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Article

Web framework for the operational planning management system

Framework web para sistema de gestión de la planeación operativa

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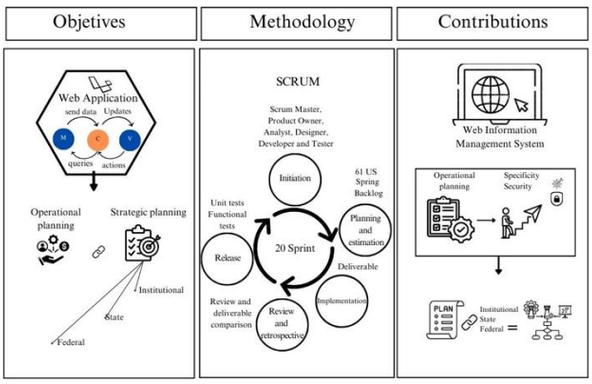
Abstract

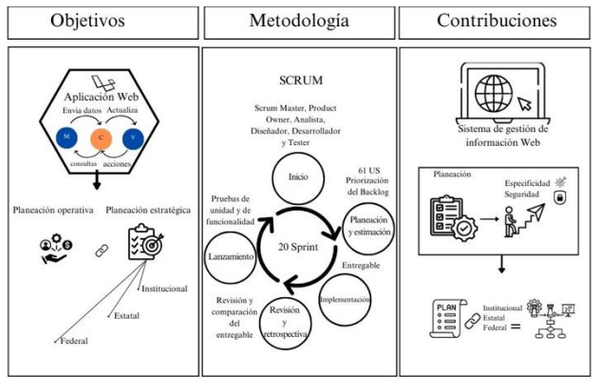
In a previous research work, the authors designed an information management model for short-term planning for the Hidalgo Technological Universities; This article presents the implementation of these model in the form of a Web application based on the Controller View Model pattern that allows linking the allocation of resources for operational planning with the objectives of strategic planning at the institutional, state and federal level. The Scrum methodology was used for the development of the application in which 61 user stories and 20 Sprints were established, the application was subjected to unit and functionality testing. The framework used was Laravel. The contribution is an information management system that meets the needs in terms of Operational Planning at a higher level of specificity and security; capable of linking institutional, state and federal planning, allowing compliance with strategic planning.



Information management system, Model view controller, Operating planning

Resumen

En un trabajo de investigación previo, los autores diseñaron un modelo de gestión de información para la planificación a corto plazo para las Universidades Tecnológicas Hidalguenses; este artículo presenta la implementación de ese modelo a través de una aplicación Web basada en el patrón Modelo Vista Controlador, que vincula la asignación de recursos para la planificación operativa con los objetivos de la planificación estratégica a nivel institucional, estatal y federal. Se utilizó la metodología Scrum para su desarrollo; se establecieron 61 historias de usuario y 20 Sprints; la aplicación fue sometida a pruebas de unidad y funcionalidad. El framework utilizado fue Laravel. La contribución es un sistema de gestión de información que atiende las necesidades en términos de Planificación Operativa en un mayor nivel de especificidad y seguridad; capaz de vincular la planeación institucional, estatal y federal, permitiendo el cumplimiento de la planificación estratégica.



Sistema de administración de información, Modelo vista controlador, Planeación operativa

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Introduction

The Technological Universities from Hidalgo carry out annual operational programs, formed by a series of projects that establish the programming of their activities, objectives, goals, indicators, people in charge and resources required for their operation in a year and that should be in accordance with Institutional Programs and with the National and State Development Plans. 65% of these universities prepare the Annual Operating Program at the line item level and only 10% prepare it at the article level (Escorza et al., 2023), which means that it is prepared in a very general manner that limits the level of precision and this results in generalized budget allocations; it is not possible to adequately monitor the budget and the specific requirements of the universities' substantive functions (teaching, research, outreach and extension) and administrative functions are not reflected in it. Eighty-five percent of Technological University personnel use spreadsheets, 7% use word processors and only 8% have a system for their preparation (Escorza et al., 2023).

Therefore, it is essential to have an information management system for the Annual Operating Program that meets the requirements of the Hidalgo Technological Universities in terms of short-term planning. Next, in the following sections, the paper refers to the Literature Review, Research Context and the methodology used for the development of the project. Then, it refers to results obtained, Finally, conclusions will be addressed.

Literature review

Theoretical framework

The literature distinguishes three levels of the planning process: strategic (corporative or institutional), tactical (functional) and operational (Vergara-Escobar, et al., 2021). Strategic planning (long-term) defines the mission and objectives; tactical planning (medium-term) defines the mission and objectives of the areas or departments based on strategic planning; and operational planning (or short-term, usually one year) implements and operates the tactical plans (Badejo and Ierapetritou, 2022). In short-term planning, the Annual Operational Programs are prepared.

An Annual Operating Program is a system of control over the activities that the organization must follow in a programmed manner and allows the organization to move in a period of time to meet its goals and objectives, through the use of budgets, indicators and other management tools (Crespo, et al., 2022).

On the other hand, referring to technical knowledge it is said that:

Software architecture includes the components of the software system, the visible properties of those components and the relationships that exist between them, organized in such a way that they satisfy the functional and non-functional requirements of the system (Blas, et al., 2019).

A software architecture or architectural pattern describes the organizational scheme of the system, while a software or design pattern provides a universal and reusable solution to common problems in software architecture design (Farshidi, et al., 2020), the most distinguished being: Client-Server, Model View Controller (MVC), Service Oriented Architecture (SOA), Layers, Pipeline and Filters, Master-Slave (Farshidi, et al., 2020).

The MVC pattern organizes the application into three components: the model that represents the information in database and functions related to data processing; the view is integrated by input forms and information output reports; and the controller that processes user requests and instructs the model and view to take actions based on that information (Pérez et al., 2018). The separation between the model and the view allows multiple views to use the same model. Many researches have shown that application development using the MVC concept is better than conventional development (Subari, et al., 2021).

The MVC pattern has been adopted as an architecture for Web applications in the main programming languages, because it is a lightweight, fast and easy to implement option (Murillo et al., 2020).

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A framework "is a working environment or framework where a set of concepts, practices and criteria are standardized to approach a particular type of problem as a reference and solve new problems of a similar nature" (Pérez, et al., 2018).

Web development frameworks make use of design patterns (Pantoja and Pardo, 2016) therefore, they facilitate and speed up the creation of web applications, they are easy to maintain and configure; this is because they incorporate functionalities developed, tested and implemented in a certain programming language, which results in the generation of robust, orderly code, free of redundancies (Espinosa-Hurtado, 2021).

Laravel is a freely licensed framework for the development of web systems in PHP language that allows the generation of code in an elegant and simple way, (Avilés, et al., 2020) is flexible and scalable (Laaziri, et al., 2019). It enables the development of large and complex enterprise-level projects, in addition, it promotes the use of modern web development practices based on the MVC pattern (Sunardi and Suharjito, 2019). Laravel has extensive features such as security, password storage, password reminders and resets, encryption and validation, simplifies authentication, facilitates routing and access, and increases power within the website framework (Soegoto, 2018).

State of the art

In 2007, García Santillán and Lamadrid Landa carried out multidisciplinary research which resulted in an Annual Operating Program Model for educational institutions, created in Microsoft Excel for the Technical Professional Education College (CONALEP) of the State of Veracruz.

In 2010, Ramírez Arellano conducted a research study in which he proposed a Bayesian model for the classification of goals to support planning. For this purpose, he uses data mining, artificial intelligence, decision trees, among others, taking as a case study the Annual Operational Program of the National Polytechnic Institute (Ramírez, 2010).

The Autonomous University of the State of Mexico has a Web system for capturing information from its Annual Operating Program (Autonomous University of the State of Mexico, 2012).

Locally, the Secretariat of Public Education of the State of Hidalgo (SEPH) has a Web system in which they keep track of the Annual Operating Program of the sub-secretariats, directorates and departments that form it; therefore, it is internal and is not shared with other Institutions of Secondary or Higher Education (Cano, 2022).

At the Autonomous University of the State of Hidalgo, each directorate creates its Annual Operating Program according to its needs, which is reflected in a system that is managed internally (Núñez, 2022).

As for state universities, the Technological University of Tula Tepejí (Aguayo, 2022) and the Polytechnic University of Tulancingo have an internal system for the management of the Annual Operating Program (Del Villar, 2022).

Research Context

By the year 2024 in Mexico, the Technological Universities subsystem will be 33 years old, and so far, it has 124 universities in 29 states of the republic (General Directorate of Technological and Polytechnic Universities, 2024). There are eight Technological Universities in the state of Hidalgo: from Tula Tepejí, Huasteca Hidalguense, Valle del Mezquital, Tulancingo, Mineral de la Reforma, Sierra Hidalguense, Minera de Zimapán and Zona Metropolitana del Valle de México (General Directorate of Technological and Polytechnic Universities, 2024).

The Technological University of the Mezquital Valley (UTVM) was created on September 9th, 1996 in the municipality of Ixmiquilpan; its mission is to offer "educational and technological services that promote sustainable development, committed to the formation of human beings with a sense of identity and values, through the development of competencies based on research and linkage" (Technological University of the Mezquital Valley, 2024).

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The Technological University of the Mezquital Valley is taken as a case study, where the Scrum methodology was applied for the development of the system.

Methodology

The application of an instrument in the Technological Universities of Hidalgo allowed obtaining the diagnosis of the current situation regarding the problems presented by the Technological Universities of Hidalgo for the elaboration of the Annual Operating Program and facilitated to know the information requirements (Escorza et al., 2023) to develop a system using a web framework for the Annual Operating Program focused on the Technological Universities of Hidalgo that makes the elaboration times more efficient and allows revisions in real time.

Specifically, the web system would allow:

- Enter the resources required for each programmed activity in order to obtain a specific list of the inputs needed in a year.
- Assign institutional, state and federal objectives to the programmed activities in order to identify the link between the programmed activities and the objectives.
- Generate real-time reports that enable decision making.
- Create user profiles that allow or restrict access to the corresponding modules to ensure information security.
- Do testing unit and functionality tests to avoid errors and guarantee the system's quality

Scrum was used as the methodology for the development of the project, since, being considered agile, it allows the development of projects in a short time and with a small work team. Scrum has five iterative phases.

In the Initiation phase, the Scrum Master was identified and the roles of the other Scrum team members were defined: Product owner, Analyst, Designer, Developer and Tester. The Scrum Master assigned the activities to each member.

The system had to contemplate two user roles: the person in charge of the Planning area at the University and the project leader.

The Planning Manager would interact with the system as follows:

- Enter the descriptive letters of the projects, assign the person who will be the project leader responsible for the projects and assign project budget ceilings classified by chapter.
- Enter and/or update the objectives of its Institutional Plan, Sector Plan and State Plan that are related.
- Enter and/or update the cross-cutting objectives of the related Institutional Plan, Sector Plan and State Plan.
- Enter and/or update the objectives of the related Federal Sector Plan and National Development Plan.
- Performs budget adjustments, compensated movements and edits project information.
- Loads (if available and desired) information from the preliminary draft budget.
- Track all projects and the ability to print any report.

On the other hand, the project leader would perform the following activities:

- He/she is exclusively responsible for the information of the project(s) he/she is in charge of, so he/she cannot see or modify information of other projects that do not correspond to him/her.
- Enter and/or modify information for each project you are responsible for, for example: justification, objective, goal, measurement indicator, among others.

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- At the time of entering the actions, choose a specific objective at the institutional level that is addressing your action, in turn, the specific objectives will appear at the state level; in this way, it is forced to align its actions with the strategic planning at the state level.

- Also, at the time of entering the actions, you must choose a specific objective related to the federal level to verify the existence of the alignment of these with the strategic planning at the federal level.

- Optionally choose a cross-cutting objective.

- Schedule actions to be carried out within one year.

- Allocates resources (items or inputs) used to carry out the actions according to a financial ceiling validated by chapter and previously entered by the person in charge of the Planning area until the budget ceiling is depleted for each chapter.

- Displays and prints reports related to the operational planning of its project(s).

Both interactions of these two types of users with the Annual Operating Program are shown graphically through the Activities diagram, as shown in Figure 1. Based on this, the User stories (US) were specifically designed, which in this case were considered to be 26 for project leaders and 35 for those responsible for planning (a total of 61 US).

In the Planning and Estimation phase, the Backlog was prioritized, which meant the establishment of nine Sprints for the project leaders, while eleven were defined for the planning manager, for a total of 20; in both cases, the work blocks were ordered according to delivery priority. As an example, Table 1 shows the prioritized backlog for the project leaders.

Each Sprint represents one iteration. As far as the project leader and planner are concerned, the Sprint related to user registration and authentication in the system was the highest priority for their attention; while the Sprint related to reporting for both users was the lowest, as shown in Table 2.

In this phase, the user stories were established; Table 3 shows the estimated story corresponding to the budgetary allocation of resources per chapter for each project (Sprint 3). The design of interface prototypes was elaborated by means of Mockups in this same phase.

In the next phase called Implementation, the first deliverable related to project leader authentication in the operational planning system was coded.

In the fourth phase Review and Retrospect, the deliverable's working block was compared with the proposed target, and meetings were held with the Scrum team to add functionalities that had not been contemplated in the first instance, if necessary.

In the last phase, Release, the functionals tests of the deliverable were performed. Once the first block (authentication of the project leader) was completed, we continued with the block of authentication of the planning manager and iterated again. The iterations were repeated until all twenty blocks were completed.

Table 4 shows a fragment of the test plan that contains the strategy used for the tests (the how) and the type of test used related to Sprint (blocks) three, four, ten and six and ten and seven in a unitary and integrated manner. From Sprint two onwards, integration and acceptance tests were performed; in order to subsequently verify the requested changes.

Box 1

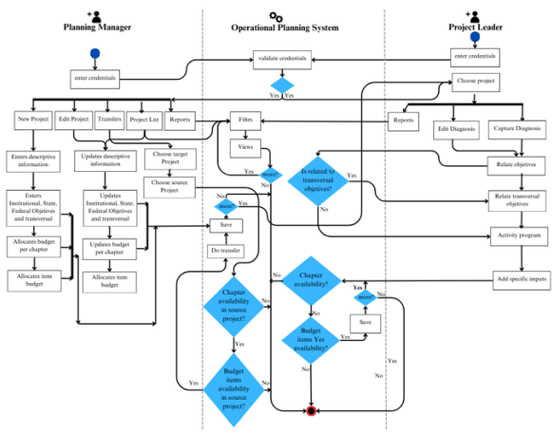

Figure 1
Activity diagram for the operational planning system

Source: Own elaboration

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Box 2

Table 1

Prioritized backlog of epics for the project leader

Sprint	Epic Development	Nº US	User Stories
1	As a project leader I need to have a username and password to perform the operational planning of my project(s).	US-16	Show the interface to access the system.
		US-17	Validate the user and password entered by the project leader.
		US-18	Show the welcome portal to the system in case of access.
		US-19	Recover password in case of forgetting it.
2	As project leader I need to consult the budget available for my project(s) by chapters.	US-26	Consult the available budget for my project by chapters.
3	As project leader I need to visualize the catalog of items.	US-12	List item catalogs that are available by line item.
		US-13	Search for items by specific line item.
		US-14	Search for items in a specific way.
		US-15	View item details.
4	As project leader I need to visualize the line-item catalog.	US-9	List the line item catalogs to which you have access.
		US-10	Perform searches of accessed line items.
		US-11	Display details of line items to which you have access.
5	As a project leader I need to visualize the chapters	US-20	List the chapter catalogs to which you have access.
		US-21	Perform searches of chapters to which you have access.
		US-22	View details of chapters you have access to.
6	As a project leader I need to add the diagnosis of my project(s)	US-23	Add diagnosis, justification, general objective, measurement indicators.
		US-24	Modify diagnosis, justification, general objective, measurement indicators.
		US-25	Consult budget availability by chapter.
7	As a project leader I need to add activities to my project(s).	US-1	Add activities to my project(s) and relate them to institutional, state, national and cross-cutting objectives.
		US-2	Modify activities to my project(s) related to institutional, state, national and cross-cutting objectives.
		US-3	Add activities to my project(s).
8	As a project leader I need to schedule activities to my project(s).	US-4	Schedule number of activities to my project(s) and month of implementation.
		US-5	Modify the number of activities for my project(s) and month of implementation.
9	As a project leader I need to view reports related to my project(s).	US-6	Choose reports related to my project(s).
		US-7	View reports related to my project(s).
		US-8	Print reports related to my project(s).

Source: Own elaboration

Box 3

Table 2

Prioritized backlog corresponding to the project leader and planning area managers

Sprint	Epics development
1	As a project leader I need to have a username and password to perform the operational planning of my project(s).
2	As a planning manager I need to have a username and password to follow up the operational planning of the project(s).
3	As a planning manager I need to allocate budget by chapters to each project.
4	As a project leader I need to consult the available budget for my project(s) by chapters.
5	As a planning manager I need to visualize the article catalog.
6	As a project leader I need to view the item catalog.
7	As a project leader I need to view the line-item catalog.
8	As a planner I need to view the line-item catalog.
9	As a project leader I need to display the chapters
10	As a planning manager I need to visualize the chapters
11	As a planning manager I need to visualize the diagnosis of the project(s).
12	As a project leader I need to add the diagnosis of my project(s).
13	As a planning manager I need to consult the budget available for each project by chapter.
14	As a project leader I need to add activities to my project(s).
15	As a planning manager I need to visualize project activities.
16	As a project leader I need to schedule activities to my project(s).
17	As a planning manager I need to view the scheduling of project activities.
18	As a planning manager I need to make transfers between project line items.
19	As a project leader I need to view reports related to my project(s).
20	As a planning manager I need to view reports related to my project(s).

Source: Own elaboration

As for the software used, we can mention that Laravel version 9 was the php-based web framework we were working with, the database was created in MySQL and the code editor was Visual Code Studio.

Box 4

Table 3

User story

Id: US-31
User story title: Budget allocation for each project.
Description: I as a planning manager want to allocate budget by chapter to each project. **Acceptance criteria:** The total budget per chapter must be equal to the budget assigned by the Sub-secretariat of Higher Education of Hidalgo by official letter. **Responsible:** First author **DoD:** Approved by the application developers. **Remarks:** Test the functionality of the application. **Priority: 3** **Estimated: 2 days**

Source: Own elaboration

Box 5

Table 4

Fragment Test Plan

No	Type of test	Responsible	Programmed Date	Assigned Code
1	Content	Third author	28/03/2022	SL-03_01
2	Interface	Third author	28/03/2022	SL-03_02
3	Routes	Third author	28/03/2022	SL-03_03
4	Database	Third author	28/03/2022	SL-03_04
5	Content	Third author	29/03/2022	SL-04_01
6	Interface	Third author	29/03/2022	SL-04_02
7	Routes	Third author	29/03/2022	SL-04_03
8	Database	Third author	29/03/2022	SL-04_04
9	Navigation	Third author	29/03/2022	SL-05_01
10	Content	Third author	30/03/2022	SL-16_01
11	Interface	Third author	30/03/2022	SL-16_02
12	Routes	Third author	30/03/2022	SL-16_03
13	Database	Third author	30/03/2022	SL-16_04
14	Content	Third author	30/03/2022	SL-17_01
15	Interface	Third author	31/03/2022	SL-17_02
16	Routes	Third author	31/03/2022	SL-17_03
17	Database	Third author	31/03/2022	SL-17_04

Source: Own elaboration

Results

The obtained product is a responsive web system developed in Laravel. As mentioned above, the system requires two types of users (roles): the Planning Manager and the Project Leader; for this, the robust authentication system that Laravel has was implemented and adapted to the needs of the project for an efficient management of user permissions, credential validation and password encryption.

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For each table stored in the database a corresponding model was created in Laravel, figure 2 shows a model related to the line-item catalog. Controllers were also created for each user story and its corresponding view. Figures 3 and 4 show evidence of each of them. The data forms are protected from attacks that spoof a request to a web server by impersonating a trusted user, using the @CSRF directive (Cross-site request forgery Model View Controller).

Box 6

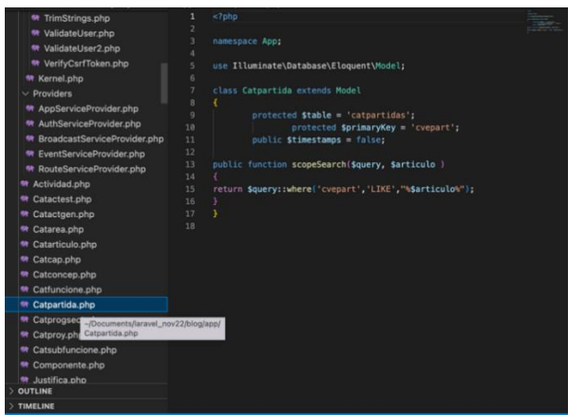

Figure 2

Laravel model related to the table of items of the Annual Operating Program

Source: Own elaboration based LARAVEL, 8

The routes were created for calling the views, controllers and functions within the controllers.

Box 7

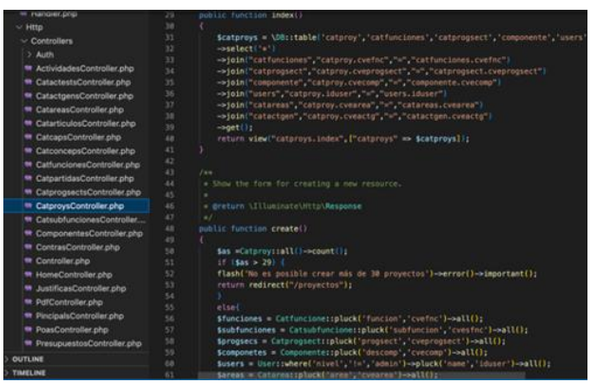

Figure 3

Laravel Controller related to the Annual Operational Program projects catalog

Source: Own elaboration based LARAVEL, 8

Box 8

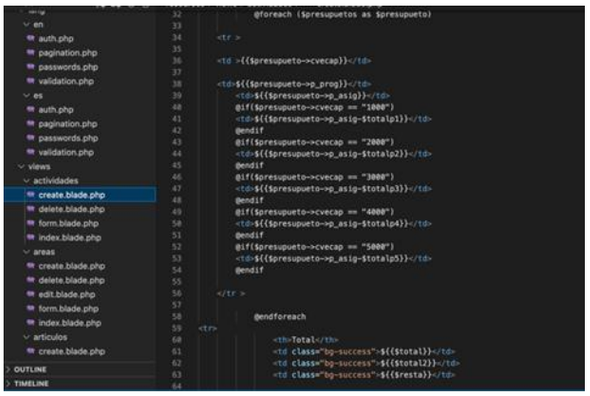

Figure 4

Laravel view related to the creation of the Annual Operational Program activities

Source: Own elaboration based LARAVEL,8

Box 9

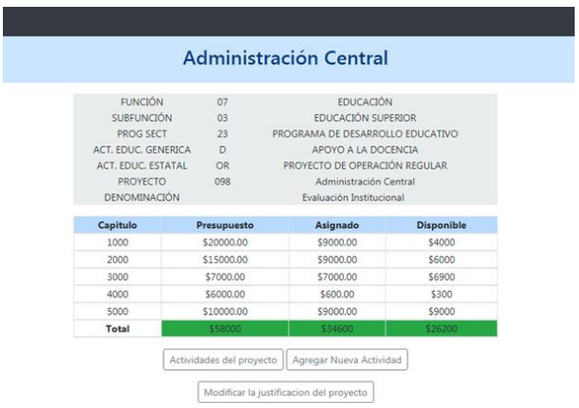

Figure 5

Allocated and available budget for the project called Central Administration, activity of a project leader

Source: Own elaboration based LARAVEL, 8

The Web system for the Annual Operating Program allows the generation of new information through project reports and concentrated reports to support decision making. Some of the reports are: Projects, Concentrated projects, List of activities, Activities that meet Institutional Planning objectives, Activities that meet State level objectives, Compensated movements, Transfers, Concentrated items, Concentrated items and projects, General, specific and cross-cutting objectives at Institutional, State or Federal level that are covered, among others.

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Some of the interfaces of the information management system are shown below. In the interface of figure 5, the leader can see the budget that has been assigned to his project by the Planning Manager and the available budget that is updated as activities are added and resources are assigned to them.

Box 10

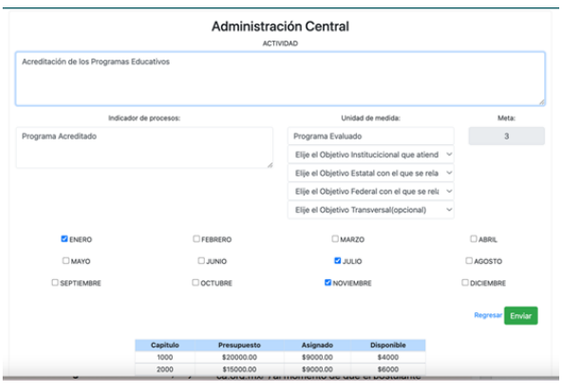

Figure 6
Programming of activities and their relationship with institutional, state, federal and cross-cutting objectives

Source: Own elaboration based LARAVEL, 8

The activity annex and its programming for one year, as well as the process indicators, units of measurement and the annual goal can be seen in Figure 6. This section also includes the institutional, state, federal and cross-cutting objectives to which the activity is related.

Figure 7 shows the allocation of inputs and scheduling, i.e., the required number of inputs per month that are necessary to perform each of the entered activities that make up a project. It can also be seen that the inputs assigned are at the item level, i.e., with greater specificity.

The catalog of products classified by items can be consulted by the project leaders and by the person in charge of the Planning area; however, the latter is responsible for the entry of new products and price modifications, as well as the cancellation of any of them, as shown in Figure 8.

Box 11

Figure 7
Activity Expense Scheduling

Source: Own elaboration based LARAVEL, 8

On the other hand, the project catalog can only be viewed by the person responsible for the Planning area, who is authorized to modify projects, assign resources by chapter, assign leaders to projects, as well as to cancel any of them. Figure 9 shows a list of projects with test data, the responsible leaders and their status.

Box 12

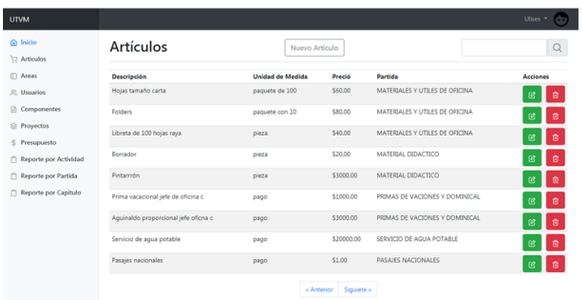

Figure 8
Catalog of items, updateable only by the person in charge of the Planning area

Source: Own elaboration based LARAVEL, 8

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Box 13

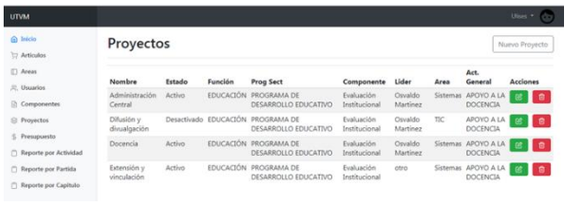

Figure 9

Catalog of projects that can be added, modified and deleted by the planning area manager

Source: Own elaboration based LARAVEL, 8

Box 14

Figure 10

Report classified by activity of the Central Administration Project

Source: Own elaboration based LARAVEL, 8

Scrum allows unit and functionality testing to be carried out at the end of each sprint, without having to wait for the application to be liberated in its entirety, which made it possible to identify errors in a timely manner and correct them. Part of the Test log is shown in Table 5, which shows the tests performed on Sprint 3, their status, results, severity and observations. The status in process indicates that the test needs to be performed again after the programmer corrects the mistakes found in the test.

Box 15

Table 5

Test Log Fragment

Key	Date	Obtained Results	Status	Results	Severity	Observations
SL-03_01	28/03/2022	Some spelling mistakes were found	In process	Not approved	Low	It is necessary to eliminate spelling mistakes.
SL-03_01	28/03/2022	Some spelling mistakes were found	Concluded	Approved	Low	No spelling mistakes
SL-03_02	28/03/2022	Interface operation was verified	Concluded	Approved	High	
SL-03_03	28/03/2022	The routes for get and post methods were checked.	Concluded	Approved	High	
SL-03_04	28/03/2022	Connection to the database was verified.	Concluded	Approved	average	Successful connection to database

Source: Own elaboration

Conclusions

This article presented a summary of a web system that manages the information of the Annual Operative Program that Hidalgo Technological Universities elaborate annually as part of their regulations; based on requirements provided by the personnel of The Technological University of the Mezquital Valley that has incidence in its conformation.

The collaboration with The Technological University of the Mezquital Valley was very important because it allowed us to learn about the process of developing the Annual Operating Program; the suggestions, experiences and documentation provided allowed us to determine the requirements mentioned above, to later translate them into the user stories as a starting point for the development of the system, which resulted in a responsive web system that could be customized according to the user profiles: project leader and the person in charge of the Planning area. The advantage of being responsive is that it can be accessed from any mobile device. However, as it makes use of Bootstrap templates and styles, the system requires an internet connection to keep those styles and maintain the information in the views presentable to the user, this would be one of the limitations of the system.

The Scrum methodology for the development of this system simplifies the process of its elaboration, since, being an efficient method, it was adapted to the requirements and changes of information by those responsible for the planning area and project leaders. The use of an MVC pattern for its coding has resulted in a responsive web system with security functions: user profiles that allow or restrict access to information; password encryption; validation; authentication; access and routing; which guarantees the integrity of the information and, in addition, the use of an MVC makes it easier to make future changes. The use of a web framework for the creation of this system has made it possible to enter and update the information that makes up a planning project that feeds the reports generated in real time and requested by various agencies; through this tool, activities are programmed and resources required for each activity are assigned with a greater degree of specificity, in such a way that a list of inputs required by item is generated, which facilitates purchasing.

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Finally, it relates the programmed activities that make up a project with institutional, state and federal objectives that allow us to identify the linkage or deviation between them.

The various strategies and types of tests carried out on the system have made it possible to identify and correct mistakes in a timely manner. Therefore, it can be said that, the design and coding of an Information Management Model for the Annual Operational Program proposed in previous research was achieved, through the development of a Web System that employs an MVC design pattern, through the Laravel framework.

Regarding the testing, as evidenced in the results section, the web application was subjected to testing at the term of each Sprint, which allowed the identification of errors and their correction, so it is concluded that application responds to the user requirements expressed in US and the result of the unit and functionality testing was positive.

As a future work, it is intended that:

This web system can be tested by the other Hidalgo Technological Universities in order to generalize its use and extend its benefits to other institutions.

This same exercise should be carried out with the State Polytechnic Universities that have a similar programmatic structure to the Technological Universities and that have similar regulations for the elaboration of their Annual Operating Program.

Analyze possible complementary modules such as those related to the administrative functions of Warehouse, Purchasing, Maintenance, to improve service, guarantee deliveries under schedules, availability of inventories in real time, among others.

Declarations

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Escorza-Sánchez Yolanda Marysol: Contributed to the project idea, research, programming and writing

Mendoza-Espinoza Héctor Eduardo: Contributed to the project idea, research method and technique and testing

Hernández-Gracia Tirso Javier: Contributed to research and testing

Availability of data and materials

The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

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Abbreviations

CONALEP	Technical Professional Education College
CSRF	Cross-site request forgery
MVC	Model View Controller
SEPH	Secretariat of Public Education of the State of Hidalgo
SOA	Service Oriented Architecture
US	User Story
UTVM	Technological University of the Mezquital Valley

References

Antecedents

Escorza, S.Y.M., Hernández, G.T.J. and Mendoza, E.H.E. (2023). Information Management Model for Short-Term Planning in Technological Universities. Journal of Hunan University (Natural Sciences), 50(5), 167-175.

General Directorate of Technological and Polytechnic Universities (2024). Educational offer.

ISSN: 2531-2952
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Escorza-Sánchez, Yolanda Marysol, Mendoza-Espinoza, Héctor Eduardo and Hernández-Gracia, Tirso Javier. [2024]. Web framework for the operational planning management system. Journal Applied Computing. 8[22]-1-12: e10822112.
DOI: https://doi.org/10.35429/JCA.2024.8.22.1.12

Technological University of the Mezquital Valley. (2024). Philosophy.

Basics

Avilés, S., Avila-Pesantez, D. and Avila, L. (2020). Web system development based on Laravel and VueJs frameworks for process management: A case study. Revista Peruana de Computación y Sistemas, 3(2), 3-10.

Badejo, O. and Ierapetritou, M. (2022). Integrating tactical planning, operational planning and scheduling using data-driven feasibility analysis. Computers & Chemical Engineering, 161(2022).

Blas, M.J., Leone, H. and Gonnet S. (2019). Modeling and Verification of Software Architecture Design Patterns for Cloud Computing Environments. Revista Ibérica de Sistemas y Tecnologías de Informação RISTI, 35(12), 1-17.

Crespo, G.M.K., Romero, L.M.A., Urdaneta, M.A.J. and González, O.A.I. (2022). Administrative management through operational and financial planning of shrimp production microenterprises in Orense for the period 2019 - 2022. Revista Eruditus, 3(1), 81-106.

Espinosa-Hurtado, R. (2021). Comparative analysis for the evaluation of frameworks used in web development applications. CEDAMAZ, 11(2), 133-141.

Farshidi, S., Jansen, S. and Martijn van der Werf, J. (2020). Capturing software architecture knowledge for pattern-driven design. The Journal of Systems & Software, 169(2020), 1-18.

Laaziri, M., Benmoussa, K., Khoulji, S., Larbi, K. M and El Yamami, A. (2019). A comparative study of laravel and symfony PHP frameworks. International Journal of Electrical and Computer Engineering (IJECE), 9(1), 704-712.

Murillo, L., Ramiro, P. and Melgarejo, B.R.P. (2020). Persuasive Architecture with hybrid webRTC Technologies to develop a real time model view controller framework. Revista de investigaciones de la escuela de posgrado, 9(4), 283-292.

Pantoja, L. and Pardo, C. (2016). Assessing the ease of learning of MVC frameworks in the Development of web Applications. Revista Especializada en Ingeniería, 10(2016), 129-142.

Pérez, L., Miguelena, R. and Diallo, A. (2018), Framework for the implementation a project of Application Architecture of the Business Architecture Model for Management Livestock Traceability. 6th Engineering, Science and Technology Conference (2017): KnE Engineering, 811–820.

Soegoto, E.S. (2018). Implementing Laravel framework website as brand image in higher-education institution. IOP Conf. Series: Materials Science and Engineering, 407(2018), 1-7.

Sunardi, A. and Suharjito. (2019). MVC Architecture: A Comparative Study Between Laravel Framework and Slim Framework in Freelancer Project Monitoring System Web Based. Procedia Computer Science, 157(2019), 134-141.

Vergara-Escobar, O.J., Silva, G.A.G., Riegel, F., Rubin, U.M.A., Reimundo A.E.G., Rodríguez, L.F. and Camilo, N. (2021). Perspectives academic management at the three levels: Strategic, Tactical and Operational for the training of skills in nursing management in Argentina, Brazil, Chile and Colombia, Cardoso R. and Batista, Q.J.(Ed.). Educação, Trabalho e Gestão na Saúde: reflexões, reflexos e ações, Científica, Digital LTDA, Guarujá São Paulo Brasil, 63-89.

Supports

Aguayo, N. (2022). Interview conducted by first author, July 11st, 2022.

Autonomous University of the State of Mexico (2012). Annual Operational Program 2012.

Cano, L.N.A. (2022). Interview conducted by first author, July 12nd, 2022.

Del Villar, F. O. (2022). Interview conducted by second author, August 1st, 2022.

García, S.A. and Lamadrid, L.V. (2007). Annual operating program model for educational institutions, under Excel environment.

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RENIECYT-CONAHCYT: 1702902
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Escorza-Sánchez, Yolanda Marysol, Mendoza-Espinoza, Héctor Eduardo and Hernández-Gracia, Tirso Javier. [2024]. Web framework for the operational planning management system. Journal Applied Computing. 8[22]-1-12: e10822112.
DOI: https://doi.org/10.35429/JCA.2024.8.22.1.12

Núñez, I. V. (2022). Interview conducted by first author, August 3rd, 2022.

Ramírez, A.A. (2010). Construction and validation a Bayesian model for the classification of goals as support for planning: Case study Annual Operational Program (POA) of the National Polytechnic Institute. (Disertation) Instituto Politécnico Nacional.

Subari, A. Manan, S. and Ariyanto, E. (2021). Implementation of MVC (Model-View-Controller) architecture in online submission and reporting process at official travel warrant information system based on web application. Journal of Physics: Conference Series, 1918(2021), 1-7.

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Escorza-Sánchez, Yolanda Marysol, Mendoza-Espinoza, Héctor Eduardo and Hernández-Gracia, Tirso Javier. [2024]. Web framework for the operational planning management system. Journal Applied Computing. 8[22]-1-12: e10822112.
DOI: https://doi.org/10.35429/JCA.2024.8.22.1.12