Automation system for social service using CMMI

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Abstract

The Universidad Autónoma de Tlaxcala since its start has included Social Service in all its careers, and since 2012 has included Social Service as a Learning Unit. Due to some problems detected, arises the need to automate the process, to allow the improvement of costs, time, as well as the digitized information of the entire process. This article presents the system developed to solve this problem, in order to improve the handling of information of Students, Faculties and University Extension. This project was developed by students of Computer Engineering with the follow-up of teachers, and has as key challenge the use of CMMI-Dev Level 2, to maintain and guarantee quality in the project. Currently the project is concluded and implemented in the page of the Universidad Autónoma de Tlaxcala and has been trained to each user.

Automation System, CMMI, Quality, Social service, Experimentation with Software Engineering

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Introduction

This article focuses on the development of a system to automate the Social Service process (SSS), allowing for the improvement of services. For the development of this project, different related works were reviewed, for example Integral System of Social Service of the Universidad Autónoma de Tamaulipas (SISS), is a web application that serves to manage the information of the Social Service process of the borrowers of the Universidad Autónoma de Tamaulipas. The SISS provides an easy and intuitive way to capture reports [1]. The General Direction of Educational Guidance and Assistance DGOAE [2], is an Information System of Automated Social Service in which students of the UNAM can consult different institutions that have agreement with the university, where they can perform their Social service. Finally, there are Automatic Integral Libraries Systems [3] that are composed of several modules, which are designed with the objective of helping to improve the different activities that a library performs.

Justification

The project SSS will automate the current process of Social Service of the university, the project benefit to administrators of University Extension, teochers for Faculty and Students. The most relevants activities are

• The system stores information of dependencies and associated programs valid.

• The system saves a considerable amount of paper and space for each student who performs their social service.

• SSS stores all the digital documents of the process.

• SSS is link with the Integral System of Administrative Information (SIIA) to obtain datas and documents such as Birth Certificate, Study Certificate.

• SSS manages the whole process of social service, from the request until the generation of evidence of conclusion.

Problem Definition

The Social Service is an indispensable requirement in the formation of university students; the process that follows is tedious, reason why it generates great problems in terms of time, administration and resources for students. The Social Service area noticed that there was a clear need for a system that regulates the processes digitally, able to manage the files, and avoiding excess physical documents. For each student the documentation is validated, and an automatized system would effective for this activity, facilitating the organization of the file in a digital way. Due to the need to check the status of the student, it requires certain information that was originally handled with certified document, which could be omitted by unifying the system of academic information of the student and the Social Service System, so that in some way there would be a reduction of costs in the process.

Proposed Solution

Figure 1 shows an overview for the Social Service System. (SSS)

Figure 1 Diagram of the proposal

Web Client: Supports browsers like Mozilla Firefox and Google Chrome.

Web Server: Apache Web Server

Database: ORACLE.

CMMI

In order to minimize risks in project development, efficiently manage requirements changes and maintain quality acoording to customer expectations, it was decided to use a methodological process under CMMI-Dev Level 2. In this way, it is posible identify the processes that are transversal in all phases of the project [4], [5] and [6]. The process areas used in the Social Service Systems are: Configuration Management, Measurement and Analysis, Process and Product Quality Assurance, Requirements Management, Monitoring and control of the project, and Planning.

• The purpose of Configuration Management (CM) (CMMI-DEV) is to establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits

• Measurement and Analysis (MA) develop and sustain a measurement capability used to support management information needs.

• Process and Product Quality Assurance (PPQA) provide staff and management with objective insight into processes and associated work products.

• Requirements Management (REQM) (CMMI-DEV) is to manage requirements of the project's products and product components and to ensure alignment between those requirements and the project's plans and work products.

• Monitoring and Control (PMC) provide an understanding of the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.

• The purpose of Project Planning (PP) (CMMI-DEV) is to establish and maintain plans that define project activities.

Identified Requirements

After knowing the Social Service process, 16 Functional Requirements were identified for the development of this project, as well as 3 main users: University Extension, Students and Faculty. We have divided the project in three modules, according to the users the following is the list of Functional Requirements:

Module	Objective
UNIVERSITY EXTENSION	Create period
	Register Dependency
	Generate Certified of termination of SS.
STUDENTS	Fill the Document of Social Service Request
	Generate the document Social Service Request.
	Validate the data of the Request.
	Generate registration format of the Social Service.
	Fill the document of Program Control
	Carry out the report of activities of Social Service
	Generate the document of activities of Social Service.
FACULTY	Validate the Request of Social Service
	Validate the Registration of the Social Service and documentation.
	Validate the Registration of the Social Service
	Validate Letter of Acceptance
	Validate Monthly Reports
	Validate Conclusion Letter

Table 1 List of Functional Requirements

In addition, the following non-functional requirements were identified, quality requirements that all projects must have, and are considered in this project:

Interface with User, Interfaces with other software or hardware, Reliability, Efficiency, Maintenance, Reusability and Design and Construction Restrictions.

Used Technology

The following technologies were used for the design and implementation of the proposal.

1. Java Enterprise Edition, is a programming platform that allows the use of architectures of distributed N layers [7].

2. Netbeans 8.1, free environment for developing desktop applications, mobile and web applications java, HTML5, JavaScript and CSS [8].

3. WildFly 10 as it is flexible, lightweight and managed that implements the specifications of the Java Platform Enterprise Edition 7. It includes ready-to-run versions of Apache, WildFly, MySQL, Java and required dependencies.

4. Oracle Database 10, as an object-relational database management system, developed by Oracle Corporation, manages: transaction support, stability, scalability, and muti platform support [10].

5. The first-class component library 6.0 and the JavaServer Faces (JSF) primefaces extensions 4.0.0 library were used in the design of screens since it has a set of components for the creation of web applications [11].

6. The Jasper Reports version 6.1.1 library was used for generating reports, it helps to create documents ready to print in a simple and flexible way from a Java application [12].

Architecture

In general, the architecture of the Social Service System is composed of three large layers that in turn are divided into sub-layers.

The first is the layer of the model, which contains the data access sublayer and business logic, the middle layer is a web services layer, it exposes the functions that define and solve the model, so that a Third layer, which is the user interface, can make use of them. The three layers are independent, which facilitates the implementation of different user interfaces, depending on the technology required by the client.
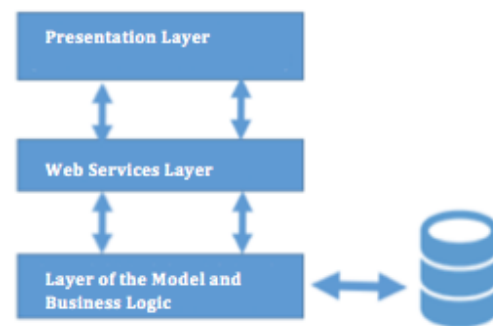

Figure 2 Architecture

Social Service System

The following solution was proposed from the presented problem, here is a brief description of the development of the system. It is important to mention that we use the code conventions suggested in [13] to maintain the quality of the project. As already mentioned, users and modules are: University Extension, Students and Faculty. We describe each module.

University Extension Module

In the University Extension Module, the user has permissions to create period, register dependencies and generate certificates of termination of Social Service

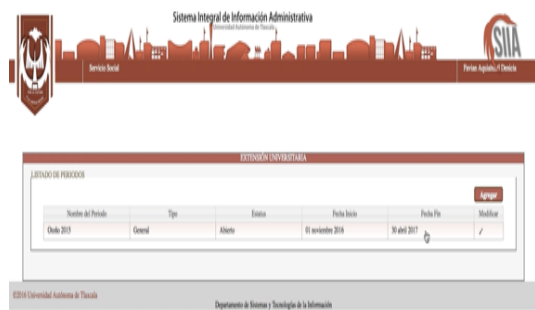Figure 4 shows a list of periods made by University Extension.

Figure 3 List of periods

Figure 4 Shows the screen to create a new period.

Figure 4 Create a new period

Faculty Module

The Faculty user can view and validate the documents uploaded in the system by the Student user. Figure 5 shows the list of applications belonging to the Faculty Module. From this screen can be checked each student's file, the Faculty user can validate or reject the documentation, in addition to viewing the documentation status per student.

Figure 5 List of Applications

Student Module

This user will be able to consult his personal information, besides request and generate the documents corresponding to his Social Service. Figure 6 shows the screen in which the student can register the request, these data are of great importance, since the documentation generated will be based on this information.
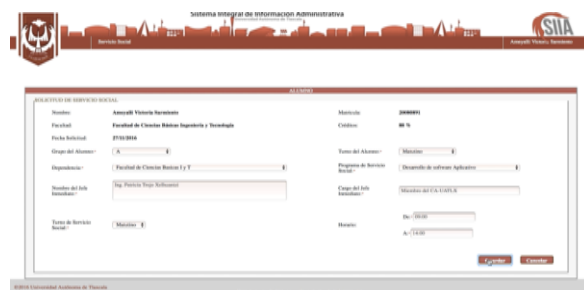

Figure 6 Application for Social Service

Figure 7 shows the list of documents to be covered by a student, the system is designed to accept documentation in PDF format, this documentation will be validated later by the user Faculty.
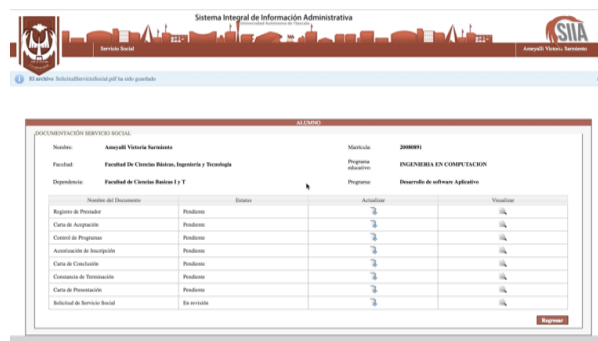

Figure 7 Documentation for Social Service

Once the process is completed and validated in the System, the certificate of conclusion of the Social Service is generated, which is delivered to the students by the University Extension team.

Tests

At the end of the Social Service System, we did Modular Testing, Integration Testing and System Testing. To receive the letter of complete satisfaction the tests had some iterations until they were No Defects Found.

Conclusions

The present system has the purpose to optimize and improve the Social Service process, it represents a great support for the students, coordinators of the Faculties and work team of Social Service, it includes a great interaction with the users and we know that its impact will be interesting, because it reduces the time and cost of process, in addition, having a system that manages the documentation of students reduces physical space and workload. The automation of this process is a important advance for the university, this project is in operation, but it is open to continuous improvements. This system ensures a more efficient and simple work thus obtaining the satisfaction of the users. This system is not to replace human contact, it manages the information in order to facilitate its storage, access and modification.

Finally, this project is a result of the collaborative work of teachers and students, the challenge was to use CMMI-Dev Level 2 to maintain quality in the project. We consider that this experience has been of great benefit to the team. The project is already implanted in the page of the Universidad Autónoma de Tlaxcala and the users have been trained: Faculty Coordinators, work team of University Extension and Students who will start their Social Service in August of this year.

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