Web system: Quick Response Code (QR) For the Control of Teaching Attendance at the Educational Institution No. 20712 Santa Sana. Tana - 2024

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***Abstract*—** This study addresses the use of a web system for attendance control that significantly improves time management and the accuracy of records in educational institutions. In this context, the objective of the research is to implement a web system based on the attendance control of teachers in the educational institution No. 20712 "Santa Ana de Tana" in the province of Yauyos, to reliably record the hours of entry and teacher exit, thus improving efficiency and facilitating the management of attendance data. The development began with planning, defining attendance control and its priority, and specific needs of the institution, the design was created taking into account the user requirements, and basic functionalities during the condition, the basic programming was highlighted. of data and the QR application, to be built in the testing phase, automatic and manual integration tests were carried out, documented through acceptance tests to ensure the quality of the developed web system. From the perspective of resource management, there was an increase: 59% of directors in Latin America consider that the absence of teachers affects learning. This implies a better allocation and use of available resources in educational institutions. Likewise, the decrease of 23% believes that lateness has a negative influence. The implementation of web systems facilitates quick and accurate registration, promoting punctuality and responsibility among teachers. This work contributes to the advancement of more sustainable and inclusive environments in the educational field. A more agile and secure technological solution positively impacts institutional management.

Keywords:— Attendance Control: A process or system used to record and monitor the presence of teachers at the educational institution.

I. INTRODUCTION

Currently, it concludes that a web system provides positive support in attendance control, since it reduces the time in generating reports and promotes a culture of compliance with schedules. Likewise, in Latin America, (Dillon, 2015) states, based on the latest PISA report, that 59% of principals consider that the absence of teachers has a direct impact on student learning and that 23% of them believe that lateness influences in this knowledge. (Guzmán Mendoza, 2020). Likewise, attendance control requires agility and veracity of information through a system that provides easy handling for students and teachers, which implies quick and timely recording of data. In this sense, when evaluating the quality of the software it is necessary to take into account that the same models of traditional software are used for web systems, however, there are more relevant aspects to measure for this type of software such as Effectiveness, Efficiency and Utility of the system (Erika Paola Reina,Susana Gabriela Patiño,Fabián Quijosaca, 2019). Regarding the education sector, many private universities and some public ones already have a system that allows them to have better automated control of attendance of teachers and administrative staff. (Karen Estupiña, 2019). The implementation of Web systems can be used in any Web browser (chrome, firefox, Internet Explorer, etc.) regardless of the operating system. To use Web applications it is not necessary to install them on each computer since users connect to a server where the system is hosted. Web applications have several advantages over traditional downloadable software programs. These are the main ones (Gerardo Bach, Edinson Castillo, 2018). The lack of implementation of a web system for controlling teacher attendance emerges as an essential technological solution. The implementation of a web application has positively impacted the attendance control process. (Ajalcriña Jeancarlos, Cruzado Juan, 2022). Furthermore, the analysis of the teacher attendance control processes allows the activities to be verified and therefore improve processes in the public Educational Institution, located in an urban environment. Therefore, our main objective of this research is the implementation of a web system to improve efficiency in the attendance of teaching staff, with the purpose of improving the accuracy of records and the facilitation of improving teaching attention and optimizing management. assistance data. Where the entry and exit time, the number of weekly, monthly and annual hours that each teacher must teach can be reliably recorded. Meanwhile, the system created will allow efficient work to be carried out, creating a friendly interface, with many options and tools, with pleasant designs according to the requirements of EIE No. 2712 "Santa Ana de Tana", Yauyos Province, Lima department , Peru. It is necessary to develop a web system adapted to the needs of IEI No. 20712 "Santa Ana de Tana" in an urban area, to improve the educational environment since time management is essential for both teachers and students. By providing a digital solution for attendance recording, the goal is that the system makes it easier for administrators and teachers, allowing them to focus more on their educational responsibilities. Furthermore, this not only helps to have a clear view of teaching staff attendance, but also fosters a culture of accountability and compliance.

2. Materials and Methods

2.1Materials

Smartphones and tablets: With camera and QR reader applications. QR code scanners: Specialized devices for reading QR codes. HTML, CSS, JavaScript: For the development of the front-end of the web application. MySQL, PostgreSQL, MongoDB: To store attendance

information and teacher data. Wi-Fi Network: For devices to connect and communicate with the system in real time. Generation and Reading of QR Codes Understand how to generate QR codes with the necessary information (e.g. teacher data, date and time). Know how to integrate QR readers into web and mobile applications. GOOGLE MAPS APIS is a library that allows you to integrate a map into any website and the best thing is that through geolocation it can automatically direct us to our current location.

2.2.Agile development methodology (RUP)

The 2 agile methodology was used (Juan Villanueva, Maria Siachoque, 2014), it is a software development process and together with the UML, it constitutes a standard methodology most used for the analysis, implementation and documentation of object-oriented systems, it is the more disciplined way of assigning tasks and responsibilities to who does it, how and when, also its main virtue is to ensure the production of high quality software, appropriate to the needs of the end user within a predictable schedule and budget, among them we find the characteristics more important. It is an iterative and incremental process, based on the successive refinement of the system. It is a controlled process, where requirements management and change management play a primary important role. Based on the construction of visual models of the system. Focused on the development of architecture, so it handles the concept of component-based development. It supports object-oriented techniques and in particular the use of UML. (Emerson T. R., 2019).

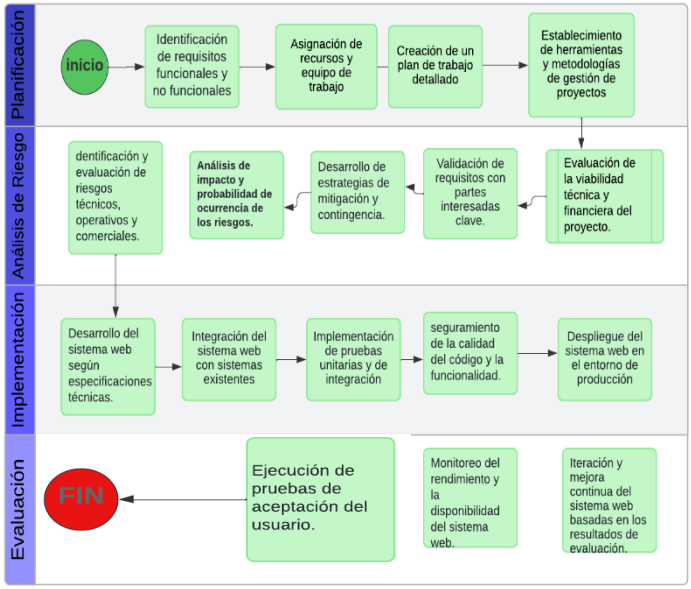


Figure 1: *Software Development Flowchart.*

2.2.1. Planning phase:

The phase focuses on developing an efficient web system for teacher attendance control, which allows automatic registration, generation of reports and notifications about attendance. The second is to automate the attendance registration and provide access to attendance reports in real time. . Thus improving the accuracy in recording attendance, ensuring the privacy and security of the data. The third Allow teachers to record their attendance daily and generate weekly, monthly, annual attendance reports by establishing communication through (email, meetings), to define roles and responsibilities for each member of teachers in which it seeks to promote efficiency and quality based on the educational environment through the web system and QR code in order to improve attendance management.

2.2.2. Design phase:

Regarding the design, it was carried out according to the user's requirements, basic functionalities were designed to be built in the next phase. For the termination of functionalities, a quality validation must be carried out in which they must be approved by users. The design and implementation process is detailed based on the identified requirements: Presentation Layer: Contains the web screens with Bootstrap CSS technology in which the user interacts. Business Layer: Contains the web screens with Bootstrap CSS technology in which the user interacts. Database Layer: Contains the database model, here are the data with which the system interacts. Figure 2 demonstrates the architecture of the Software, in which you can see the three layers with which the software is structured.

2.2.3. Coding phase:

The coding of the web system for teacher attendance control involves the development of backend and frontend functionalities, as well as the integration of both. This example demonstrates how to configure and connect a Node.js server with a React application to record and display teacher attendance data. The modular structure and coding best practices ensure that the system is scalable and maintainable.

.2.2.4.. Type of research design

A) Kind of investigation

Applied research aims to solve problems within a certain context, through the development of practical solutions ((Valderrama, 2014)). The type of research of the thesis is of an applied nature, since it involved the implementation of a web system that improved the attendance control process at the “Santa Ana Tana” educational institution.

B) Research design.

An experimental design of a pre-experimental and longitudinal nature was used; covering a single group with minimal control; Generally, this approach is advantageous since it approaches the problematic situation more closely (Herbandez, Mendoza, 2018). Additionally, a longitudinal analysis implies carrying out the study in multiple phases, allowing the comparison of the data obtained with the sample that has been chosen (Cabezas Morán, 2018).
Likewise, it is classified as a pre-experimental design because it involves the manipulation of the VD (Attendance Control) with the objective of examining its development both in the initial phase and after the implementation of the web system. This research approach includes carrying out a pre-test and a post-test (Pre and Post Test), addressing the following elements.

c) Independent and Dependent Variable Table

$$\frac{NAA}{TDNC} * 100 = TA$$

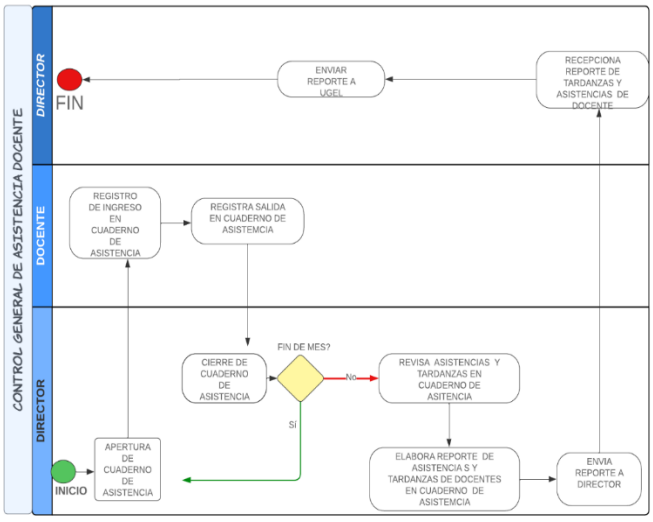
NDA: Number of Teaching Assistants.
TA: Total Assists.

$$\frac{NAA}{NTD} * 100 = IA$$

IA: Absenteeism Index Number
NAA: Total number of Absentees
NTD: Total number of Teachers.

2.2.4.Test phase:

An exhaustive verification of the system was carried out through teaching with the Application and manuals in order to detect possible errors in the code and improve its quality. Subsequently, the acceptance test was executed to ensure the quality of the smart application and the satisfaction of the user of the educational institution. Firstly, the collection of information during the 20 days is mentioned, as observed in the General Control of Teacher Attendance without the application (Graph No. 05), where the teacher and director participated, this process begins when the director gives opening the attendance notebook, then the teacher records the data required for entry attendance. At the end of the work day, he/she registers his/her signature in the attendance log. After everyone has registered within the hour according to the established norm, the manager closes the attendance log. This procedure is continuous during the work month until the end of the month, where the director reviews and evaluates the teacher's attendance and tardiness, in order to prepare the attendance and tardiness report according to the format established by MINEDU (Ministry of Education), then to issue this report, it is there where it manages the documents to send along with the attendance and tardiness report to the UGEL (Local Educational Management Unit).



Graph N° 5. General Control of Teaching Attendance before the Application.

2.2.5. Teaching Assistance Registration Process with the application

An exhaustive verification of the system was carried out by teaching with the Application as follows: Chart No. 08. General Registration Process for Teaching Attendance Control with the Application.. The QR code is a two-dimensional symbology, approved as an international ISO standard (ISO / IEC18004). This symbology was intended to be used in controlling the production of automobile accessories. As can be seen in (Photo 01. QR Code). It is currently used in different fields.

Foto01.CódigoQR

Fuente: Internet

Currently QR codes are being used by the public, with the ease of being read or captured by the digital cameras of mobile phones, when connected to the Internet they generate the reading of a URL encoded with a QR code.

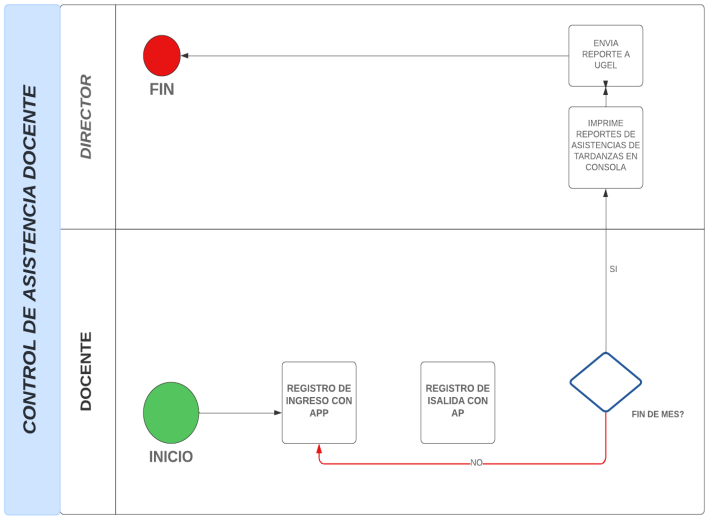


Grafico N° 08. General Registration Process for Teacher Attendance Control with the Application.

II. Resultados

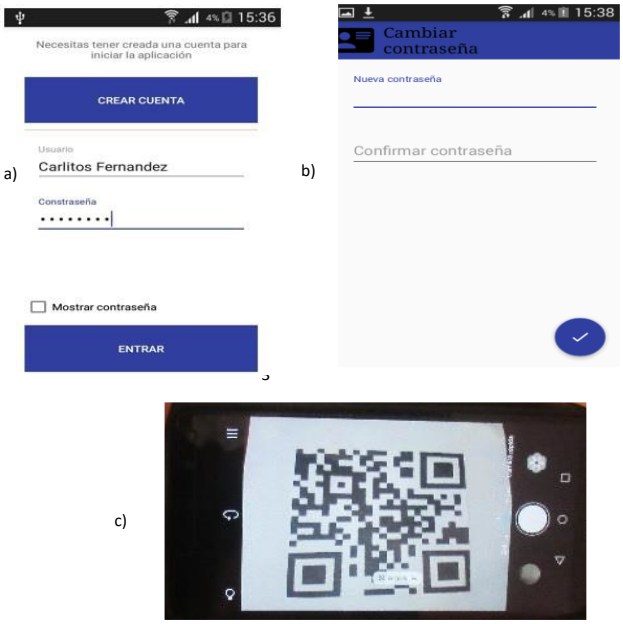
A)Presentación de interfaz principal

Figure 11 provides a concise visual representation of the main menu, where it shows the application options for teacher attendance control. The key characteristics that influence: a) The user with their corresponding photographic identifications. b) statistical graph on manual assistance and assistance through the application.

Figure 11: Teacher user main menu interface

B) Assistance process, username, password, QR scanner

Figure N°12 a): Login, Used to access the Application, entering a username and password. b): Change password, this option is used to change the user's password. c): Scanner QR, is the option through which the QR code is scanned using the mobile phone camera.



Source N°12: Process to register attendance with the QR application

C) Notification process

The teaching attendance notification process through a mobile application with a Quick Response (QR) Code can be implemented by following these steps: a) Teacher's Schedule, this item shows the Teacher's schedule during the week. b) Reports of the day, this item shows the Teacher reports that have already been issued up to that time of day. c) Entry report, in this view the teacher's entry report is sent to the classroom. d): Exit report, in this view the Teacher's exit report is sent just when leaving the classroom. e) Emergency report, in this view the Teacher's emergency exit report is sent when he cannot leave the classroom in the indicated time, but rather, when due to force majeure it comes out ahead of time.

e)

Figure N° 13: Teacher notification process, functions and attendance records

D) Daily reports

Manual attendance recording, although traditional, has numerous drawbacks that can affect the accuracy and efficiency of attendance control. The implementation of a mobile application with a QR code can mitigate these problems, providing a faster, more accurate and efficient system for managing teaching attendance. It can be visualized in the following statistical figures a.

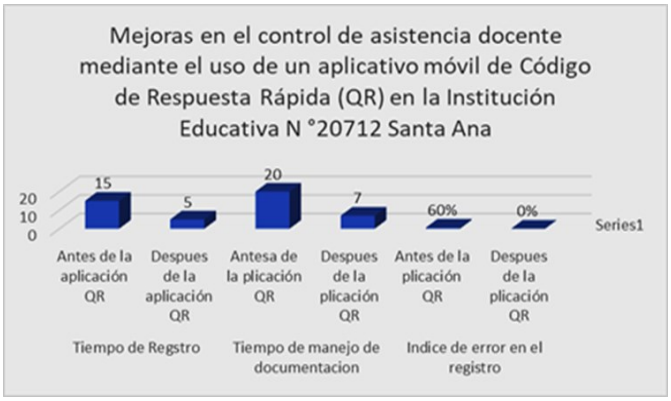


Figure N° 13: Diagnostic reports in attendance records

Discussion

The implementation of a web system based on QR technology for the control of teacher attendance at Educational Institution No. 20712 "Santa Ana de Tana" in the province of Yauyos has proven to be highly effective, significantly improving time management and the accuracy of the registers. Through this study, several key areas of improvement and their impacts have been identified, as well as certain limitations and challenges that need to be addressed to optimize the adoption and use of this technology. as Acevedo Quispe (2018) points out. It not only improves accuracy and efficiency, but also allows for more secure and organized handling of data. The training of managers and teachers is essential for the transition to these digital systems. Likewise, "Attendance control is an administrative process that serves to automatically monitor entry and exit" (Fernandez, 2023)

Figure 11 concisely illustrates the main menu of the teacher attendance control application. The key features that influence the usability and functionality of the system are: Photographic User Identification: This element improves security and accuracy by ensuring that each attendance record is made by the correct teacher. This feature reduces the risk of spoofing and errors.

According to Dillon (2015), the latest PISA report highlights that 59% of principals consider that the absence of teachers directly affects student learning. Furthermore, 23% point out that teacher tardiness also has an impact on academic performance. This context highlights the importance of implementing an efficient attendance control system to mitigate these problems and improve educational quality. On the other hand, the world is entering the so-called "new normal" and it is evident that forum control in real time is an indispensable tool to prevent crowds (Jorge Llanos B.,Edgar Felipe Hurtado P., 2021)

Comparative graphs on manual assistance and application assistance provide a clear visualization of the improvement in registration accuracy and efficiency. This visual data facilitates informed decision making and continuous evaluation of system performance. The use of QR codes in each of the university classrooms, which through Smartphone mobile devices, teachers will be able to scan and register their classes digitally or by entering through the entry links sent to their institutional emails, making the modern, agile and friendly process; both to open and close classes (Jhon, Ortiz S. and Yordy, Rico S., 2021).
Blyde, Leal and Montiel (2013). They highlight that web applications do not require installation on each computer, since users access them through a browser. This facilitates the implementation and maintenance of the system, reducing costs and improving accessibility. Likewise, the document issuance process plays a vital role as an integral part of academic management, since it is part of the student engagement process. Documentation procedures, such as recording grades and attendance, are subprocesses that belong to the documentation process, with the participants involved being: teachers and the internal administrative area. In relation to the above, this study recommends the use of a responsively designed web application to improve the previous processes, allowing time to be reduced, increasing the effectiveness and feasibility of the processes (Abasalo Yengle, Angie Daleschka, Sanchez Estrada, Victor Eduardo, 2023)
Figure 12 details the options available in the main menu of the application, providing clear guidance for users: Security is paramount, and controlled username and password access ensures that only authorized personnel can use the application. QR Scanner: This functionality is the core of the system, allowing quick and accurate attendance registration by reading QR codes. The travel notification process of the mobile application with QR technology is detailed and covers several important aspects such as: Teacher Schedule, Day Reports, Arrival and Exit Report, which has proven to be an effective

and efficient solution to improve the management of the time and accuracy of records at the Educational Institution No. 20712 "Santa Ana de Tana". Also the differences between these two codes is that the QR code is a system to store information similar to the usual barcodes and which we find The difference is that a QR code stores data in two dimensions and can be scanned vertically or horizontally to be decoded (TORRES RAMIREZ, 2019). Also the QR Code. Furthermore, the message used as a private key can be letters or symbols (Nugraha, 2024). Finally, incorporating the QR code into the worker's mobile phone is an interesting bet that is made in the work "Quick response (QR) code for the control of teaching attendance at the educational institution No. 60522 Felipe Ramón Documet Silva of the city of Nauta-2017" In this, the software in addition to being implemented in the Quick Response Code mobile application, eliminating the problem of fingerprints that have suffered wear due to age or the constant use of substances that erase sharpness, complicating their detection (Ahuanari Tamani, Carlitos Fernández; Shapiama Jeffree, 2017)

Limitation and future work

Not all teachers and students may have access to mobile devices or an adequate Internet connection, which can limit the effectiveness of the web system. Institutions in rural areas or with fewer resources may have difficulties implementing and maintaining a technological system of this type. Some teachers and administrative staff may show resistance to adopting new technologies due to unfamiliarity or fear of change. In Educational Institution No. 20712 "Santa Ana de Tana", this problem could be evident. It is necessary to offer continuous training to ensure that all users of the system understand and correctly use all the functionalities. The possibility of technical errors, such as server failures, programming errors, or connectivity issues, may disrupt the attendance record and affect the accuracy of the data. The optimal functioning of the web system depends on a stable Internet connection, which can be a challenge in certain areas. For future work on the QR application system in the educational field, it is suggested to implement and develop continuing training programs for teachers and administrative staff on the use of technology, emphasizing the importance of accuracy in attendance recording and data security. Likewise, carry out studies in a variety of educational institutions, both urban and rural, to obtain more generalizable results that are applicable to different contexts. A good alternative would be to explore the use of emerging technologies such as artificial intelligence, machine learning and blockchain to improve the accuracy, security and functionality of the attendance control system.

Conclusions

The study demonstrates that the implementation of a web system for attendance control significantly improves time management and the accuracy of records in educational institutions. At Educational Institution No. 20712 "Santa Ana de Tana" in the province of Yauyos, the use of a web system based on attendance control has made it possible to reliably record the entry and exit times of teachers, improving efficiency and facilitating the management of attendance data.

Project planning included the definition of priorities and specific needs of the institution. The design of the system was carried out considering the requirements of the users and the basic functionalities necessary. In the development phase, the programming of the database and the QR application stood out, ensuring their integration through automatic and manual tests documented through acceptance tests.

From a resource management perspective, an increase in efficiency was observed, since 59% of principals in Latin America consider that the absence of teachers negatively affects learning, and 23% believe that lateness has an adverse influence. . The implementation of the web system facilitated quick and accurate registration, promoting punctuality and responsibility among teachers.

This work contributes to progress towards more sustainable and inclusive educational environments, offering an agile and secure technological solution for institutional management. In summary, the implementation of a web system for teacher attendance control not only optimizes time and resource management, but also has a positive impact on educational quality and the creation of a culture of responsibility and punctuality in educational institutions.

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Second A. Author, photograph and biography not available at the time of publication.