

Implementation of a web system to improve the monitoring of supplies of medicines for the company CENARES

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Abstract– *The guarantee of drug supply is crucial in the pharmaceutical industry to ensure an effective health system. The CENARES company is in charge of supplying medicines nationwide and seeks to improve its supply procedure. Implementing a custom web system can be a valuable solution to maximize resources, increase transparency, and improve efficiency in managing requests and distributions.*

Keywords-- *Web system, medicines, supply, data analysis, monitoring*

I. INTRODUCTION

At the international level, there is a major problem in terms of the provision of medicines. Various challenges, such as supply disruptions, logistical complications, and production bottlenecks, greatly hamper the ability to meet global demand for drugs in a timely manner. This scenario has a negative impact, especially on the most vulnerable sectors of multiple nations, depriving them of access to essential treatments and endangering their well-being and health. Some countries that face this problem are Brazil, India and South Africa, where the lack of equity and provision in access to medicines affects a large number of individuals.

In Peru, CENARES faces major problems with the supply of medicines. Supply disruptions, logistics and manufacturing issues are the main obstacles to meeting the country's demand for medicines in a timely manner. This situation has a negative impact on the population, especially on the most vulnerable sectors such as those with limited resources and rural areas. The lack of access to essential medicines threatens the health of the population and limits their quality of life. To face this challenge, a network system is proposed to efficiently and transparently manage the distribution of medicines throughout Peru.

In the town of the district of El Agustino, a particular problem arises related to the establishment of medicines. The lack and shortage of essential medicines in primary health care centers poses challenges in meeting the needs of the local

community. As a result, residents are forced to seek medicine elsewhere or postpone treatment, compromising their well-being and health. To deal with this situation, the implementation of a web system at the local level is proposed with the objective of improving inventory management, facilitating communication between one or various actors involved and guaranteeing the adequate availability of medicines in the health centers of the district of El Agustino.[1].

The pharmaceutical industry is one of the fundamental pillars in any health system. That is why a company in charge of supplying medicines like CENARES has the responsibility of guaranteeing the supply of medicines throughout the national territory. However, this sourcing procedure is not always easy and can present challenges that affect the quality and efficiency of operations. The lack of a timely supply of medicines is a critical challenge that limits the ability of CENARES to achieve its goals of provision of medical materials is seriously compromised. In addition, the lack of an adequate technological tool to supervise and manage the inventory of medical supplies at the national level worsens this situation. The lack of a product monitoring and control system, including expiration dates, can lead to prolonged storage or waste of medicines and other materials, generating unnecessary costs and affecting the quality of care offered to the population. In addition, decision-making is hampered by the scarcity of accurate and timely data on inventory and supply management, which hinders the ability of CENARES managers to make informed decisions and affects the efficiency and effectiveness of the organization significantly. significant.[2].

Faced with this difficult situation, the adoption of a highly personalized web system is considered an imperative solution to optimize the supervision of medical supplies. Through this measure, it is expected to increase the excellence of the service provided to the population, both nationally and internationally, ensuring the timely supply of essential medicines for those who need them. Taking into account that the lack of accurate and timely data on inventory and supply management makes it difficult for CENARES managers to make informed decisions, which directly impacts the efficiency and effectiveness of the organization at an international level. [3].

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For this reason, it is essential to implement a system that improves the monitoring of drug supplies, providing CENARES with a comprehensive technological tool to optimize its processes, make informed decisions and guarantee a timely and adequate supply of drugs, for the benefit of the population that it needs it most at the international level.[4].

Given this situation, CENARES has explored alternatives to maximize its resources and improve the drug supply procedure. The implementation of a highly personalized web system as an invaluable tool to achieve this, since it allows greater transparency in the process, a reduction in costs and an improvement in the optimization of the management of requests and distributions, being a primary objective to improve the efficiency in this area. In addition, the generation of reports and the analysis of data provided by the web system can help the organization to identify areas for improvement and opportunities for expansion, with the purpose of promoting its development and growth in the field of drug supply.[5].

The implementation of this innovative web tool will enable CENARES to exhaustively supervise the supply of medicines in health establishments and hospitals nationwide, including the control of expiration dates. This will translate into the provision of excellent medical services and an increase in the level of customer satisfaction, which will position CENARES as a leading competitor in the pharmaceutical industry market. In the current context, drug management has become extremely complex due to the wide range of products, the growing demand and logistical challenges. Therefore, CENARES is exploring avant-garde solutions to face these challenges.[6].

By generating reports and performing data analysis, this revolutionary web system will allow CENARES to identify areas for improvement and expansion opportunities, thus promoting its development and growth in the field of drug supply. By monitoring the supply at the national level and controlling the expiration of medicines, CENARES will be in an advantageous position to offer first-class medical services and increase customer satisfaction, thus consolidating its competitiveness in the dynamic market of the pharmaceutical industry. The efficient supply of medicines is crucial to guarantee the health and well-being of the population. In this sense, the company CENARES, in charge of providing medicines throughout the national territory,

CENARES, in its mission to improve the supervision of drug supplies, seeks to implement this technological tool that provides greater transparency and control over the request, distribution, and storage processes. This generates benefits for both the company and the patients. Recognizing the importance of efficiency and quality in the supply of medicines, CENARES is considering adopting a more advanced technological approach, ranging from inventory management to final delivery at health facilities.[8]

The CENARES company recognizes the need to adapt to changing demands and continuously improve its operations. The adoption of innovative technologies is essential to stay competitive in the pharmaceutical industry. Fully aware of this, CENARES is exploring solutions that allow it to optimize its supply processes and adapt to the demands of the constantly evolving market. Through this technological tool, a more precise and transparent monitoring of medications would be achieved, thus optimizing management and reducing possible errors.[9].

II. THEORETICAL FRAMEWORK

The complexity of the drug supply process implies the coordination of multiple participants and stages, which can create difficulties in effective planning and execution.

The lack of transparency in the supply flow can cause delays, stock-outs or excess inventory, which impairs the quality and efficiency of operations.[10].

For this project several areas are related which will allow the implementation of a web system which offers significant benefits: Greater transparency: Through a web system, complete visibility of the supply process is achieved, from the request to the distribution, which improves decision making and planning.

Automatic control systems: The automation of processes to date has had many advances, it has allowed us to connect with the virtual world, such as the use of artificial intelligence techniques, it has been possible to create systems that capture the needs of the human being.

Cost reduction: By automating administrative tasks and optimizing work flows, it is possible to reduce the costs associated with the supply of medicines.[11].

Improvement in the optimization of the administration of requests and distributions: A web system facilitates the efficient management of drug requests and their distribution, which reduces response times and minimizes errors.

Identification of areas for improvement: The web system allows the generation of reports and data analysis that help identify opportunities for improvement in the supply process, which facilitates evidence-based decision-making.

Identification of expansion opportunities: Through the analysis of data provided by the web system, it is possible to detect possibilities of expansion in the supply of medicines, which allows taking advantage of new opportunities for growth and development.[12].

The web system will also make it possible to monitor the supply of medicines at the national level, which will facilitate the early detection of problems and the implementation of 4 corrective measures. In addition, the web system will ensure an

updated record of drug expiration dates, thus preventing the use of expired drugs and ensuring patient safety.[13]

III. METHODOLOGY

In the process of developing the web system to improve the control of drug supplies in the CENARES company, the agile CRUD methodology has been used. This selection is based on its ability to streamline the creation, reading, updating and deletion of data efficiently, enabling effective management of information related to drug supplies.

The application of agile methodologies in the development of web systems generates numerous benefits in environments where the requirements can undergo modifications during the work process. These methodologies have the primary objective of rapidly and continuously providing functionalities that add value, prioritizing software development over documentation, which can be tedious or not very relevant for users.[14]

The CRUD methodology is distinguished by its focus on data stewardship and constant improvement. Unlike other methodologies such as SCRUM, it is not divided into specific stages, but instead focuses on creating, reading, updating, and deleting data using a structured workflow. This allows for more flexible and adaptable work management, without fixed time constraints.

In the context of this project, the CRUD methodology is optimally adapted, since it seeks to improve the monitoring of drug supplies in the CENARES company. Using this approach, it is possible to clearly and visually organize and prioritize tasks related to supply management, from data collection to reporting and analysis. The different roles involved, such as the administrator, the development team and the system manager, conform to the CRUD methodology, collaborating in the planning and execution of tasks efficiently. Based on these aspects, the CRUD methodology has been selected as an approach for the implementation of the drug supply control web system in the CENARES company, due to its ability to streamline data management,



Fig. 1 CRUD procedure

In order to gain a better understanding of the CRUD approach, the following visual representation is presented below:

It can be seen that by using the CRUD procedure with MVC, the development team achieves a clear visualization of

the tasks that are pending, in progress and completed, which simplifies the coordination and efficient allocation of resources.

It is possible to implement various stages of the process that include the capture, update, consultation and deletion of data related to drug supplies. Each of these tasks would be represented as an action in the model-view-controller (MVC) and would progress as progress is made. This modality allows visual monitoring of the status of each task and provides transparency on the general progress of the project.[16].

This process presents challenges that can affect the quality and efficiency of operations. Faced with this situation, CENARES has sought alternatives to maximize resources and improve its supply procedure. In this study, the implementation of a customized web system is proposed as a valuable tool to achieve this, providing transparency, cost reduction and optimization in the management of requests and distributions.

In addition, the generation of reports and analysis of data provided by the web system will contribute to the identification of areas for improvement and expansion opportunities, promoting the development and growth of CENARES in the supply of medicines. The implementation of this tool will allow monitoring the supply of medicines in health establishments and hospitals at the national level, as well as the management of their expiration. This will result in the provision of superior medical services and a higher level of customer satisfaction, increasing the competitiveness of CENARES in the pharmaceutical industry market.[17].

For the development of the web system, it was decided to adopt an agile methodology based on the CRUD procedure with MVC, in which each of the projects ends with the culmination of one or more specific requirements.

In the same way, a web environment based on the PHP language was used, which provides a wide variety of functionalities and 5 tools to implement solid and efficient solutions, thus improving system management. In relation to data storage, a MySQL relational database was used, recognized as a popular and reliable option in the field of web development. This database offers a flexible and scalable structure for data storage and retrieval. Through the use of SQL queries, it was possible to efficiently manage the information related to drug supplies, allowing fast and secure access to the data.[18].

One of the methodologies used to develop a web system is metrics, which is based on the planning, development, maintenance of the information system, it is an easy-to-use guide for the design and construction of information systems using concepts and information systems engineering techniques.

An exhaustive review of the literature related to drug supply management in the pharmaceutical industry will be

carried out, including previous studies on web systems and their impact on efficiency and competitiveness.

A detailed analysis of the drug supply processes in CENARES will be carried out, identifying existing challenges and areas for improvement.

A web system adapted to the specific needs of CENARES will be designed, considering aspects such as transparency in the process, cost reduction and optimization in the administration of requests and distributions.

The web system will be implemented in CENARES, followed by exhaustive tests to verify its operation and adjust any necessary aspect.

Relevant data on the supply of medicines and their management were collected through the implemented web system. This data will be analyzed to identify areas for improvement and potential expansion opportunities.

The impact of the web system on the efficiency and competitiveness of CENARES will be evaluated, considering indicators such as improvement in the quality of supply, cost reduction and the level of customer satisfaction.

For the development of the system the following functional requirements are carried out:

Functional requirement 1: The system must allow the login of the administrators of the CENARES company, this includes ID number and password.

Functional requirement 2: The system must manage the information on medications used in the CENARES company. Information to be recorded includes the name of the medication, the quantity available, the expiration date, and the storage location.

Functional requirement 3: The system must allow users to order medicines from CENARES, so that the company can plan and manage its acquisitions.

Functional requirement 4: The system must allow managing the information of drug suppliers: their names, code, RUC, telephone, addresses, purchase prices and delivery dates.

Functional requirement 5: The system must allow reporting on drug inventory, acquisitions made, orders in progress, then the system must allow monitoring of the drug stock of the DIREAS/GERESAS/DIRIS.

Functional requirement 6: The system must allow the backup option to guarantee that no information is lost in the event of a system failure.

IV. RESULTS

Next, the following detailed results of our web system for the company supplying

CENARES medicines and how this system has significantly improved the company's inventory management experience.



Fig. 2 Login module

In principle, we have the system access component that shows a Login form to enter the username and password. The system is accessed by pressing the "Login" button. Then a home screen is displayed where the mission and vision of the company is related along with the different sections for the management of medications, orders, suppliers and reports that will be clearly displayed for the administrator.



Fig. 3 Administrator window

The image below shows several components that represent each of the different procedures offered by the system. In this case "order management" that will be received through a form that the system will offer for those people who want to place their orders identified by their names, mail, medication, quantity, and description. Where the main functions are the following: Edit, Delete and Show the data of each record, which allows managing and modifying the information efficiently.

ID	Nombre	Email	Descripción	Medicamento	Cantidad
36	Caroline	carla_gomez@gmail.com	Sin descripción	Diazepam	25
35	Manuel	lony_2003_manuel@hotmail.com	Sin descripción	Agraptum	65
33	Diego Wilson	diego.wilson@gmail.com	123	Aspirina	95

Fig. 4 Order management window

Fig. 5 Order form

In the next section, a series of elements are displayed that will be taken into account when editing the order information. Where the "administrator" will be asked to replace the following fields for the order: name, email, medication, quantity and description.

Fig. 6 Order editing window

After the creation and implementation of the CENARES drug management web system, the challenge of improving

inventory control by the administrative area has been overcome. This tool provides information for the control of the CENARES areas and likewise obtain a better knowledge of the company's actions.

In summary, the implementation of a personalized web system in CENARES is a necessary and valuable solution to improve efficiency and quality in the drug supply process. This system will benefit both the company and the population in general, guaranteeing a timely and adequate supply of essential medicines and improving the quality of medical care offered. In addition, it will provide CENARES with a comprehensive technological tool to optimize its processes, make informed decisions and maximize the organization's efficiency.

V. DISCUSSION

The results obtained show that the web application developed using technologies such as PHP, MySQL, phpMyAdmin and Visual Studio Code is a viable solution for the registration and generation of reports about the drug inventory. These activities play a fundamental role in the supply that CENARES provides to medical centers.

Regarding the methodological approach used in the development of the web application, it was observed that the implementation of the agile SCRUM methodology was highly effective in achieving a software product in a short period of time. The adoption of this methodology allowed meeting the requirements in an iterative manner, prioritizing collaboration and continuous adaptation, but it may also be more appropriate to opt for a traditional or cascading methodology.

It is clear that the use of technology offers numerous benefits in the field of inventory management, providing effective tools for the collection, processing and visualization of the medicines that are supplied. In this way, technology is driving a true revolution in supply. In addition, it should be noted that a web application does not necessarily have to be complex or have a wide range of functionalities to be useful in supply institutions with a low level of technology familiarity.

Regarding the aforementioned, the possible improvements that can be applied to the web application, it is suggested to implement a tool to search by "ID" for the different areas that the web page offers, since it is somewhat tedious to have to scroll through the upper or lower part of the web page, to be able to search for the information that the administrator wants to consult.

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