

OPTIMIZING WEB INTERFACES FOR ATTENDANCE CONTROL: THE POWER OF BOOTSTRAP IN ADAPTIVE DEVELOPMENT

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Abstract – Any workplace has as its main process the recording of attendance of the personnel working in its facilities. The control of the information generated from the recording of employee arrivals and departures allows for the collection of data on the specific duration of work activities, shift assignments, and the detection of overtime, which facilitates the calculation of accurate and timely payroll (sesame, 2025). This paper shows the creation of a web-based attendance recording and efficient report generation system, featuring an improved interface for reporting and statistics processes, allowing advanced filters and efficient data export using Bootstrap to respond to adaptive development in a changing computing environment.

Keywords: adaptive, attendance, reports, web.

Abstract -- Any workplace's main process is recording the attendance of its employees. Monitoring the information generated by employee entry and exit records allows for the collection of data on specific work activities, shift assignments, and overtime pool detection, facilitating accurate and timely payroll calculations (SESAME, 2025). This work demonstrates the creation of a web-based attendance recording and efficient report generation system. It includes an improved interface for reporting and statistics processes, allowing for advanced filters and efficient data exports using Bootstrap to address adaptive development in a changing computing environment.

Key words – adaptive, assistance, reporting, web.

INTRODUCTION

The definition of an attendance control system in the words of SESAME (1): "is a technological solution that allows companies to keep an accurate and detailed record of their employees' working hours." Such a technological solution can handle special events

such as leave and vacations, as well as reports that identify employee behavior. This allows for informed decisions about human resources and planning related to the required workforce.

Any assistance system that accurately calculates payroll has the collateral objectives of eliminating personnel record tampering and identifying the actual amount of overtime that directly affects the profits of the workplace featured on the IBIX portal (2). Adaptive software development (ASD) offers flexibility to changes in customer requirements, collaboration, and constant system improvements. It can be said to be the predecessor of the Agile Development Methodology. ASD is considered one of the most widely used development methodologies at the moment. Examples of products created using this methodology with the intention of addressing growing technological advances include Microsoft Windows, Google Chrome, NETFLIX, and Spotify, according to OPENXCELL (3). In the responsive web development sector, Bootstrap is a framework that provides a powerful, extensible toolkit packed with features, templates, and pre-designed components for creating sites that integrate a front-end geared toward improving the user experience (UX). It includes Sass for quick and easy import of only the components required for customization and construction of the web design published by Bootstrap (4) experts.

One of the great advantages of using Bootstrap for adaptive development is the ability to speed up the process of creating responsive web applications, i.e., pages that automatically adjust regardless of the type of electronic device screen: smartphone, tablet, laptop, or desktop PC. This is due to its ability to incorporate templates and pre-designed components provided by LOADING on its site (5).

The Poblano Institute for Migrant Assistance (IPAM) is an institution dedicated to providing support to migrants from Puebla and their families, facilitating their

reintegration and offering assistance with various procedures

(6). Within the administrative area, a problem has been identified in the management of attendance control for technical staff, as the current system has manual errors, delays in generating reports, and a lack of automation, which makes it difficult to efficiently monitor staff attendance and performance in order to increase productivity in the company.

Faced with this problem, it was proposed to update and optimize the attendance recording system by implementing a technological solution that would enable automated recording of arrivals and departures, real-time report generation, and secure storage of information. The aim of this modernization is to improve IPAM's operational efficiency, ensuring greater transparency, security, and accuracy in personnel management.

The project was developed in several stages, beginning with an analysis of the current system and the identification of its deficiencies. Subsequently, a new system was designed based on a structured database, which allows attendance records to be stored automatically. In addition, an accessible web interface was implemented, where administrators can view and download monthly reports with detailed personnel information.

Problem

The implementation of the entry and exit control system in the IPAM's administrative area seeks to solve various operational and administrative problems that currently affect personnel management. Some of the main deficiencies include:

1. Errors in Manual Registration. Manual attendance registration is prone to human error, such as data omission, incorrect information, or lost records.

Solution: Digitization of the process to ensure accurate and automatic records.

2. Lack of control and transparency: There is no efficient mechanism for verifying staff punctuality or possible irregularities in attendance records.

Solution: Generate automatic reports and provide real-time access to information.

3. Difficulty in Generating Reports: The update of the IPAM technical staff registration control system seeks to address deficiencies and limitations in the current system, improving its efficiency, security, and functionality.

The main problems to be solved include:

1. Lack of Accuracy and Automation

Problem: The current system can generate incomplete or incorrect records, affecting the accuracy of attendance control.

Solution: Implementation of more accurate and automatic capture of entry and exit data.

2. Limited or Difficult-to-Access Reports

Problem: Generating attendance and performance reports is slow or does not allow for detailed analysis.

Solution: Improve the reporting interface, allowing for advanced filters and quick data export.

4. Lack of Control and Security in Records

Problem: Data can be modified without authorization or lost due to storage failures.

Solution: Increased database security, with unalterable records and automatic backups.

5. Low Efficiency in Schedule Recording

Problem: The current system does not allow for quick recording, which leads to waiting times or errors in schedule capture.

Solution: Optimization of the interface to make registration faster and more intuitive.

6. Absence of Integration with New Technologies

Problem: The system lacks modern features such as mobile access and automatic alerts.

Solution: Implementation of improved features, such as remote access and attendance notifications.

With this update, IPAM will improve technical staff management, ensuring a more efficient, secure, and adaptable system.

State of the Art

Currently, the use of automated attendance control systems in work environments has grown significantly. These systems allow for accurate recording of staff arrival and departure times, as well as calculating overtime, generating reports, and improving human resource management.

A study conducted by Reyes and Sánchez (7), entitled "Design and implementation of an attendance control system with biometric technology for educational institutions," highlights the effectiveness of using fingerprints as a method of authentication. This system significantly reduced absenteeism and facilitated the monitoring of punctuality at a university center. The authors conclude that "the use of biometrics improves security and reduces the margin of error compared to manual methods."

On the other hand, in his master's thesis, Márquez López (8) develops a web-based attendance control system for small businesses, using technologies similar to those employed in the IPAM project (PHP, MySQL, and JavaScript). In his research, he points out that "the implementation of such systems streamlines administrative processes and contributes to workplace transparency."

Similarly, Hernández, García, and Solís (9), in their article "Automation of personnel control in government institutions using ICT tools," argue that automation allows for faster and more informed decision-making, since "real-time information reduces human error and improves efficiency in public personnel management."

Likewise, research published in the Journal of Applied Computer Engineering by Mendoza, Rodríguez, and Pérez (10) concludes that attendance systems help organizations comply with current labor legislation and promote fairness in schedule compliance. They state that "the use of digital records allows for accurate monitoring of the workday, which is essential for companies seeking greater productivity and internal control."

The published work "Proposal for the implementation of a web-based computer system for attendance control for the ESSALUD Zorritos - Tumbes healthcare center; 2022" implements and validates employee efficiency and satisfaction with the automation of the attendance control process, using front-end software based on Bootstrap, according to Ortiz Arellano (11).

A recent study from Peru is entitled "Implementation of a Web-Based Attendance Control System (sisca v1.0) for the staff of the Manuel Odria Amoretti educational institution - Chipillico." The authors Abramonte, Olaya, and Zeta (12) chose Bootstrap as the framework for the front-end interface, whose user experience achieves satisfaction ratings of over 70%.

Taken together, these studies show that attendance control systems not only improve time and human resource management, but also play an important role in institutional transparency, regulatory compliance, and operational efficiency.

Justification

Updating the attendance control system for technical staff at the Instituto Poblano de Asistencia al Migrante (IPAM) is an urgent necessity in order to optimize personnel management, improve record security, and ensure accurate attendance tracking. Currently, the system has several deficiencies that affect operational efficiency, causing delays and errors in schedule control, which negatively impacts human resource management.

First, manual registration or the use of obsolete systems can lead to data inconsistencies, whether due to human error, unintentional omissions, or improper manipulation. This makes it difficult to make decisions based on accurate and reliable information. Updating the system will ensure automated and secure registration, eliminating errors and ensuring the integrity of the information.

In addition, the generation of attendance and performance reports is currently a slow and inefficient process. With the modernization of the system, detailed reports can be accessed in real time, with the option of exporting them in different formats (such as Excel or PDF). This will allow for better monitoring of schedule compliance, as well as the detection of attendance patterns that help improve personnel management.

Another fundamental aspect is security. Without an up-to-date system, records may be vulnerable to information loss or unauthorized alterations. The implementation of secure databases, with automatic backups and access controls, will ensure the protection of information and reduce the risk of data manipulation or loss.

Finally, IPAM needs to be at the forefront of using technologies that facilitate its daily operations.

Updating the system will allow for

integration with modern devices, such as biometric readers or mobile applications, which will improve accessibility and streamline the registration process.

In conclusion, this project not only represents a technological improvement, but also a fundamental tool for efficiency, transparency, and security in the administration of IPAM's technical staff. Implementing this update will be a strategic investment that will bring short-, medium-, and long-term benefits, strengthening the institute's commitment to excellence in human resources management.

General Objective

Update and optimize the attendance tracking system for technical staff at the Puebla Institute for Migrant Assistance (IPAM), enabling accurate attendance monitoring, automated reporting, and improved data security, with the aim of increasing operational efficiency and reducing administrative errors.

Specific Objectives:

- Automate staff entry and exit registration based on Bootstrap for the adaptive FRONT-END and reduce errors derived from the current control system.
- Implement a real-time report generation system to facilitate attendance monitoring and analysis.
- Ensure data security and integrity through protected databases and automatic backups.
- Optimize the system interface to improve the user experience and accessibility for administrative staff.
- Integrate technological tools

technological (such as biometrics or secure authentication) to strengthen access control.

Scope

- The system will enable automated registration of entries and exits, reducing manual errors.
 - Detailed attendance reports will be generated in different formats (Excel, PDF) to facilitate analysis.
 - Access levels will be established to ensure data security and confidentiality.
 - Automatic data backups will be implemented to prevent information loss.
 - The interface will be improved for more intuitive and efficient use.
- Limitations:
- It will not include payroll control or salary calculation, as its focus is on attendance management.
 - It will not include integration with external systems, such as ERP or government platforms.
 - Remote access to the system will not be guaranteed in the initial phase, as its use will be limited to IPAM facilities.
 - It will not be able to perform productivity analysis based on staff performance, being limited to schedule control.
 - It will not include facial or advanced biometric recognition in its first version, although this may be integrated in future updates.

DEVELOPMENT

Design

The design phase translated the requirements into a detailed technical plan. Entity-Relationship (E-R) diagrams were developed to model the database structure, identifying key entities such as Employees, Records, and Users, and their logical interconnections (Illustration 4 Entity-Relationship Diagram). At the same time, Use Case diagrams (Illustration 5 Use Case Diagram) were created to describe the functional interactions between users and the system, such as "Attendance Registration." The database structure in MySQL was defined based on these diagrams, ensuring data integrity. The user interface was designed with Bootstrap to ensure responsiveness, and IPAM's institutional colors were integrated to maintain brand consistency and offer a familiar and professional experience. **Implementation**

At this stage, the design was turned into functional code. We proceeded with the installation and configuration of essential development tools, such as XAMPP for the local server environment and Visual Studio Code as the code editor. The system was developed using PHP for server logic, MySQL for relational database management, and JavaScript for client-side interactivity. Key modules were implemented, such as user authentication for secure administrator access and algorithms for the dynamic generation of the various types of reports required.

Testing and Debugging

This phase was crucial for validating the functionality and robustness of the system. Comprehensive testing was performed

of all modules: attendance recording, historical data queries, and information export. During this process, significant errors were identified and corrected:

- a) Date conversion failure: This was corrected to ensure proper formatting in MySQL, guaranteeing the accuracy of timestamps.
 - b) Incorrect display on mobile devices: The design was optimized with CSS and Bootstrap to ensure proper adaptation and user experience on different mobile devices.
 - c) Correcting these errors was vital for system reliability and user satisfaction. **Installation of Tools**
- For the development of the system, the following essential tools were installed and configured: XAMPP (local server for PHP and MySQL): Downloaded from <https://www.apachefriends.org/es/index.html>. Apache and MySQL services were installed and activated. XAMPP provided an integrated development environment that emulates a complete web server, essential for testing the PHP application and its interaction with the database locally (Figure 2 XAMPP installation screenshot). See image 1.

Image 1. XAMPP installation screenshot.



Source: Own work (2025).

Visual Studio Code (Code Editor): Downloaded from <https://code.visualstudio.com/>. This code editor was the main tool for writing, editing, and debugging the system's source code. Its versatility and support for multiple programming languages, along with its ecosystem of extensions, greatly facilitated the development process. See image 2.

Image 2. Visual Studio Code installation screenshot.



Source: Own work (2025).

MySQL (Database): Although part of XAMPP, MySQL is the fundamental database technology. The project database was created by executing a specific SQL script. In addition, the necessary user permissions were configured to ensure a secure and efficient connection between the PHP application and the database.

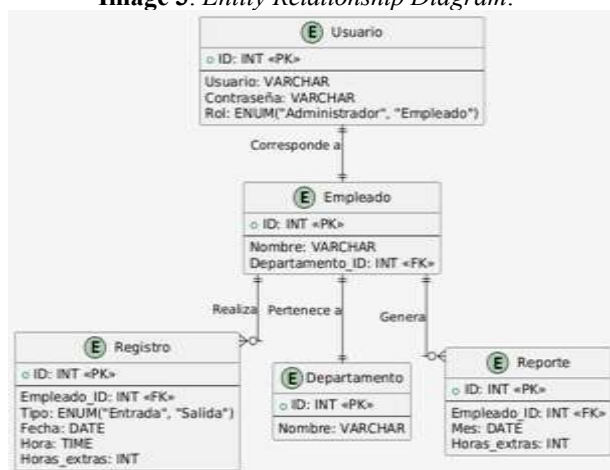
System Design: Data Modeling and Functionalities

The system design was based on the creation of models that outlined the database structure and user interactions, ensuring a coherent and functional architecture.

Entity-Relationship Diagram (E-R)

The E-R Diagram (Figure 4 Entity-Relationship Diagram) served as the conceptual blueprint for the database. It represented the primary entities of the system, such as employees, attendance records, and administrative users, along with the relationships that exist between them. This graphical modeling was crucial for defining the structure of the tables, the attributes of each entity, and the way in which the data are interconnected, which is fundamental for the integrity and efficiency of information storage. See image 3.

Image 3. Entity Relationship Diagram.



Source: Own work (2025).

Code Implementation

The implementation of the system involved coding the database and application logic in PHP and JavaScript, translating the design into an operating system. Database (MySQL). The records table is the core of the attendance data storage. Its structure is defined by the following SQL statement:

SQL

```

CREATE TABLE `records` (
  `id` int(11) NOT NULL,
  `name` varchar(100) NOT NULL,
  `day`
enum('Monday','Tuesday','Wednesday','Thursday','Friday','Saturday','Sunday') NOT NULL,
  `type` enum('entry','exit') NOT NULL,
  `time` time NOT NULL,

```

```

`date` timestamp NOT NULL DEFAULT
current_timestamp() ON UPDATE current_timestamp(),
`overtime` float DEFAULT 0
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
COLLATE=utf8mb4_general_ci;

```

This table includes fields such as id (unique identifier), employee name, day (enumeration for days of the week), record type (entry/exit), event time, date (with automatic creation and update timestamp), and overtime (for overtime calculations). "Figure 6 Screenshot of the log table" showed a visual representation of this table structure with sample data.

PHP Code for Recording Attendance

The PHP script for attendance recording (index.php) is responsible for capturing and storing the data. This code: Establishes a dual connection to the database (assistance and assistance_backup), a key strategy for data redundancy and security. If the main database fails, the backup ensures continuity of information.

Configures the time zone to America/Mexico_City to ensure the accuracy of timestamps.

Processes POST requests from the registration form, capturing the name, day, type, and time of the event.

Insert the record into both databases.

Include business logic to notify the employee if their check-in occurs after 09:00:00

(marking "⚠ You are late."), promoting punctuality.

PHP Administrator Code

The administration panel (accessible via admin.php) is the control center for managing the system. The code includes:

Session Management: session_start() and a validation if (!isset(\$_SESSION['admin'])) to ensure that only users authenticated as administrators can access it, redirecting them to login.php if they do not meet the security requirements.

Database Connection: Establishes the connection to the attendance database to retrieve the necessary information.

Data Query: Executes an SQL query (SELECT id, name, day, type, overtime hours, date FROM records ORDER BY date DESC) to retrieve all attendance records, sorted by descending date to display the most recent events first.

User Interface: The interface uses Bootstrap 5 and custom CSS styles for a responsive and visually appealing design. It features a header with institutional logos and the title "Administration Panel."

Dashboard Features: It offers quick action buttons for essential administrative tasks:

"Export to Excel" (export.php): Allows you to download attendance data for detailed analysis.

"Monthly Report" (reporte_mensual.php): Generates consolidated reports by month.

"Logout" (logout.php): For secure logout from the system.

Record Table: Data retrieved from the database is displayed in a well-structured HTML table, allowing administrators to clearly view the ID, name, day, type, overtime, and date of each record. See image 4.

Image 4. Code for the record table.

```
CREATE TABLE registros (
  id INT(11) NOT NULL,
  nombre VARCHAR(100) NOT NULL,
  dia ENUM('Lunes', 'Martes', 'Miércoles', 'Jueves', 'Viernes', 'Sábado', 'Domingo') NOT NULL,
  tipo ENUM('Entrada', 'Salida') NOT NULL,
  hora TIME NOT NULL,
  fecha DATETIME NOT NULL DEFAULT current_timestamp() ON UPDATE current_timestamp(),
  horas_extra FLOAT DEFAULT 0
) ENGINE=InnoDB (utf8) (charset=utf8mb4) COLLATE=utf8mb4_general_ci;
```

Source: Own work (2025).

DISCUSSION AND ANALYSIS OF RESULTS

The purpose of developing this system was to provide a digital solution for recording IPAM staff arrivals and departures. The result of this project is an efficient and functional web platform that allows users to quickly and automatically register their name and the corresponding action (arrival or departure).

The system's structure is based on open source technologies such as PHP and MySQL, and it is run within the local environment provided by XAMPP. This makes its implementation simple and economical, as it does not require additional software licenses. The system can be accessed from both a computer and a mobile device connected to the same local network, facilitating its use in various environments and work contexts.

The main form, located on the 'index.php' page, asks the user to enter their name and select the desired action. When the form is submitted, the system automatically records the exact time and date of the event, saving this information in the database. Thanks to this automation, there is no need for manual entries, minimizing errors and increasing the accuracy of the records.

In addition, an interface was designed for consulting stored records, allowing the collected data to be viewed in an orderly manner. This feature is useful for supervisors or administrators who wish to review staff attendance during specific periods.

In summary, the system developed satisfactorily meets the requirements established at the beginning of the project. It provides an easily accessible tool with intuitive operation that significantly improves

attendance control and reduces the use of physical media. The solution is scalable and can be adapted or expanded according to the future needs of the organization.

Check-in

- The employee will register their name

- Select the day
- Click on "Register Entry."
- The time and date are saved automatically.
- If the employee arrives late, an alert will be triggered notifying the user that they have arrived late. See image 5.

Image 5. Screenshot of entry.

Source: Own creation (2025).

Logout

- Once again, the worker will enter their details.
- Now they will click on "Register Exit."
- The same record for the day is updated.

Image 5. Logout screenshot.

Source: Own work (2025).

Below are the initial properties of the process to be automated, compared with the characteristics achieved once the adaptive system with Bootstrap was implemented. See Table 1.

Table 1. Comparative table of results.

Indicator	Before	After	Estimated improvement
Attendance record	Manual (physical logs)	Digital and automated	+80% Efficiency
Average time per record	2-3 minutes	10-15 seconds	-85% in time
Accessibility to reports	Weekly, manual	Immediate (per click)	+90% speed
Generation of monthly reports	Manual use of Excel	Automatic export to Excel	+95% productivity
Overtime validation	Subjective and unverifiable	Automatic calculation by departure time	+100% Accuracy
Data security	Low (paper can be lost or altered)	High (protected database)	+100% Integrity
Administrative transparency	Limited	Access by profile and complete traceability	+85% control

Source: Own elaboration (2025).

Evaluation of satisfaction with the attendance registration system

Instructions: Please answer the following questions honestly by selecting the option that best reflects your opinion. Your feedback is essential for improving the system.

Interface and Usability

How would you rate the overall appearance of the system (visual design)?

☐ Very attractive ☐ Attractive ☐ Average ☐ Unattractive

Is it easy for users to understand and use the interface?

☐ Completely ☐ Mostly ☐ With difficulty ☐ Not at all intuitive

Are the buttons and menus of the system clear and functional?

☐ Yes ☐ No

Is the system design accessible to people with basic technology skills?

☐ Yes ☐ No

Does it require a lot of training to use it?

☐ No ☐ A little ☐ Yes ☐ A lot

The level of satisfaction with the appearance of the developed application is high, due to significant improvements in its interface and overall user experience.

Key Aspects of Visual Satisfaction

The perception of an application's appearance is a crucial element for user satisfaction, as it directly influences ease of use, trust

and acceptance of the system. In this case, several points contribute to a high aesthetic rating:

Visual Renewal and Professionalism

The transition from a potentially outdated interface to a modern and carefully designed one is a key factor. A current and professional image is not only visually appealing, but also projects an impression of efficiency and seriousness on the part of the institution. The revamped design elements, clear typography, and color scheme that matches IPAM's identity contribute to a pleasant visual experience and a favorable perception of the program's quality.

Total Adaptability and Multi-Device Compatibility

One of the greatest successes of the implementation, achieved thanks to Bootstrap, is the total adaptability of the interface. This means that the application adjusts smoothly and optimally to different screens, from desktop computers to tablets and mobile phones. Solving the problem of "incorrect display on mobile devices" is a decisive point, as it allows users to use the system from any device without seeing visual errors or having problems interacting. This adaptability greatly improves accessibility and comfort, which are fundamental aspects for user satisfaction.

Improved Usability and User Experience (UX/UI)

A well-designed interface is not only attractive, but also easier to use. The clear layout of elements, consistent navigation, and intuitive interactions make it easier to learn and reduce frustration. The improved appearance helps users find features quickly, enter data efficiently, and understand information, leading directly to a smooth and effective user experience. This improvement in how the system is used on a daily basis is an important reason for satisfaction.

Discussion

There is comparative research on the most popular tools for front-end development in web applications, which highlights the contributions made by Bootstrap as a responsive web tool that contains the most commonly used pre-designed components in web design, such as buttons, menus, and forms. It also integrates easily with JQuery and JS. All these features make Bootstrap the best alternative for any range of web projects, as it is very reliable in terms of performance, efficiency, scalability, and maintainability, according to its authors Quisaguano, Lasluisa, Oto, and Esquivel (13).

Because web users want to have a visually unforgettable experience when browsing professionally designed sites, thanks to good front-end design, "consumer satisfaction and loyalty" can be achieved, and it is not just a commercial transaction (e-commerce), according to authors Sánchez & Revelo (14).

Furthermore, the discussion can be directed towards a methodology for agile web development based on Bootstrap, which facilitates the creation of sites, as referred to by Logroño et al. (15).

CONCLUSIONS

The development of the attendance recording system for the technical staff of the Instituto Poblano de Asistencia al Migrante (IPAM) represents a significant advance in the modernization and efficiency of internal administrative processes. Thanks to the implementation of this technological solution, it has been possible to automate the management of staff arrivals and departures, eliminating the old system which, although functional, was susceptible to human error, data loss, and lack of traceability.

One of the main achievements of the project was the successful implementation of key features such as time recording, automatic detection of delays, overtime calculation, and monthly report generation in Excel format. In addition, system security was strengthened through exclusive access to the administrative panel, protected by credentials. This ensures that only authorized personnel can manage and consult attendance data.

The impact of the project has been remarkable. The time spent on repetitive tasks such as manual record counting has been significantly reduced, allowing the administrative area to focus its attention on higher-value activities. Likewise, data accuracy has been improved and transparency in human resource management has been increased, with clear, accessible, and chronologically ordered records.

From a technological standpoint, this system has become a functional, intuitive, and adaptable tool that can be run on the institute's local network and accessed from various devices, including cell phones. This makes it easy for employees and managers to use at any time of day, thereby fostering a more disciplined and efficient organizational culture.

In conclusion, the success of the project lies in having identified a real need within IPAM and proposing an effective, sustainable, and easily adoptable solution. With this implementation, the organization is in a better position to optimize its resources, ensure punctuality, and improve personnel management, thus contributing to the institute's mission of providing quality services to migrants in Puebla and their families.

Recommendations

To ensure the permanence and constant improvement of the developed system, the following strategies are proposed (all focused on ensuring its long-term effectiveness):

Ongoing training: It is essential to offer regular training sessions to staff (both new and existing) to ensure that they understand and make the most of the system's features.

Preventive technical maintenance: It is recommended to implement a schedule of technical reviews (monthly or quarterly) in order to detect possible failures in time and ensure that the system operates stably.

Feedback-based updates: It is important to consider suggestions from users (administrative and technical) in order to incorporate improvements and new features that align with the changing needs of the institution.

Automatic data backup: It is recommended to establish automatic database backup mechanisms (preferably daily) to prevent information loss in the event of possible system failures or human error.

Future work

"Adaptability is becoming a necessity," according to the OWIUS portal (16) in Barcelona, Spain, which lists some of the prevailing trends in web development, among which the following stand out:

Trends in advanced adaptive design: Attempts to improve the ability of web application components to adjust to the dimensions of any screen, as well as to the user's context preferences. Tools such as CSS Grid and Flexbox increase flexibility in structuring content to suit each device.

Trends in responsive and improved adaptive design. Responsive design has become a fundamental part of the web, pointing towards a more adaptive design. Currently, there is a wide variety of devices and screens with non-standard dimensions, from foldable phones to augmented reality screens.

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