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Automation of registration and data collection processes for the diagnosis of University Social Responsibility of the Universidad Tecnológica de Jalisco

Automatización de los procesos de registro y levantamiento de datos para el diagnóstico de Responsabilidad Social Universitaria de la Universidad Tecnológica de Jalisco

MACÍAS-BRAMBILA, Hassem Rubén[1]†*, LÓPEZ-LAGUNA, Ana Bertha[2], GONZÁLEZ-DEL CASTILLO, Edgardo Emmanuel[2] and PEÑA-MONTES DE OCA, Adriana Isela[2]

[1]*Universidad de Guadalajara*
[2]*Universidad Tecnológica de Jalisco*

ID 1st Author: *Hassem Rubén, Macías –Brambila* / **ORC ID:** 0002-6540-7464, **CVU CONACYT ID:** 902812

ID 1st Coauthor: *Ana Bertha, López Laguna* / **ORC ID:** 0000-0002-8145-7955, **CVU CONACYT ID:** 847437

ID 2nd Coauthor: *Edgardo Emnnanuel, González del Castillo* / **ORC ID:** 0000-0002-2503-689X, **CVU CONACYT ID:** 916620

ID 3rd Coauthor: *Adriana Isela, Peña Montes de Oca*/ **ORC ID:** 0001-8220-3108, **CVU CONACYT ID:** 70757

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Abstract

This article describes the process of analysis, design, development and implementation of the modules of registration, validation and data collection on the RESSUDI Web Site for the development of the initial diagnosis of University Social Responsibility at the Universidad Tecnológica de Jalisco. This technological development meets the need to implement actions and strategies in the integral formation of the University Community that transcend the Institution's interior and exterior, for which the Research Group (RG) UTJAL-CA-2 Social Responsibility, Sustainability and Integral Development for SMEs developed through its Innovative Lines of Applied Research and Technological Development (ILARTD) this implementation through the agile SCRUM methodology, derived from its periodicity characteristics and its high flexibility to changes. The data collection module includes different questionnaires for each of the actors that make up the University Community, such as academics, administrative staff and students, which will be later analyzed through the specialized statistical software SPSS for the development of an Intervention Program Institutional.

Web application, Web development, University Social Responsibility

Resumen

El presente artículo describe el proceso de análisis, diseño, desarrollo e implementación de los módulos de registro, validación y levantamiento de datos en el Sitio Web RESSUDI para la elaboración del diagnóstico inicial de Responsabilidad Social Universitaria en la Universidad Tecnológica de Jalisco. Este desarrollo tecnológico tiene el objetivo de brindar un diganóstico para implementar acciones y estrategias en la formación integral de la Comunidad Universitaria que trasciendan al interior y exterior de la Institución, por lo que el Cuerpo Académico Consolidado (CAC) UTJAL-CA-2 Responsabilidad Social, Sustentabilidad y Desarrollo Integral para PyMES desarrolló a través de sus Líneas Innovadoras de Investigación Aplicada y Desarrollo Tecnológico (LLIADT) esta implementación a través de la metodología ágil SCRUM, derivado de sus características de periodicidad y su alta flexibilidad a los cambios. El módulo de levantamiento de datos contempla distintos cuestionarios para cada uno de los actores que conforman la Comunidad Universitaria, tales como los académicos, administrativos y estudiantes, los que serán posteriormente analizados a través del software estadístico especializado SPSS para el desarrollo de un Programa de Intervención Institucional.

Aplicación web, Desarrollo web, responsabilidad social universitaria

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* Correspondence to Author (email: hassem.macias@academico.udg.mx)
† Researcher contributing as first author.

Introduction

At the end of 2017, the General Coordination of Technological and Polytechnic Universities (CGUTyP) presented the National Tutorial Model of the UUTT Subsystem, which defines the operating policies of the Institutional Tutoring Program, the profile of the tutor, activities and responsibilities of the actors involved, as well as a proposal of indicators that allows to determine the existence, sufficiency, efficiency, effectiveness and results of the program.

Thus, in January 2018, the Technological University of Jalisco (UTJ) begins with the analysis and design of strategies for the implementation of the Institutional Tutoring Program (PIT). The Rectory and Academic Secretariat, through the Institutional Tutoring Academy, make up the Institutional Tutoring Committee, which as a Collegiate Body in the Institution established a work plan and a line of action for the tasks and activities to be carried out.

In this scenario and with the imperative of carrying out actions that contribute to the integral formation of students, with a special emphasis on inclusion, gender equity and with a Social Responsibility approach, it is that it is integrated into the Consolidated Academic Body (CAC) Social Responsibility, Sustainability and Integral Development for SMEs, which from its Innovative Lines of Applied Research and Technological Development (LIIADT) developed a proposal to strengthen the PIT of the UTJ. This proposal initially contemplates the realization of a diagnosis in which the whole community can participate, making evident the actions, tasks and activities that are carried out in the Institution and outside it, with the objective of potentializing and consolidating them, as well as for the implementation of new intentional actions.

With this objective and being consistent with the Integral Quality and Environmental Management System, we opted for the development of a module for data collection through a web application, to subsequently perform the data analysis, using the Software: Statistical Package for the Social Sciences (SPSS), and thus determine a characterization of Social Responsibility at the Technological University of Jalisco.

This technological implementation was integrated into the UTJAL-CA-2 Integral Information System which is stored and managed from the UTJ servers and is accessible from: http://ressudi.utj.edu.mx.

This implementation of the data collection module was designed to impact more than 4,000 people who make up the university community, categorized as students, professors and administrators, in the latter are also considered management positions.

Prior to the technological development, the design of the data collection instruments was carried out, tropicalizing the questions to the activities, impact and responsibilities of each of the mentioned categories and relating them in such a way that it is possible to cross the reagents in each category of community.

Methodology

The technological project was developed in a four-month period between January and April 2018, in which Scrum was determined as the development methodology for the application, since it allows managing projects based on partial deliveries and which also includes on a regular basis and constant partial deliveries and thus ensures the development of the project more quickly. This methodology establishes three main roles: Project owner (project owner) that defines the objectives and verifies that everything is done correctly, Master Scrum (expert in Scrum) that solves the problems that arise in the team and the Scrum team (Scrum team) which is the development team.

This methodology is described by Laínez (2015) as ideal for incremental development in complex scenarios where the requirements have to change frequently. In the implementation of this methodology we worked in phases, such as: analysis, design, development and testing.

Analysis

This phase of the project began with the development of the product stack (Product Backlog), which is a document in which all the relevant information is collected, as well as the tasks that are intended to be performed, the requirements with which you must have the application and all the functionalities and features that the project needs.

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The start of data collection required the consultation of frames and proposals of University Social Responsibility, as well as resources derived from various collaborations in the meetings of the University Social Responsibility Union Latin America (URSULA) and the Model of University Social Responsibility for the Association National University and Higher Education Institutions (ANUIES) Central West Region, through the Committee for Integral Development and Social Responsibility, as well as the National Tutoring Model of the CGUTyP and the LIIADT of the UTJAL-CA-2.

Likewise; Continuous interviews with experts and leaders in Social Responsibility were included, such as the Expo Guadalajara Regional ally Foundation of the Mexican Center for Philanthropy (CEMEFI), the Chamber of the Jalisco Construction Industry promoting the Global Compact of the United Nations Organization (UN) and the Tutoring Coordinations of the Technological Universities of León and Aguascalientes for the National Tutoring Model, this set of face-to-face interviews and videoconferences allowed defining the scope, focus, objectives, impact and operation of the application, as well as its subsequent communication with the SPSS.

After having the information classified and categorized by functionalities, it began with the preparation of the Software Requirements Specification (ERS) document for which the template offered by the IEEE Std 830-1998 of the Institute of Electrical and Electronics Engineers was used (IEEE, 1998), this document specified the roles of the participants, the characteristics of the users, the scope of the software, as well as the functional and non-functional requirements.

Below is the description of some specific ERS requirements:

Requirement number	R7.14		
Requirement name	Create personnel category		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/25/2019, record 10		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R8.02		
Requirement name	Export survey results to Microsoft Excel		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, record 05		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R8.03		
Requirement name	Export survey results to PDF		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, record 06		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R8.04		
Requirement name	Export survey results in CSV		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, registration 07		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R1.11		
Requirement name	Create Account		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, record 05		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R1.12		
Requirement name	Confirm account registration		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, record 06		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Requirement number	R1.13		
Requirement name	Send confirmation email		
Type	1 Requirement	0 Restriction	
Source of the requirement	Interview 01/12/2019, record 06		
Requirement Priority	1 High / Essential	0 Average / Desired	0 Low

Table 1 Specification of requirements

The second stage is the definition of the list of tasks (Sprint Backlog), a document in which the tasks to be performed are defined and assigned to the person in charge of developing them, in addition to the period in which each task should be performed one of the activities, for this task a Gantt chart and a Pert chart were made, which also allowed to control the programming of the tasks.

It is called Sprint at a certain period of time in which a set of tasks or actions must be performed, which were described in the Sprint Backlog document, the objective of these partial deliveries is the possibility of implementing rapid tests on the components and thus evaluate functionality performance or detect unwanted features in the product.

This phase includes meetings every day in the development of the project, these activities do not exceed a duration of more than 15 minutes, and the objective is to communicate progress or problems with all team members, these activities are called Daily Scrum (daily meeting).

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Design

The first task in the architectural design was the development of the block diagram, which allowed to have an outline of the modules or fragments of the functionality and / or models of the application. This, in turn, allowed the development of a class dictionary and the Class-Responsibility-Collaboration (CRC) cards, which allowed to clearly establish the relationships between the software instances, as well as their dependencies and the justification of each one of them. Below is the CRC card of the Indicator entity:

Indicator **Superclase: Category**	
Attributes	**Methods**
-code: integer (4) - name: varchar (40) - category: varchar (40)	+ Link (): void + setName (varchar []): void + getName (): varchar [] + setCategory (varchar []): void + getCategory (): varchar []
Responsibilities	**Collaborations**
Category Linking	Categories
Classification of responses by type of user	User
Classification of responses by indicator	NA

Table 2 CRC Card of the Indicator entity

Through the Unified Modeling Language (UML) modeling of the static and dynamic aspects of the system was performed. The class diagram offered a greater level of detail, as well as determined all the auxiliary fragments necessary for operation. Showing the classes that make up the system describing their relevant attributes, methods and relationships.

From this diagram the Object was detached, which allowed the identification of the behavior of the instances with respect to the established relationships and the state they keep.

In the same way, the use case diagrams were made to model the scenarios in which the actors interact with the system, which allowed us to understand how they access the different functionalities, as well as see the relationships that exist between the cases of raised uses.

Below is the diagram of cases of use of the general functions of the system:

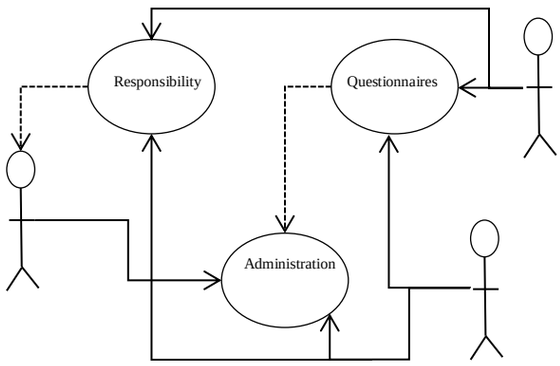

Figure 1 Diagram of cases of use of general functions

Likewise; The development of these models allowed the elaboration of documents such as the definition of use cases, determining the operation and sequence of the actions of the actor, the system and the conditions or alternatives that could occur, as well as the identification of entities in which CRUD processes (Create, Read, Update and Delete) were defined for the entities of the system and the identification of actors, where the inputs and outputs of the system were defined. Below is the detail of the process area in the definition of the use case of adding coordinator:

#	Actor activity	System activity [Description / Calculation]	[Condition] Alternative
1	Click on the coordinator menu.	Display coordinator options menu.	This activity can only be performed by a coordinator.
2	Click on the name option: "Add new coordinator".	The system will redirect the coordinator to another page, which will contain the form to be filled in with the necessary data for the creation of the new coordinator.	This activity can only be performed by a coordinator.
3	Filling out the form with the necessary data for the creation of a new coordinator account	Store the captured data in a text box waiting to be sent for verification.	N/A
4	Click on the "Create" button.	Check that the fields are filled correctly and generate logging.	In case the form has the correct data, the new coordinator account will be created, otherwise the form will be returned with the pertinent comments informing about the incorrect filling contained in said form.

Table 3 Process area of the use case definition of adding coordinator

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The semantic data design allowed the definition of metadata repositories, their relationship and the restrictions of functionality and integrity, which ensure according to Date (2001) the coherence and meaning of the data that is stored.

These restrictions can be by their type, attribute, varrel or from the same database. Likewise; The conceptual and implementation models of the Database were developed through the Relationship Entity diagram and the Relational Model.

Below is a metadata repository of the questionnaire entity:

Questionnaire						
First name	**Description**	**Type**	**Size**	**Domain**	**PK**	**FK**
Id	Question_id	Integer	4	0-9	Yes	No
Description	Questionnaire Name	Varchar	40	A-Z,a-z,0-9	No	No
Period	Quarter	Varchar	20	A-Z,a-z,0-9	No	No
Objective	Objective questionnaire	Varchar	120	A-Z,a-z,0-9	No	No
Results	Results questionnaire	Varchar	200	A-Z,a-z,0-9	No	No

Table 4 Repository of metadata of the questionnaire entity

Developing

The application development phase was carried out with the collaboration and direction of stay projects in which students of the Higher University Technician Educational Program (PE) in Information and Communication Technologies (ICT) Systems area participated Computers, where Sublime Text was used, which defines Ferrer (2015) as a text and source code editor.

This process included the implementation of the internal design through the Model-View-Controller (MVC) pattern, which according to Lieutenant (2003), contemplates the correct administration of the interactions that will be developed with the user, as well as the presentation of the data for its interpretation and the correct communication flow with the domain layer, in which Zend 1.12 was used with version 5.6 of the Hypertext Preprocessor (PHP), defined by Cobo (2205) as a server-side programming language , in which it was necessary to combine with version 2.1 of Jquery, which according to Flanagan (2011) allows to simplify common tasks and hide the differences between versions and browsers.

In the same way, in the Zend Framework development framework, which Padilla (2009) defines as a collection of professional packages for web development, in an object-oriented model with a broad spectrum of benefits.

The alignment of the requirements established by the MVC forced to download the application skeleton from the provider's web portal, which was configured with the characteristics of the local server, which allowed the developers to use the manuals, components and libraries of the web development model. Below is the CAC Integral System interface, which is accessible from http://ressudi.utj.edu.mx:

Figure 2 CAC Integral Web System interface

Through the authentication of the users, and with respect to their level of permissions, all the modules developed can be accessed, the project management interface is shown below:

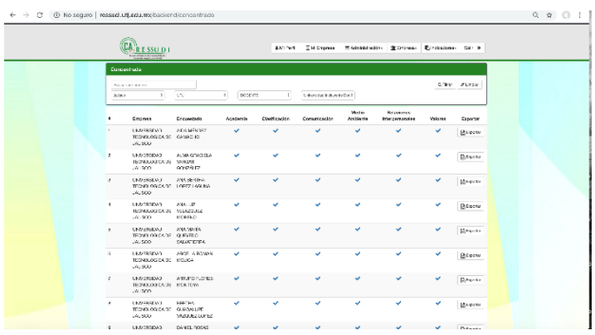

Figure 3 CAC Integral Web System interface

Likewise; You can view the questionnaires, the progress and the accounts created for each category. The administrative user interface is shown below:

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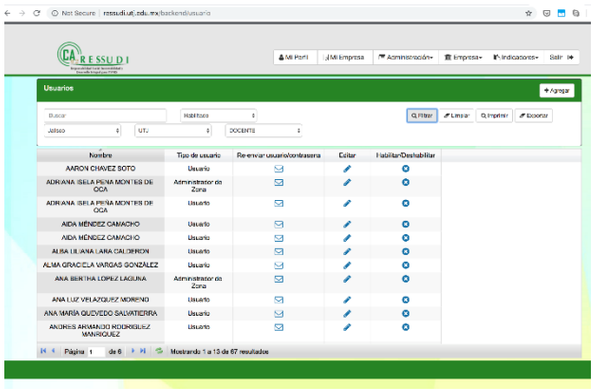

Figure 4 CAC Integral Web System interface

Tests

In this phase, a test plan was designed and implemented for the integration of the module of University Social Responsibility questionnaires into the UTJAL-CA-2 Integral Information System.

This test plan includes general project information, as well as a version history and definition of the scope of the tests, which included:

– Evidence items
– Functionalities to test
– Regression tests
– Functionalities not to try
– Test strategy

Further; With the objective of determining an approximate performance of the execution of the Use Cases, the criteria of acceptance and rejection of the tests were defined through binary behavior. As well as the determination of deliverables, resources, planning and organization for the execution of the test plan.

Results

It was determined to continue with a centralized data storage system for its administration because the estimate made according to the operational capacity of a data collection day of the six divisions of the University concurrently and with a connected computer laboratory at the same time by division, it contemplates a simultaneous connectivity of approximately 150 people, so that customer requests, data storage management and operations processing do not justify the cost of a distributed database.

Regarding the determination of the development, installation and configuration environment of the server, no restriction was contemplated except for the acquisition of licenses, so it was decided to implement free technologies, which favors the adaptation of technologies to its processes by not representing licensing costs and which in turn was consistent with the rest of the modules that make up the existing system.

Cases that contemplated aspects of connectivity, performance, interface and functionality were carried out through the test plan; for which the simultaneous connection of 165 users and their respective requests as customers, as well as the outputs of the processes, which through descriptive statistics allowed to determine the coincidence in 98.20% with the expected results in the cases of proof. The rest of the exits that did not meet the acceptance criteria were documented and reprocessed.

Conclusions

The implementation of the module for the automation of the processes of registration and data collection, is a fundamental tool for the process of preparing the diagnosis of University Social Responsibility, since it provides a massive systematized means for data collection in the University , which can certainly be applied to other projects, which in the future require the collection of data in a massive way.

Likewise; This project is congruent with the Integral Quality and Environmental System of the Institution, which is made up of ISO 9001: 2015 and ISO 14001: 2004, since no paper was used in this process.

In the same way, the connectivity of this module with the SPSS allows rapid data manipulation to determine the characterization of the RSU in the UTJ. This project is only the first phase of the implementation of the National Tutoring Model with a vision of inclusion, gender equity and Social Responsibility, since with the characterization obtained, strategies aimed at strengthening and consolidating the policies of the Institution, and of course to contribute to the integral formation of the students and workers of the Technological University of Jalisco, all this from a Social Responsibility perspective.

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