

Web Application Server for the publication of Integrative Projects of UTJ – CCD Students

Servidor de Aplicaciones Web para la publicación de Proyectos Integradores de Alumnos UTJ – CCD

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Abstract

The publication of WEB applications corresponds to transmitting the projects carried out by students on the Internet, in this way they can be opened from any point with access to the world wide web. This project aims to publish WEB applications developed as final projects, allowing a favorable impact on the training of students, since it will provide them with a real approach to the development of this type of technological tools in the public and private industry. Derived from the various certifications that the university undergoes, the central final project server will serve as a central repository in the evidence warehouse. Additionally, a central Web system was developed for the management of Integrative Projects carried out at the end of each period at the Technological University of Jalisco at its Ciudad Creativa Digital site, based on the software engineering process, dividing the work into phases and supported by the Scrum agile methodology for the management of each of them.

Resumen

La publicación de aplicaciones WEB corresponde a transmitir los proyectos realizados por los alumnos en internet, para que de esta manera puedan ser accedidos desde cualquier punto con acceso a la red mundial. El presente proyecto tiene por objetivo la publicación de aplicaciones WEB desarrolladas como proyectos finales, permitiendo un impacto favorable en la formación de los estudiantes, ya que les brindará un acercamiento real en el desarrollo de este tipo de herramientas tecnológicas en la industria pública y privada. Derivado de las diversas certificaciones por las que atraviesa la universidad, el servidor central de proyectos finales servirá como repositorio central en el almacén de evidencias. Adicionalmente se desarrolló un sistema Web central para la gestión de Proyectos Integradores realizados al finalizar cada periodo en la Universidad Tecnológica de Jalisco en su sede Ciudad Creativa Digital, tomando como base el proceso de ingeniería de software dividiendo el trabajo en fases y apoyado de la metodología ágil Scrum para la gestión de cada una de ellas.

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Introduction

In 2011, Guadalajara won the national competition in search of an area for the development of a Digital Creative City (CCD). Through a long process, supported by academics from the Massachusetts Institute of Technology (MIT), a dozen cities are evaluated for their multiple characteristics, including a macroeconomic outlook, environmental quality, industrial base and economic growth potential (CCD, 2023).

The creation of the Academic Unit of the Technological University of Jalisco (UTJ) in CCD constitutes one of the priority strategic actions for the Secretaría de Innovación, Ciencia y Tecnología (SICyT) of the Government of the State of Jalisco and has the purpose of promoting creativity, learning and the flow of ideas between academics, students, entrepreneurs and businessmen.

The CCD Academic Unit is part of the concept of "University of the Future". Among other things, this University responds to the challenges brought about by the fourth industrial revolution. At the University of the Future, we learn and teach under a model of cognitive and interpersonal skills that is supported by the use of innovative platforms for adaptive learning and artificial intelligence assistants that will boost competitiveness and social mobility in our State.

The study plans offered by the Information Technology division include Engineering in Software Development and Management with an intermediate exit in Higher University Technician (TSU) in Information Technologies area of Multiplatform Software Development and engineering in Virtual Environments and Digital Business with intermediate exit in TSU in Information Technologies area of Virtual Environments and Digital Business, where the Development of WEB Applications is part of the subject curriculum, with the intention of fully covering the thematic contents in the subjects of Web Applications, the last thematic unit corresponds to the publication of applications that is equivalent to allowing access to technological development through any equipment connected to the Internet, this being the culmination of the Integration Project (IP) developed.

Among the concerns of the teacher in the classroom, there is one in particular that corresponds to how the student can apply the knowledge acquired during the time that the different contents of the study programs were reviewed.

In this sense, the PI will be understood as the exercise through which this type of experiences can be evidenced, disseminated and reviewed in a wide disciplinary range that allows the generation of new reflections and contributions to the different lines of research.

The importance and richness of this exercise lies in a social, cultural and technological context that allows comprehensive solutions that approve the development of skills through their critical application to real problems and in contexts that allow social interaction through binding activities with instances of different nature.

Taking into account the above, the CCD academic unit is committed to the PI modality, as an exercise that allows promoting, giving meaning and bringing together the efforts of students and teachers, for the evidence of the acquired competencies, which allow adding value to the certification in study plans.

On the path towards excellence promoted at UTJ, in 2005 the first formats for records and matrices of project deliverables in Information Technology (IT) majors were implemented, carrying out an update of its regulations years later. For 2011, an exhaustive review and new proposals for the process to be followed in IP planning activities will be carried out. The aim is to show and demonstrate to an academic community how important it is to create spaces during the semesters of study, where the student can measure their abilities to apply the knowledge acquired in an integrative project.

For this reason, the need arises for a central server that allows these activities to be carried out, which is why the development of this project begins as a proposed solution, allowing the theoretical knowledge acquired by the students to be reinforced and putting it into practice in an approach to the real world.

Methodology

During the September-December 2022 quarter, a review of the project objective for the Web Applications subjects was carried out, which made it possible to determine the technical requirements of the server, according to the characteristics detected and with the support of the Computer Science and Telecommunications Subdirectoriate of the UTJ installed the Windows Server 2022, Standard Edition 64-bit operating system, with a database management system in SQL Server V19.1, for publishing services the universal development environment was installed with Full Laragon Stack, which contains Apache 2.4 and PHP 8.2 for Back End work. And it allows secure connections with the Secure Sockets Layer (SSL) protocol, which creates an encrypted link between a web server and a web browser, which required the installation of the corresponding security certificates provided by the UTJ by enabling access in the port 443 of the server.

For software development, it is important to follow some specification that allows developers to have discipline throughout all stages of development, so that they are more coherent and formal, which is why each of the phases that support them must be defined. the development. The central Web server system, being a tool that aims to have application in the university community for the management of final projects, must follow a software engineering process that provides the foundations under which the system will be developed.

The central WEB application for the management of integrative projects was developed taking as reference the software engineering process and the agile SCRUM Methodology for the management of each of its phases. The software engineering process aims to provide the most possible order to the development of the WEB application based on the linear sequential model also known as the waterfall model.

Waterfall development is a linear procedure that is characterized by dividing development processes into successive project phases. Unlike iterative models, each of these phases is executed only once. The results of each of the phases serve as a starting hypothesis for the next and are used, especially, in software development.

The development of the model is attributed to computer science theorist Winston W. Royce. However, Royce is not the inventor of this model. Quite the contrary, in his 1970 essay titled Managing the Development of Large Software Systems, the theorist presents a critical reflection on linear procedures. As an alternative, Royce presents an incremental iterative model in which each of the phases builds on the previous one and verifies its results (Ionos, 2019).



Figure 1 Software Engineering Process

Source: Self Made

With the intention of improving the work continuously and due to a small development team, the agile SCRUM methodology is used as support in the management of activities involved in WEB development since it is not conceived as a solid method or as a technique. of concrete work, but rather as a framework that offers teams fixed reference points to carry out their work.



Figure 2 The Agile SCRUM methodology process

Source: PM- Partners group

The Agile Scrum methodology establishes a framework that can be applied in different situations with the purpose of continually improving both the work method and the product. The framework is made up of roles, events, artifacts, and rules. Within these limits, Scrum teams must achieve the most efficient results possible by offering the customer the best possible product. In Scrum, customers and users take an important position and development is based on their needs (Ionos, 2019).

Analisis of requirements

For the initial phase in the software engineering process corresponding to the requirements analysis, collegiate work meetings were held with the PI coordinators to determine the needs in the management of final projects.

In this phase, the services that the system must provide and the restrictions under which it must operate are established. The conditions that determine what the system should do and how it should do it are specified, that is, requirements: Functional, which describe a functionality or service of the system. Non-functional, which are usually restrictions to the system or its development process such as using a certain language (Granollers, 2023).

Software design

During the January-April 2023 quarter, work meetings were reanalyzed for the planning of final projects in the IT division where the design of the central system for project management was carried out, obtaining as a final product the use case diagram taking as reference the Unified Modeling Language (UML) developed in the open source BOUML tool.

This is the phase in which the data structures, functions and behaviors are defined based on the restrictions imposed by the main requirements of the previous phase. In practice, the architecture and structure of the individual components of the system are defined (Asset Studio, 2022).

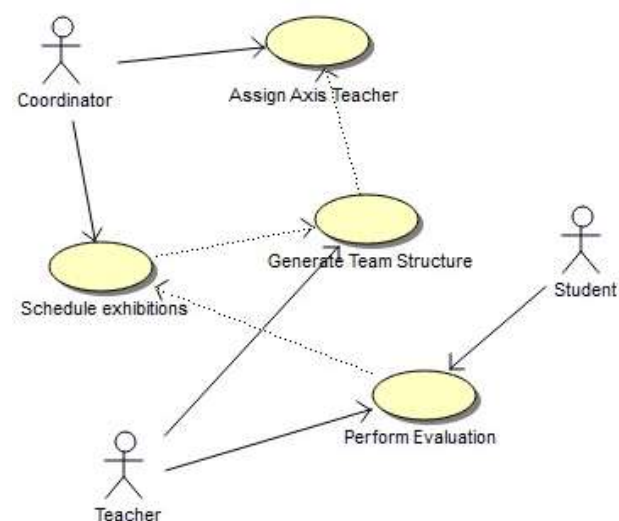


Figure 3 Use Cases Final Projects

Source: Self Made

Coding

After defining the operational instructions for the implementation phase and having documented them in the corresponding diagrams, we proceed to write the source code of the Web application that will manage the collaborative work between teachers and students for the execution of the PI.

To perform the coding, the Visual Studio Code development environment was used. Built on open source, a lightweight but powerful source code editor that runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript, and Node.js and has a rich ecosystem of extensions for other languages and runtimes (Microsoft, 2023).

During the May-August 2023 quarter, the source code was drafted for the Front End, which is the part where the user can directly access the application. The versions of HTML 5, CSS 3 and Javascript ES12 were used in support of the Bootstrap responsive design FrameWork CSS, which is a tool for the development of interfaces, for the development of the Back End, version 8.2 of PHP was used by implementing the Laravel WEB development framework in version 10.x that has an elegant and expressive syntax, following the tool's own framework such as the Model View Controller (MVC).

MVC is a design pattern that considers dividing an application into three clearly identifiable modules with well-defined functionality, the model is a set of classes that represent the real-world information that the system must process, the views are the set of classes that are responsible for showing the user the information contained in the model and the controller is an object that is responsible for directing the flow of control of the application due to external messages, such as data entered by the user or menu options selected by him (Bascon ,2004).

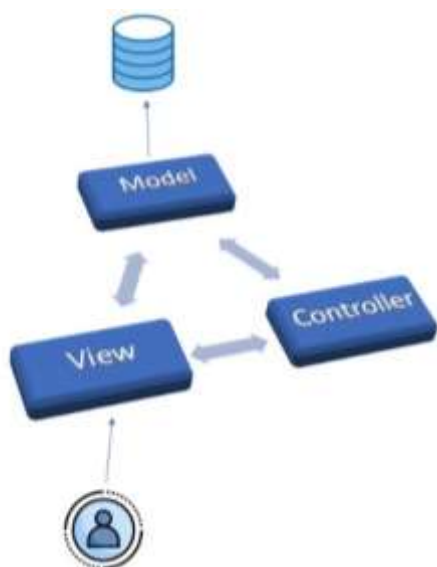


Figure 4 Model View Controller
Source: Self Made

Implementation tests

Once the application is developed, it is tested to determine if it solves the problem satisfactorily, so during the September-December 2023 semester, smoke tests have been carried out with the support of the students of the division in the laboratories of calculation with the prior authorization of the career direction.

Smoke testing is a process used to test software to determine whether the build of the deployed software is stable or not. When performing software smoke testing, you run a series of tests designed to evaluate each of the software's core functionalities. If the product fails the smoke test, it means that the initial version has major defects that need to be fixed before further testing (Zaptest, 2023).

Web Hosting

Web hosting is a service that stores your website or web application and makes it easily accessible across different devices such as desktop, mobile and tablets. Any web application or website is usually made up of many files, such as images, videos, text and code, which must be stored on special computers called servers. The web hosting service provider maintains, configures, and runs the physical servers that you can rent for your files. Site and web application hosting services also provide additional support such as security, backup, and website performance, saving you time to focus on the core functions of the website (Amazon, 2023).



Figure 5 WEB hosting operation
Source: Hostinger (2023)

Choosing a web hosting plan is similar as renting an office space and sometimes the cost is high in relation to the benefit obtained, for this reason the CCD central server seeks to solve the need for WEB hosting for students' integrative projects, allowing you to live the real experience just like when hiring a private service. At the same time, it would allow the storage of the necessary evidence for the quality accreditations that the university undergoes. Serving as a central repository for the warehouse of final projects.

Accreditation is the result of a systematic and voluntary evaluation and monitoring process of the fulfillment of the university functions of a Higher Education Institution (HEI), which allows obtaining reliable and objective information on the quality of the Academic Programs (AP) that it develops. It gives certainty to society regarding the quality of trained human resources and the different processes that take place in an educational institution (COPAES, 2023).

Derived from the accreditation process that the UTJ's Information Technology study plans go through at its CCD headquarters, before the National Council for Accreditation in Informatics and Computing A.C. (CONAIC), which determines the implementation in its evaluation criteria. of IP that allow students to demonstrate the skills acquired throughout their university life.

Specifically in Criterion 3. Curriculum, indicator 3.5.2. The subjects corresponding to the specialty include projects aimed at developing the student's ability to solve real problems in accordance with the technological needs of the program itself (CONAIC, 2023).

In this sense, this integrative project seeks to solve the evidence required in the indicators, allowing success in the acquisition of accreditations.

Results

The final result is the implementation of the WEB application on the CCD central server for the management of integrative projects, which will allow the correct administration of the processes involved in the planning and execution of integrative projects carried out at the end of each period at UTJ-CCD.



Figure 6 System interface for project management in CCD
Source: Self Made

Having a central WEB application for IP management will allow the activities of the academic unit in CCD to be carried out in a harmonious and disciplined manner, being functional, efficient and productive in the development of the integrative projects carried out at the end of the quarterly period. , making it easier to obtain consistent information at runtime.



Figure 7 Login to access the system for managing integrative projects
Source: Self Made

Correct management of integrative projects will have benefits in optimizing information flow, improving teamwork, resolving problems, and delivering data in real time. By virtue of its ability to streamline and add more value to both internal and external processes, the implementation of a project management system has ceased to be a plus and has become a necessity, thus positioning itself as an extremely important process for the university development and growth.



Figure 8 Main menu of the project management system
Source: Self Made

Another result obtained with the CCD central server is the hosting service for integrative projects, since by maintaining a domain and a defined IP number it provides the computing resources to UTJ students to publish their final work on the Internet secure, evidencing the knowledge acquired during the semester, while at the same time concentrating the necessary evidence for accreditations.

Gratitude

We thank Dr. Héctor Pulido González Rector of the Technological University of Jalisco and Professor Soraya Navarro Rayas, Academic Secretary of the institution, for providing the necessary means and mechanisms to carry out the project.

Conclusions

Information technologies are part of the evolution and have taken on great importance in the educational field, providing the necessary tools to teachers, students and administrators to enrich the teaching process.

Establishing the competencies exhibited by students in learning to develop WEB applications mark the areas of improvement to be considered in consecutive periods.

Taking into account the research carried out addressing the management and publication of IP, it can be said that the relevant technological tools for this process are those that allow students to monitor their own learning, allowing the teacher to make use of different motivational strategies for the development of their creativity, critical thinking and autonomy.

To the extent that teachers and students are linked in the learning process, the development of new projects is strengthened in an integrated way with IT.

It would be interesting to implement statistical analyzes of the stored data so that, with the support of artificial intelligence, projects could be assigned to students according to their development skills.

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