Workflow management system in higher education

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Abstract

This article refers to the new workflow management system which was designed for students that participate in international mobility programs. The need for this kind of system arose when this category of students could not be integrated in current management system, as well as the dramatic increase of international students, which made it impossible to handle with any other method. Based on this, it was decided to create a separate platform dedicated to this category of students. The new platform will drastically reduce the need for human and time resources for managing the students that participate in international mobility programs.

1 Introduction

Programming tools for managing different disciplines is one of the most important part of information technology. Even though there are many similar products, most companies try to develop their own solution which will be more adapted to the company's inner regalement. The universities are no exception. The work environment in Tbilisi State University is complex and versatile. The current management system cannot support some departments of TSU, based on their specific workflow, because of which there is a need for a certain programming solution.

This article describes the development process of information portal, which will serve as a management tool for student mobility programs in TSU. This is web-based workflow management system, which will be implemented in Tbilisi State University by foreign relations department.

The management of student exchange programs is a complex challenge and requires a lot of human resources, whose main responsibility will be to gather and process information. The challenging part is caused by the huge stream of mixed type information, which requires complex structuring, authenticity and accuracy verification, sorting and saving, as well as sending relevant information to different organization (including non-local) by specific procedure, format and time schedule. As a result, huge number of documents gets accumulated, which becomes impossible to manage without full or partial automatization.

In TSU, as well as many big organizations, implement various management systems for handling workflow, sms.tsu.ge [1] and lms.tsu.ge [2] are introduced for managing different categories of students, but there are some cases, in which these systems are not compatible. One of such cases includes the management of students from foreign countries. Because of the different studying process with these students, it was impossible to include them in current system. The difference is that these students have a free schedule and are not included in any timeframe by any studying course or degree. Because of this, the university had to use a nonelectronic methods, which, of course, required a lot of human and time resource, which in time, due to increase of the number of foreign students, became impossible for university to allocate resources for this matter. Due to the reasons mentioned above, the department of foreign relations made a decision to create a separate platform, that would be used for managing this category of students and provide management system effectivity.

The main technical challenge related to creating the system, was to process mixed type information and sorting in structural form. Generally, the process is very complex, and automating and compiling it in a uniform system is a quite a challenge. Eventually, the solution was to create an effective database structure. The architecture of the database made it possible to simplify the workflow as much as possible, which was the main requirement during planning of the project. The same architecture of the database and correct programming decision also made possible to analyze the data, which helped implement the reporting and statistics system. The management and the processing of these data was deemed impossible before. The solution mentioned above made it also possible to introduce the search and filtering option, which is also impossible with unstructured data. The important factor was also to design the system in such manner that the product would satisfy the modern requirements and could be modified and expanded easily. In conclusion we implemented these important design factors:

- **Simple workflow**
  The system should be perceived easily, the user should be able to understand how the system works and how to use it. The functionality needs to be modular and automatized.
- **Access control**
  Each user should have a role / permission to access the resource. The access rights should be clear to per user.
- **Autofill fields**
  It's very comfortable to user to have an autofill fields. The system should minimize the human resource requirement as much as possible.
- **Reporting**
  It's convenient and necessary to have a reporting tool, especially with the system that has to manage huge amounts of data.
- **Cloud hosting**
  It's also very convenient to have the system that is managed by the server and the user doesn't have to install client-side application. The changes in the system should reflect instantly. The cloud hosting s a preferable solution for this task. The cloud can be accessed from any computer.
- **History**
  The data structure should support the version management. The main advantage of this option is to be able to see the changes in database.
- **Security**
  In similar systems, users should be separated by roles and permissions. This problem was solved by Spring Security [3] and implementing complex database views.

The front-end was implemented using Angular [4] and the back-end runs Java using Spring Framework [5], the database runs on PostgreSQL. The system is currently in development and still has no domain, but can be access using TSU's internal network on address: http://192.168.254.98:8080

The 2nd and 3rd section of this article describes the workflow of administrator and the student users. The 4th section describes similar systems. The 5th section includes the summary and the future development phases.

2 Administrative Side

This module will include all necessary functionalities that are required for the system to work and be managed:

- The page for viewing and processing received application forms with filtration option;
- Student management page with every related functionality. It's possible to open students page and also export the information in word .docx format, generating student's final result document, where will be listed all passed subject with related final points;
- University management page with adding, deleting and correction functionalities;
- Subject management page with adding, deleting and correction functionalities;
- Study course management page with adding, deleting and correction functionalities, as well as adding and removing subjects;
- Semester management page with adding, deleting and correction functionalities, as well as activation options for university, semester visibility options, adding, removing and correcting subjects in semester.
- Exchange programs management page with adding, deleting and correction functionalities.
- Evaluation entering page – it will be possible to enter student evaluation points by each subject; the scoring type will be added dynamically by the user.
- Homepage configuration panel – On this page the administrator will be able to modify the public page. The changes will be reflected immediately. The functionality will be very convenient because the changes on public page will be frequent and with option like this, it won't be necessary to edit the source code.
- Statistics page – On this page will be possible to see the statistical information by different parameter, for example how any students are form a certain university, by which type of mobility program are the students in TSU, choosing the subjects and etc.

3 Student Side

This module will include all necessary functionalities that will be used by the students and regular visitors of the website:

- Homepage – This page will include information about TSU and available and student exchange programs with registration and authorization functionalities.
- Exchange programs page – This page will include the list of universities that can participate in student mobility programs. It will be possible to see which semester or subject is available for which university. There will be links to sites where the student can register for application in exchange programs.
- Application page – The student who wants to participate in mobility programs will have to register and fill the form and upload required documents. The verification email will be sent on email. The user can check the status of application on personal page.
- Personal page – After registration, the user will have their own personal page, where the student will initially see only their information. After the student's application is approved, they will also be able to use other functionalities – academic registration, scores and exam schedule.
- Academic registration page – Here the user will be able to choose or remove the desired subject. The page will be open until the end of academic registration

- Evaluation page – The user will be able to see their evaluations in different subjects and see the final score.
- The functionality to download exam schedule.

4 Similar Systems

There is currently workflow management system sms.tsu.ge [1] for bachelor's course and lms.tsu.ge [2] for masters and doctorate courses. However, these systems cannot integrate foreign exchange students and because of this it was impossible to include these students in any of the system. This was the reason for creating a new platform, which will serve specifically this category of students.

5 Summary and the future development

There are many useful functionalities that can be used in these kind of systems, for example notifications, which is implemented in website by sending emails, but in the future using SMS messages is also plausible. It would also be convenient to develop an app for smartphones, which can include several simple and often used functionalities, like authorization, personal page and others. It's also possible to implement the possibility to connect with other workflow management systems, for example, typically, to generate legal documents the document management systems are being used. If the system could connect to this kind of systems and exchange the information, it would be possible to generate legal documents directly from the system, which would simplify and make workflow more flexible. At this stage it's only possible to generate template documents, however integrating a more complex document generating system won't be difficult.

The management system is crucial part of every large organization to ensure fast and safe work environment. The modern technologies make possible to automate and refine the workflow. Based on this, we believe that portal that would be implemented in Tbilisi State University will be a huge step forward to further develop and refine the management systems in general.

6 Sources used:

[1] http://sms.tsu.ge
[2] http://lms.tsu.ge
[3] https://projects.spring.io/spring-security/
[4] https://angularjs.org/
[5] https://spring.io/