using standard forms, as well as for the organizations preparing to be certified, by providing the software support for activity organization and standardizing.

3.4 Easy document search

The simple search and advanced search tools offered by the document storage are suitable for any level of computer literacy, as well as for the need to use search filters based on differently complex criteria. For a simple search, the user may fill in only one word or an expression based on a certain format, thus ordering the system to perform searches in all relevant information connected to the documents. If one desires a more precise filtering, based only on certain criteria, like the name and connection to a certain keyword, he/she may use the advanced search tool.

The user may choose to perform searches both in the data connected to the document (keywords, attributes and values, author, registration number) as well as within the document.

The system saves some search patterns, in order to allow the repeated use of common search procedures. The author is given the option to make these patterns available to other colleagues within the organization.

3.5 Natural integration of e-mail systems and fax management systems

The documents may enter the organization by various ways. Today, printed documents are the most used, but the digital formats win over more and more users. The system is ready to receive data in both cases. It provides scanning and data extraction for printed documents through Optical Character Recognition type instruments, while using e-mail program integration and fax message management tools for the documents entering under digital format, as well as an automatic loading feature for the documents saved in certain directories.

In order to prevent activity interruption, each user may receive own work instructions under form of e-mail messages. This makes sure that all users receive the new work duties even if they are not permanently connected to the SUNIDOC environment.

3.6 Natural integration of Microsoft Office applications and Microsoft Window's work environment

Due to the integration features of the SUNIDOC product for common use applications, like Windows Explorer and Microsoft Office package applications, one may use the document management system functions even in the current work environment. For example, a user working in the Microsoft Word application may choose to block a document against editing or load a new version into the document storage.

The users are able to use the documents within the SUNIDOC Document storage directly from the Windows Explorer application, without opening the document management system's specific interface.

The Management of the work flows and the supervision of the activities carried out within SUNIDOC organization provide a united and controlled collaboration environment for all employees, starting with the activities supervisors to the common users, providing the standardization and improvement of the processing or approval flows carried out within the organization. Within the system, documents are organized in folders and sub-folders. The information recorded by the system about a folder/sub-folder comprises of data such as: the physical location of the catalogue (following a hierarchical organization), the author for each of the documents within the catalogue and the catalogue author, the catalogue number, the volume number for the catalogue, if necessary, the catalogue creation date, temporary or

permanent storage time, an indicator about the possibility that the dossier can be analyzed by a commission that decides if it can be erased from the archive, the catalogue type (chosen from a configurable dictionary) and the corresponding indicative from the dictionary, the starting and ending date, a short description, associated keywords for easy retrieval, classification level.

The SUNIDOC system, implemented in University POLITEHNICA of Bucharest starting from 2006 and developing over the next years, offers search interfaces both for users with limited knowledge in computer usage and for more advanced users. The simple search user interface can be used for matching all the information in the archive or repository associated to a document, catalogue or folder to a certain pattern. The system also provides advanced searching capabilities. As such, a user is able to search for information attached to the document and considered relevant, for example: author, keywords, registration number, type of document or folder, combination of values associated to the documents or even inside the document. Search results can have the format of a standard table-report and allow users to navigate to the files or documents found and to export the results in formats such as .doc, .xls, .pdf, .csv or to directly print the results. As an advanced feature, graphical summary reports are available and may format data as pie-charts, with bars, having cells in different colors (Figure 3). The system also offers a feature to select one or more files from the disk in order to import data as bulk-import. After selecting the files, the user is able to set either: (i) the same type of document for all the imported documents or (ii) different types of documents for each of the imported files. Once loaded, information from the disk is read and organized so that to respect the bulk-import format. Depending on the database size, there is an area dedicated to information management considering the business rules and data output-format.

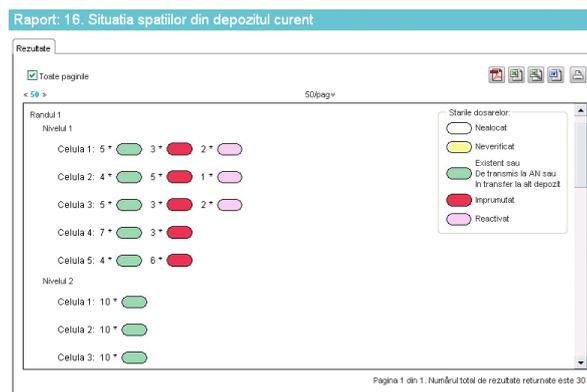


Figure 3: SUNIDOC Graphical report with cells and colour-codes

3.7 Work-flow definition

The SUNIDOC system provides the possibility to define the work flows depending on the organization necessities. A good workflow definition can avoid By performing an efficient control of the carried out activities, the system will inform all users as to the working instructions allocated to them. The supervisors will be able to oversee the performance of the activities they are responsible for and will receive notices when the activities stray from their normal course (for instance a fixed deadline is exceeded or a certain user refused to complete the received work instruction). Each user will be able to view in a special area of the system the list with their obligations. They are automatically generated depending on each user's role within the organization and on the processing performed on the work flows they are included in.

The users will permanently be informed of the received work instructions or works whose deadlines are drawing near or have been exceeded, by issuing certain notification messages; thus it will not be necessary that the users permanently refer to the information within SUNIDOC by means of its specific interface. Performing and supervising the process design may become quite difficult, but SUNIDOC provides graphical tools for the definition, consultation and alteration of the work flows (Figure 4).

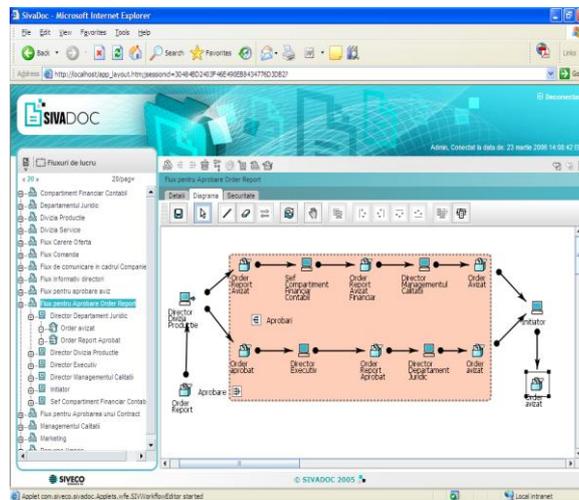


Figure 4: SUNIDOC Document management system – Definition of a workflow

Several work-flows were defined in University POLITEHNICA of Bucharest in Human Resources Department and Research Centres (Costoiu et al., 2008, 2009).

4. Conclusions

Inside the SUNIDOC system, there have been configured some complex workflows to interconnect the workstations in each administrative department and between the departments. Most of the administrative and research personnel have access to the system and they might be able to fulfill their tasks online, through the means of electronic document management. This allows for the management of University POLITEHNICA of Bucharest to find points for improvement in University's work and procedures, by setting electronic targets and deadlines for each person's task. The use of the system on a large scale will enable the identification of new possibilities to increase the efficiency of the administrative activity in the university.

References

- Costoiu M., Isopescu R., Arsene I., Plesu V., Alesincu S. Corocaescu M., 2008, Document Management Application in Romanian Universities, PRES 2008, Klemeš J., Ed., 24-28 August 2008, Prague, Vol 4, ISBN 978-80-02-02051-6, paper J.2.11, 1115.
- Costoiu M., Isopescu R., Plesu V., Arsene I., Alesincu S., Iancu P., 2009, New developments for electronic document management in University Politehnica of Bucharest, Chemical Engineering Transactions, 18, 309-314, DOI: 10.3303/CET0918049.
- Leikums T., 2012, Managing human factors in implementing electronic document system in the public sector, Romanian Review of Social Science, 2, 21-30.
- Sanchez-Martinez D., Marin-Lopez I., Himenez-Garcia T., 2008, Electronic Document Management in the University of Murcia, EUNIS 2008 VISION IT - Vision for IT in higher education, June 24 - 27, Denmark, <http://eunis.dk/papers/p45.pdf>, accessed 15.01.2012
- Toledo C. M., Aleb M. A., Chiottia O., 2011, An ontology-driven document retrieval strategy for organizational knowledge management systems, Electronic Notes in Theoretical Computer Science, 281, 21–34.
- Van Hee K., Hiders J., Houben G.J., Paredaens J., Thiran P., 2009, On the relationship between workflow models and document type, Information Systems, 34, 178-208.
- Zantout H, Marir F., 1999, Document management systems from current capabilities towards intelligent information retrieval: an overview, International Journal of Information Management, 19, 471-484.