

IFAT SYSTEM FOR IFAT DATA ANALYSIS AND DECISION MAKING SYSTEM

FOR IFAT DATA ANALYSIS AND DECISION MAKING

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<https://doi.org/10.61117/ipsumtec.v7i2.322>

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Abstract -- Information systems are developed for different purposes, depending on the needs of the human users and the business. Management information systems produce information that is used in the decision making process[1]. The development of an administrative information system in a web environment for the business processes of a company or institution is currently indispensable and for the Institute for the Promotion of Handicrafts of Tabasco (IFAT) is no different. The objective was to create a system to analyze the information on the processes of buying and selling of handicraft products created by Tabasco artisans.

To achieve this, several interviews were conducted to identify the needs directly from the personnel involved. After identifying the needs, requirements were obtained through the application of analysis and design methodologies and techniques. Subsequently, the necessary modules were developed, tested and the system was deployed. The final result was a functional tool that met the requirements of the agency.

A web development framework was chosen for the development of the system. It was decided to use the Yii framework [2] in its version 2.0, which is based on the server-side programming language PHP [3], whose version used is 8.0, for the user interface design the Bootstrap framework [4] in its version 5.3 was used, which allows the interfaces to be

accessible from any device with internet connection. The database is relational[5] and the database management is MariaDB[6].

Keywords: Web Application, MVC, MariaDB, PHP, Yii2.

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INTRODUCTION

Crafts, besides being an invaluable part of our indigenous cultures, mean work, crafts and art, which have passed from generation to generation over time among the inhabitants of indigenous peoples and communities of our state of Tabasco and the country. At present, handicrafts are still sources of employment for many families in Tabasco, although with very little remuneration, and this is due to various factors, which forces the existing artisans to have to migrate to other locations to sell their product unfairly at a low cost[7].

The state of Tabasco has the Institute for the Promotion of Handicrafts of Tabasco (IFAT), a decentralized body of the State Public Administration in charge of promoting, developing and preserving handicraft activities. This institute lacks a computer system to help it meet its objectives, mainly in the area of administration, exhibition and marketing of handicraft products.

The need to create a web application[8] to improve decision making was evident due to the lack of an effective tool to analyze information on processes of buying and selling handicrafts by artisans.

Initially, IFAT acquired the annual license of the SAE software from ASPEL® for the institute's purchase and sale, which proved to be an effective solution for the agency's needs. However, over the years, the process has changed and has become increasingly complex, which has generated the need to update the software version in order to work more efficiently.

Although several options have been explored, the acquisition of a more current version of the software has not been possible due to the limitations of the original license. In addition, it has been identified that the PEPS (First In, First Out) methodology is not supported by SAE, which has led to differences in reporting and has made it difficult to make informed decisions.

Derived from the above, the Instituto para el Fomento de las Artesanías de Tabasco needed the development of a web application for data analysis, which by capturing the information from the areas of the agency in different ways such as graphs and reports, helps to improve decision making. This is important because poor decision making can cause problems that affect the accounting of products sold or purchased, as well as processes such as the return of a product and in general terms in the economy of the institution.

Therefore. The objective was to develop a data analysis system for decision making based on graphs and reports from the different areas of the institute for the promotion of handicrafts in Tabasco.

During the process, the identified requirements were analyzed, the relational database was designed, the modules were developed, tests were executed and finally the system was deployed. This whole process was crucial to ensure that the web application is able to provide accurate and timely information that will allow better decision making in the institution.

DEVELOPMENT

For the development of the web application, it was determined to use an methodology. Agile methodology is a software development methodology that is based on core values, principles and practices. Agile methodologies can ensure that a project is successfully completed by adjusting the important resources of time, cost, quality and scope[1].

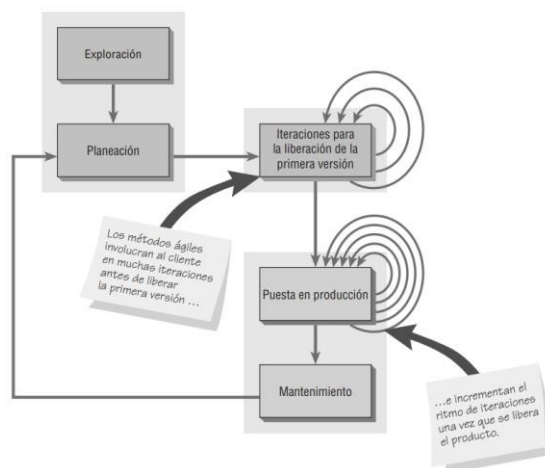


Figure 1. Stages of the agile model development process.

Scrum is an agile framework by which people can tackle complex adaptive problems while delivering products of the highest possible value productively and creatively[9].

Stages of development

Identifying objectives is an important component of the first stage of development. In this stage the analyst first discovered what the institution is trying to do; then determined whether any aspects of the information systems applications can help the institution achieve its objectives by addressing specific problems or opportunities.

To determine the requirements, interactive methods such as interviews, sampling and hard data research were used in addition to questionnaires, such as observing decision-makers' behavior and their office environments.

The results of applying these methods were captured in a requirements format designed according to the main characteristics that a system development in a web environment must observe.

The next phase that was carried out was to analyze the needs of the system. CASE tools were used to increase the graphical representation of the system's needs and thus increase productivity, improve communication with users in a more effective way and integrate the work to be performed in the system. For each identified requirement, a use case diagram was also developed.

To illustrate the results, only a few of the many elements generated during the system analysis will be presented below.

In the **Error! The self-reference to the marker is invalid.** an identified requirement is displayed for the system, which consists of the administrator panel.

Table 1. Administrator's control panel.

Requirement No.	REQ-1
End User(s)	Administrator
Requesting Area(s)	Systems area
User requirements	View from a quick way quickly display important information from system.
Priority	Essential
Frequency of Use	1 or more times a day.
Description	
It is necessary to have a panel where you can quickly visualize vital system information such as:	

- Total purchase orders: Displays the number of purchase orders generated for the month.
- Total merchandise receipts: Displays the number of merchandise receipts generated for the month.
- Total assortments: Shows the number of point-of-sale assortments made for the month.
- Total Returns: Displays the number of point of sale returns to the warehouse made for the month.
- Ranking of sales points: Displays a list in descending order of the sales points with the highest sales for the month.
- Total purchases: Shows the total amount of money used for purchases from artisans for the month.
- Total sales: Shows the total amount of money obtained from the sales of the points of sale for the month.

Functional Requirements

- 1st form.
 1. Log in by entering the username and password of a user with the administrator role in the system.
 2. The first page to load is the control panel.
- 2nd form.
 1. With the session already started and being in another section of the system.
 2. In the drop-down bar, click on the "Start" button.
 3. It will load the control panel.

Non-functional Requirements

Only personnel who have a username and password for a user with an administrator role will be able to access the administrator control panel.

Exceptions

Error in user and password: The user must enter the correct data; he/she has several attempts until the system blocks access to any of them. user on the computer from which you are trying to log in for 15 min.

In **Table 2**, all user requirements regarding the generation of supplier reports were determined. It is worth mentioning that IFAT's suppliers of handicraft products are the artisans of the state of Tabasco, who belong to a list of suppliers previously compiled by the institution, taking into account certain elements in terms of manufacturing and materials.

Table 2. Supplier Report Generator.

Requirement No.	REQ-4
End User(s)	Administrator

Figure 3 shows the use case of the administrator's panel, in which `will` have full control.

Diagrama de flujo de datos para el Sistema de Análisis de Datos Global. El diagrama muestra los actores (Administrador, Enc. Sistemas, Enc. Compras, Enc. Almacén, Enc. Puntos de Venta) interactuando con los procesos (Consultas, Inventario, Remisiones, Devoluciones, Traspaso, Ventas, Gráficas, Reportes) dentro de un contexto de 'Global Sistema Analisis Datos'.

Figure 2. Use case of the whole system.

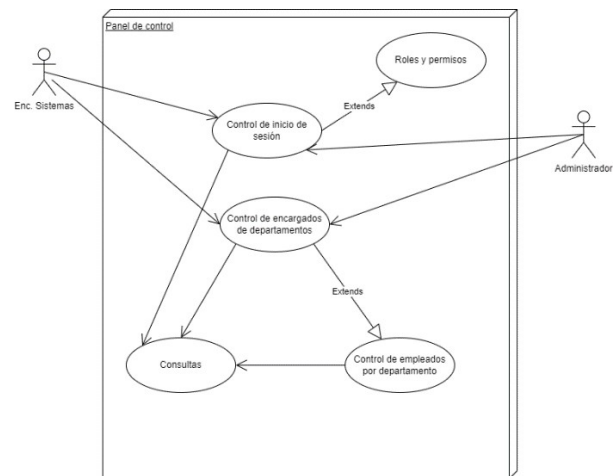


Figure 3. Administrator control panel use case.

From the requirements, Wireframes were designed. Wireframes are commonly used to design the content and functionality of a page with user needs and journeys in mind[11]. Wireframes should be used early in the development process to establish the basic structure of a page before adding visual design and content.

In this sense, all the Wireframes of the system were generated. Each one of them presents all the elements identified based on the requirements foreseen by the end users, as well as by the observations that

were carried out during the data collection stage at the IFAT facilities.
The following figures show the Wireframes generated.

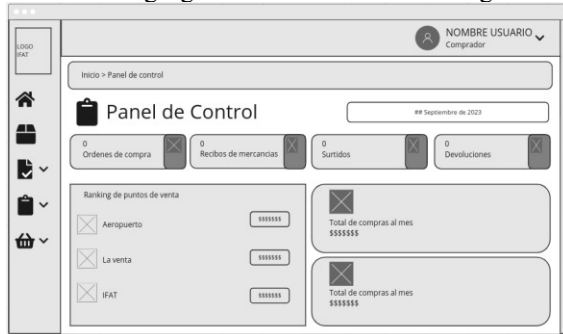


Figure 4. Wireframe of the Administrator Control panel.

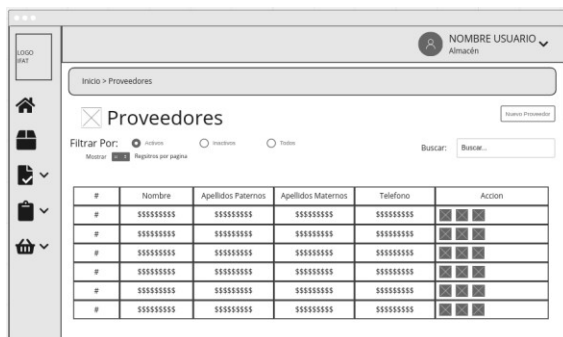


Figure 5. Supplier reporting wireframe.



Figure 6. Point-of-sale reporting wireframe.



Figure 7. User reporting wireframe.

All these Wireframes were presented to the users of the system to obtain feedback on the proposed system and the degree to which it meets the information needs.

For the generation of the wireframes, the software Lucidchart®[12] was used, which is a free and complete wireframe creator that includes a user interface design tool. Its free version was sufficient for the development of the system wireframes.

As a final step in the analysis stage, the entity-relationship model of the entire system was designed. **Figure 8** .shows in red the aggregate tables for the generation of reports to facilitate decision making based on the information stored in the database

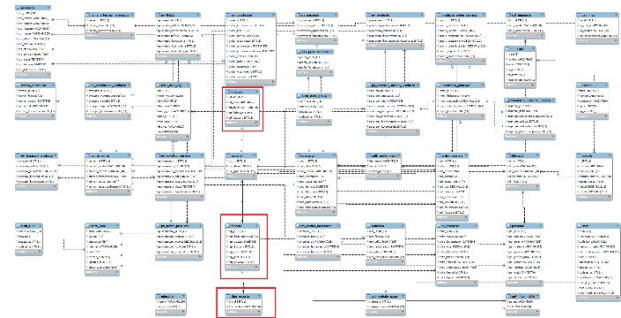


Figure 8. Complete diagram of the entire system.

For the development of the system, use was made of web technologies such as HTML, CSS, Javascript, and PHP. The technology that allowed encapsulating this stack was the Yii2 framework, which provides several tools and compatibility with other libraries.

Similarly, in order for Yii2 to work in the best way and not have compatibility problems when uploading the system to production, from the beginning of the development, the idea was to work on a Linux distribution and also to use Docker to mount entire development environment so as not to have compatibility problems between the versions of the technologies.

The selected Linux distribution was Ubuntu® version 24.04 LTS. Ubuntu features stability and extensive support for programming and server technologies[13].

Docker allows you to package an application with all its dependencies into a standardized unit for software development. Docker containers wrap a piece of software in a complete file system that contains everything it needs to run: code, runtime environment, system tools, system libraries; in general, everything that can be installed on a server[14].

For version control during the development stage of the system, it was decided to use Git® so that every change or new feature in the code would be registered by this technology and, if necessary, moved between versions.

Git® is a free, open source, distributed version control system designed to manage everything from small to very large projects with speed and efficiency[15].

It was decided to use GitHub® as a remote repository to keep the code in the cloud and avoid any inconvenience or detail about the integrity of the source code of the whole system.

GitHub provides a cloud-based Git repository that helps developers store, manage, track and control changes to their code[16].

DISCUSSION AND ANALYSIS OF RESULTS

According to the authors Tundidor, Medina, Nogueira and González [17], they point out that information systems to improve decision making are tools that help to have control, have the capacity to optimize robust information and allow integrating all the departments of the organization, as well as having historical and adequate information for each need.

In the article entitled Sistema de información directiva: herramienta para mejorar la toma de decisiones [18], the authors determined, based on the analysis of the computer systems used by the ENEES educational institution, that these systems have serious limitations, since they are not timely, reliable, of high quality and accessible. This problem is caused by the lack of a harmonized flow of information between the different systems used. Comparing the above with the present research, we can assure that these problems will not be present in the developed system, since it is designed to operate with the different areas of the institution, facilitating the flow of information captured by the operational staff and consulted by the IFAT managers.

Bron Fonseca [19] conducted an analysis of Recommender Systems (RS) for Decision Making and describes them as information filtering techniques that are born with the objective of facilitating or assisting the user making a decision. The authors mention that the main objective of these systems is to solve problems of information overload, providing the user with synthesized information that can be used in decision making.

Based on the above analysis, it is important to mention that the system developed seeks to facilitate decision making through easy access to all the information generated in the various departments involved in the institution.

The developed system solves 3 main questions:

1. Lack of information on the IFAT processes.
 - a. A web-based system was developed that allows IFAT to have control and access to information on purchase and sale processes, improving transparency and efficiency in decision making.
2. Delays in report generation
 - a. A module was developed in the web system that allows the customized generation of reports in real time, avoiding the need to generate them manually and improving the availability of the necessary information.
3. Inefficient decision making
 - a. By improving the collection of available information and the efficiency in the generation of reports, it was possible to improve the IFAT's capacity to make immediate and efficient decisions for the benefit of its operation by the people involved.

For the deployment of the system, it was decided to use a cloud platform that guarantees security and high availability. In this sense, AWS® was chosen. Amazon Web Services (AWS) is the most widely adopted and complete cloud in the world, offering more than 200 comprehensive data center services globally[20].

A virtual machine with the Ubuntu operating system was created and configured (**Figure 9**).

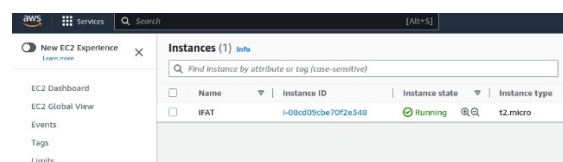


Figure 9. Virtual machine on Amazon Web Services Ubuntu operating system.

Deployment was via SSH connection to the virtual machine allowing the project to be cloned and configured (**Figure 10**).



Figure 10. SSH connection to the EC2 instance.

Nginx® was used as web server because of its easy integration with Yii2 and Linux.

Nginx® is an open source software for web servers, reverse proxy, caching, load balancing, multimedia streaming and more[21].

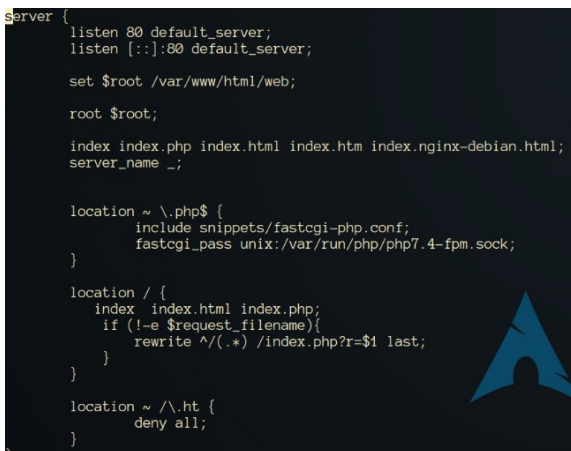


Figure 11. NGINX configuration

The following figures show the final screens of the developed system.

Control Panel - Administrator: The administrator is the one who has full control of the system, therefore, it is important that he/she has a quick overview of the functions to which he/she has access (Figure 12). Some them are:

- Choice of month: The user can choose which month to load the data from the control panel.
- Total purchase orders: Displays the number of purchase orders generated for the month.
- Total merchandise receipts: Displays the number of merchandise receipts generated for the month.
- Total assortments: Shows the number of point-of-sale assortments made for the month.
- Total returns: Displays the number of point of sale returns to the warehouse made for the month.

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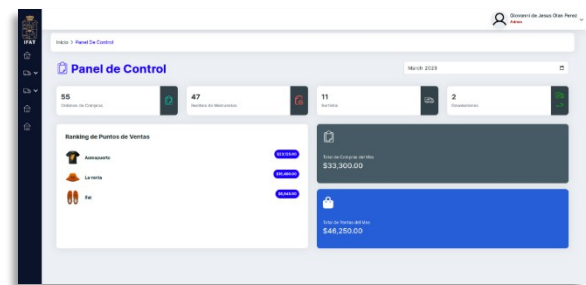


Figure 12. Administrator user control panel.

The purchase control panel shows all purchases made, as well as the names of the suppliers that supplied IFAT with the handicraft products (Figure 13).

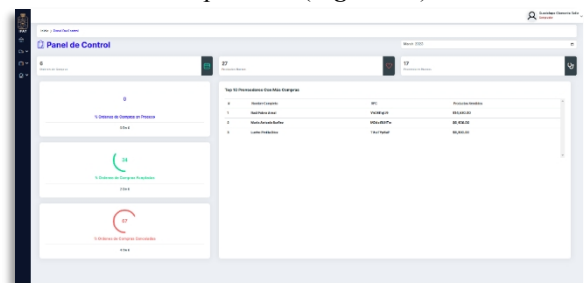


Figure 13. Purchasing control panel.

The reporting module allows users to generate customized reports and visualize data graphically. This module includes an intuitive and easy-to-use user interface, and has been designed with security and usability of the system in mind.

By default, the reporting module presents the information in tabular form. This allows the user to display supplier data in a table which can be exported in Excel format for easy use and manipulation (Figure 14).

RFC	Nombre Completo	Ramo Artesanal	Teléfono	Correo	Dirección	Estado	Fecha de Registro
430802020	Concepción	TEJES	927345528	Concepcion@gmail.com	Cd. Calle Martín CP 86000, Centro, Tabasco, Calle de la Cruz, Nueva Estación, Nueva Estación	Tabasco	2023-01-01
430802020	Concepción	TEJES	927345528	Concepcion@gmail.com	Cd. Calle Martín CP 86000, Centro, Tabasco, Calle de la Cruz, Nueva Estación, Nueva Estación	Tabasco	2023-01-01
430802020	Concepción	TEJES	927345528	Concepcion@gmail.com	Cd. Calle Martín CP 86000, Centro, Tabasco, Calle de la Cruz, Nueva Estación, Nueva Estación	Tabasco	2023-01-01
430802020	Concepción	TEJES	927345528	Concepcion@gmail.com	Cd. Calle Martín CP 86000, Centro, Tabasco, Calle de la Cruz, Nueva Estación, Nueva Estación	Tabasco	2023-01-01
430802020	Concepción	TEJES	927345528	Concepcion@gmail.com	Cd. Calle Martín CP 86000, Centro, Tabasco, Calle de la Cruz, Nueva Estación, Nueva Estación	Tabasco	2023-01-01

Figure 14. Vendor report - table.

Within the reports, there is a **Filter** option, which displays a modal view with fields that can be modified depending on the user's needs (Figure 15). The filters are:

- Columns: These are the columns that the user wants to be shown in the table.
- Municipality: These are the municipalities of which the supplier must be the supplier.
- Artisan branch: It is to filter the branch to which the supplier has to remain.
- Status: To filter by inactive or active.

Figure 15. Suppliers report - filter.

CONCLUSIONS

After finalizing the development and deployment of the web system for decision making at the Institute for the Promotion of Handicrafts of Tabasco and based on the comments of the end users: *"the system does meet the expected functionalities and features and will be of great support to make informed decisions to improve processes and information"*, it is concluded that it met the requirements of the users.

The system provides accurate and clear information, without duplication, which will allow better decisions to be made, reducing incidents such as data , duplication, among others that only generate inconsistencies in the reports.

It is advisable to consider the possibility of integrating additional processes that can be automated in the

system, such as the issue of PDF documents that are generated with the name of the person in charge of an area. To this end, it is suggested to develop a module in which employees' positions are registered and can be activated or deactivated depending on their status in the department. This would make the system more flexible and adaptable to changes in the organizational structure.

It is also important to periodically check the storage of the virtual machine where the web system is hosted, since saving PDFs is likely to occupy more disk storage in future years. This action will ensure that the system is kept in optimal conditions and avoid storage and performance problems.

As future research, it is recommended to implement artificial intelligence techniques in the analysis of data within the system, with the purpose of improving strategic decision making. By doing so, it will be possible to identify patterns, make accurate predictions and obtain key information that will enable informed decision making, optimizing operational efficiency and increasing the institution's competitiveness.

ACKNOWLEDGMENTS

Tisve Guadalupe Salazar Ramos and José de la Cruz Díaz Morales of the Institute for Promotion of Handicrafts of Tabasco (IFAT) for the facilities provided for the development of the project, as well as the Technological Institute of Villahermosa (ITVH) for supporting the teachers and students and facilitating the use of the facilities to develop the activities related to the system. The collaboration of both institutions has been essential for the success of this initiative.

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