

## **New Developments for Electronic Document Management in University POLITEHNICA of Bucharest**

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Romanian universities are focused both on education and research. Therefore efficient administration of funds and thorough correlation of diverse activities are required. To assure more efficient and transparent document management specialised software, adapted for higher education institution requirements was developed by SIVECO and implemented in University Politehnica of Bucharest. The university management has specific features as reflected in workflows defined both by the legislation and internal regulations. The document management platform is based on SIVADOC software, created by SIVECO Romania. This software was transformed and customised to satisfy the specific needs of the document management system in a large university. The system architecture has clearly defined levels and consequently the application can be distributed on several application servers or database server clusters. One of the major problems to solve when defining a document management system was to transform all documents in electronic form. Therefore the implementation of an optical character recognition (OCR) system was of great importance. The workflow management in some university departments were also improved and developed to cope with the research and administration demands. Some results concerning the implementation of this electronic document management system in the area of human resources activities as well as in research activity management are presented.

### **1. Introduction**

The new demands raised on national scale for the integration of Romanian higher education system in the European higher education and research space impose some important transformation in the document management system in universities. In Romania the development of infrastructure for communication, information systems

and services represents an important contribution to general economic development. Researches in the field of document administration are made both in informatics departments of Romanian universities and software companies.

The document management platform implemented in University Politehnica of Bucharest is based on software created by SIVECO Romania, who already has an important expertise in this field.

There are very different and numerous documents in circulation in the university and some of them should be archived. In the same time paper supported documents should be digitized to enable whole electronic document circulation. A preliminary identification of all these aspects is accomplished during the survey work at University POLITEHNICA of Bucharest. As consequence general software is created to satisfy specific requests of similar customers.

## **2. Developments of the management system**

A partnership between University Politehnica of Bucharest and SIVECO Romania, a well known software company in Romania was created in the frame of a research project funded by 2<sup>nd</sup> National Research and Innovation Plan (project no 120/2007). The project is run in the period 2007-2010. The main goal is to define, to develop and to test a document management system adapted to higher education institutions demands, starting from the specialised software SIVADOC created by SIVECO Romania S.A. The system that has been developed in the University Politehnica of Bucharest has a centralized topology. The main core of the system is represented by the server cluster placed in the university rectorate and that is the place where all data are stored and processed. The users can be connected to the system by means of an Internet browser from any location (figure 1). The University document and workflow management system inherited the standard modules of the software product SIVADOC designed by SIVECO Romania. These modules are: document repository, document archive, activity control for all workflows, system administration and notifications.

The system is a modular one, designed to allow future extensions and interconnection with other software running in the university. The extension of the system is possible and easy to realize by just adding new hardware units. The system architecture has clearly defined levels and consequently the application can be distributed on several application servers or database server clusters.

One of the major problems to solve when defining a document management system is to transform all documents in an electronic form. Therefore the implementation of an OCR system was of great importance. The definition of OCR system practically includes a DCR (Digital Character Recognition) and a DIP (Digital Image Recognition) system. The document management System (DMS) is a set of computing programmes aiming to control the electronic documents obtained by scanning. A DMS also includes other concepts such as CMS (Content Management System), DAM (Digital Asset Management), Document Imaging, Workflow System.

For obtaining the electronic form of various documents from the client-workstations in SIVADOC system, the CAPIO application was chosen to ensure scanning, treatment and transmission of documents. Ascent Collection Server (ACS) (figure 2) includes modules to validate the documents, to perform optical character recognition modules,

modules that transform the scanned document into a PDF file modules to track the volume of documents, to administrate the jobs. ASCENT system gives the possibility to define users or groups of users dedicated to divers' tasks.

Apart from the general feature presented in previous work (Isopescu R. et al, 2006, Costoiu M. et al, 2008) new characteristics have been added to cope with the increased demand of the university management. These features are mainly included in the integration with an OCR (Optical Character Recognition) software module, provided by KOFAX Ascent Capture Software: (a) integration of an advanced reporting module, (b) A feature to bulk-import documents, (c) a feature to annotate documents, (d) integration with an advanced business process management module.

### 2.1 Advanced reporting module

The advanced reporting module is made using BIRT, which is an Eclipse-based open source reporting system for web applications, especially those based on Java and J2EE. BIRT has two main components: a report designer based on Eclipse, and a runtime component that you can add to your application server. BIRT also offers a charting engine that lets you add charts to your own application.



Figure 1. Access to SIVADOC and main menu bar

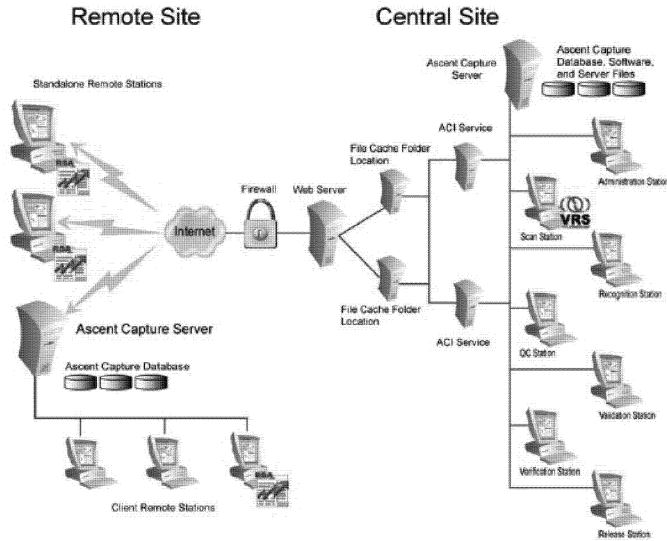


Figure 2. Ascent Collection Server - capabilities and functionality

## **2.2 Bulk-import of documents**

Bulk import is a feature that allows multiple documents to be imported. You must specify a folder and all documents from that folder will be imported into the system in the selected location. The selected folder can contain multiple folders and the system will import them by keeping the folder structure.

There are two import possibilities: (i) Using the same document type – at the beginning of the import you choose the document type and the system will import all the documents with the same document type, (ii) Different types of documents – the system will prompt the user for each document type.

## **2.3 Document annotation**

Native file viewing is the fastest, most efficient method for accessing the valuable information stored in documents. With the document annotation feature, users are enabled to open, view and mark up hundreds of file formats without converting them to another format. The users can interrupt the loading and rendering of a file, or a page of the file, and either select a different file or jump ahead to the next page of a multi-page document. Using the document annotation feature, navigating through mark-ups is easy. After clicking on the mark-up in the drawing, the mark-up is highlighted in the Explorer, so the user can identify the author in a collaborative document review process where multiple individuals may be adding mark-ups to the same drawing.

## **2.4 Integration with an advanced business process management module**

Bonita is an open source workflow solution for handling long-running, user-oriented processes providing out of the box workflow and BPM functionalities to handle the business processes. The document management system built using the integration with an advanced business process management module, inherits the main benefits of the Bonita BPM engine, which are: (i) Costs and risks reduction by automating person-to-person and system-to-system processes; (ii) Efficiently handle unexpected situations: allowing to securely and dynamically modify the definition of a running process; (iii) Efficiency: Ability to change a process in progress, evolution of processes in future, and adaptation to customer's context.

## **3. Workflow definition and implementation**

In a big enterprise as well as in a big university several departments with specialized personnel are interacting during their work. In order to make work controllable and to encourage communication workflow management systems have evolved (van der Aalst W. and van Hee K, 2002). These are a new class of information system that makes it possible to build a link between people's work and software applications.

A workflow is a process with a clearly defined start and end state (van Hee K., et al, 2009). Through proper workflow management, each of the employees will pass the work on according to a predetermined procedure. As technology advances, much workflow management has become automated and takes advantage of special software to make the process much smoother. The workflow management system creates and manages the workflows using several workflow engines which can define a process, interact with the participants and, when necessary to apply other software or IT components. The process means a series of activities linked in a logical way that lead to

the fulfilling of a task. The activity is the elementary unit of a process which is planned by a process execution engine. Nevertheless, the activity can be divided in several working units assigned to a participant to the workflow.

Workflow management makes it easier to track employee performance. When a link in the chain is broken, it is simple to go back and determine where this occurred. In addition, workflow management serves to standardize working methods, ensuring that every employee working on the same level is performing the same function.

Workflow management also helps to find ways to improve the performance in University administration. By clearly defining the roles of every employee within the teaching, research or administration process, the university can more easily improve the workflows to increase management effectiveness.

Several workflows are already implemented in the document management system in University POLITEHNICA. Figure 3 presents the workflow diagram that corresponds to the activities in a Research Centre when elaborating new research projects applications. The initiator of the activity is the project manager to whom this position was assigned by the Research Centre manager. The project manager distributes assignments in two directions: the technical proposal and financial issues. These activities are enclosed in a unit (denoted by dotted line in figure 3), meaning that the project manager solves the task of approving the proposal, after all participants have fulfilled their work. Figure 4 presents a workflow diagram for a complex activity in the Human Resources department. It describes the interconnections required in the case of a job request when several document are required and the final validation is granted by the director of the University. As University POLITEHNICA of Bucharest is the biggest technical higher education institution (twelve faculties which organize bachelor, master and doctoral studies) and also runs important research project in the frame of its departments or research centres, the diversity of employed personnel is large. The activity of Human Resources department was consequently one of the first beneficiaries of the document management system implemented.

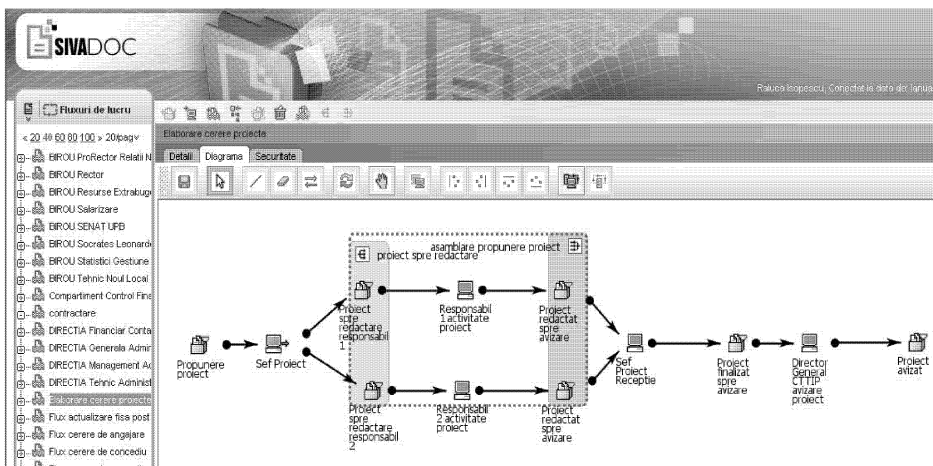


Figure 3. Workflow for research proposal activity

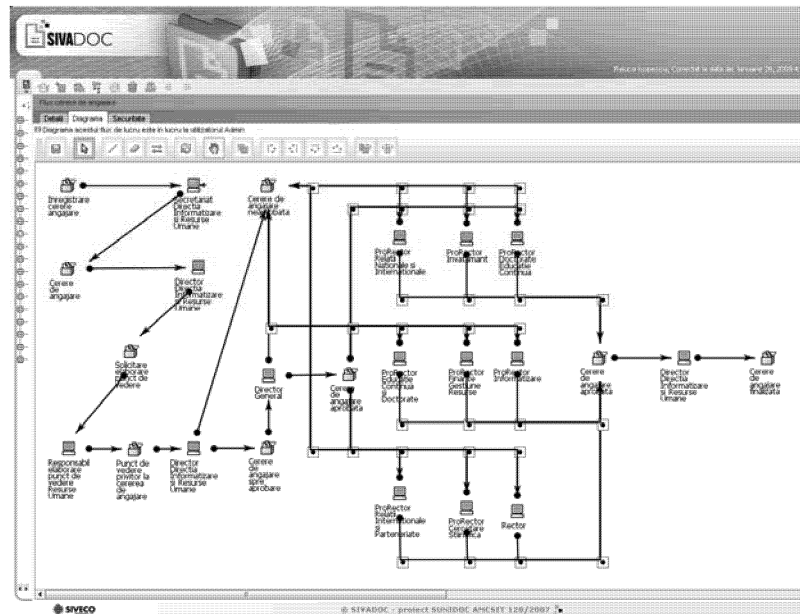


Figure 4 Workflow in the Human Resources Department: Approving a job request

#### 4. Conclusions

The design and implementation of the document management system that includes the automation of many activities specific to various entities such as faculties and chairs can offer a reliable base defining and implementing general working procedures and can facilitate the document treatment: generation, import from external sources, storage and retrieval. The system can also be a good instrument for efficient internal control of management activities. 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.

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