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DIGITAL NOTIFICATIONS FOR OPTIMIZING MATERIAL VOUCHER MANAGEMENT IN THE AUTOMOTIVE SECTOR

Gonzalez Guarneros Filiberto[1] , López Aburto María Teresa[2] , García López Serbando[3] , Martínez Ramírez Violeta[4] , Carbino Ramírez Jesús[5]

[1] National Technological Institute of Mexico/Puebla Technological Institute,filiberto.gonzalez@puebla.tecnm.mx , https://orcid.org/0009-0001-9300-0768
[2] National Technological Institute of Mexico/Technological Institute of Puebla,mariateresa.lopez@puebla.tecnm.mx , https://orcid.org/0009-0002-2078-7376
[3] National Technological Institute of Mexico/Puebla Technological Institute,serbando.garcia@puebla.tecnm.mx , https://orcid.org/0009-0001-9484-9587
[4] National Technological Institute of Mexico/Puebla Technological Institute,violeta.martinez@puebla.tecnm.mx , https://orcid.org/0000-0003-1518-786X
[5] National Technological Institute of Mexico/Puebla Technological Institute,carbinojesus@gmail.com , https://orcid.org/0009-0009-2198-8189

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Abstract – This paper presents the successful implementation of a PHP-based web system that allows the management of information on materials requested within an automotive parts company in Puebla. Each record updates the database for real-time control, allowing notifications of movements in vouchers for each requested material to be displayed on a digital panel. Reports are automatically generated in various formats: with a graph of the most requested materials, in Excel and PDF for informed decision-making.

Keywords-- Excel, reports, notifications, vouchers, web.

Abstract -- This paper presents the successful implementation of a PHP-based web-based system that manages information on requested materials within an automotive parts company in Puebla. Each entry updates the database for real-time monitoring, allowing notifications of voucher movements for each requested material to be displayed on a digital dashboard. Reports are automatically generated in various formats: with a graph of the most requested materials, as well as in Excel spreadsheets and PDFs for informed decision-making.

Key words – Excel, reports, notifications, vouchers, web.

INTRODUCTION

Currently, the global automotive sector has undergone a series of events that are important to highlight. Electromobility has been a goal set by major car manufacturers, without leaving behind the hybrid issue that leads to the disuse of gasoline and CO2 emissions. China has displaced the US as the world's largest car manufacturer. Connectivity is driving infrastructure investments in roads and highways in all countries. And finally, the EU is considering the increased use of clean energy. [1]

In Mexico, the sector is an economic driver and has become a significant benchmark, accounting for 4% of the country's GDP and 20.5% of manufacturing GDP. It generates direct employment for more than 900,000 people and millions of indirect jobs. Mexico ranks as the seventh largest vehicle producer worldwide and number one in Latin America. [2]

Current US tariffs on the domestic automotive sector for steel (25%) and aluminum (50%) have caused a 2.0% annual contraction in light vehicle production as of May. Exports fell by 2.9% annually. 2025. [3] Mexico is the largest supplier of auto parts to the US, accounting for 47% of total US imports, followed by Canada, according to 2023 data. Electromobility in North America has increased the demand for auto parts, which translates into greater economic value for Mexico [4]. In Mexico, the auto parts industry is projected to grow by up to 3.35%. INA considered that despite the imposition of tariffs by the US on this sector, auto parts production will continue to see sustainable increases in production and exports. [5].

State of the Art

The importance of web-based computer automation of processes and services within auto parts companies in Mexico is discussed in various related publications:

The work entitled "The auto parts industry in northern Mexico and the use of the Internet. In E-Commerce in Mexico-California Relations" [6], the case of the DELPHI auto parts company in Ciudad Juárez is a benchmark in auto parts production as a supraregional cluster that has represented up to 35% of its production worldwide with Mexican labor, and where the implementation of computer systems has been a determining factor in its production efficiency.

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In the publication entitled "Design of an Information System to Evaluate Working Conditions in the Auto Parts Industry in Hermosillo, Sonora, Mexico."
[7] It refers to the importance of having a web-based information system that facilitates the identification of factors that are significant in terms of employee health and safety within this industry and suggests proposals to eliminate or minimize risks. Another study conducted in Chimbote, Ecuador, entitled "Implementing a web-based sales management system for the company Repuestos y Autopartes" confirms the successful intervention in sales processes using web technology, where manual registration satisfaction, with only 10% approval, has been reversed to 100% satisfaction with the installed software [8].
In Colombia, the project "Cost Control System for the Manufacture of Auto Parts by Hernol SA" focused on developing and implementing a website for calculating production costs based on Visual C#, which includes five modules and a sixth for reports, as infallible corporate benefits [9].
The PHP-based web information system uses the Codeigniter framework and MariaDB as a database manager, reducing time and costs. It is published under the name: "Web-based Computer System for Purchasing, Sales, and Auto Parts Stock Control" and was developed in Colombia [10].

Problem statement

Today, digital transformation has become a necessity for companies that want to remain competitive in the market.
The digitization of process management is a key element in this transformation, as it allows for optimized efficiency, improved collaboration, and streamlined business operations. However, many companies are still reluctant to embrace this transition, which can have significant consequences for their performance and growth capacity.
The lack of digitization can hinder collaboration and effective communication within the company. Manual and paper-based processes make it difficult to exchange information and collaborate in real time between different departments and employees. This can lead to fragmentation of information, difficulties in decision-making, and reduced agility in adapting to market needs. To this end, the aim is to develop a web application that helps reduce these problems by digitizing MRO vouchers so that information is centralized in one place and can be consulted at any time. This would also reduce the printing of the thousands of vouchers that are currently sent out, as everything would be stored in the system and database.

General objective

To develop a web-based information system that controls digital vouchers in the MRO area for cost optimization and allocation efficiency. *Specific objectives*

- Analyze company requirements in the MRO area.
- Front-end design
- Back-end coding
- Centralization of information
- Document generation

Scope

- Improve internal communication
- Create a mobile application for different operating systems
- Biometric authentication
- Personalized user experience

Limitations

- Collaborate with other Tenneco plants
- Reduce costs in the purchasing area
- Ensure effective MRO warehouse management

DEVELOPMENT

First, he set about determining which tools would be used to develop the assigned project, based on tools used at the plant such as PowerApps, Java, PHP, and HTML.

Choice of development tools

Once it had been analyzed and reviewed in detail to choose the right tools to use and see how the project would develop, the MRO department was asked to provide us with its database on the materials existing in the plant with their respective part numbers, taking into account the following key aspects in order to work on the project, as shown in Table 1.

Table 1. *Development Tools*.

XAMPP	**8.2.12-0**
VISUAL STUDIO CODE	1.95.3
OPERATING SYSTEM	Windows
PYTHON	3.11.10
BROWSER	Edge, Google Chrome, etc.

Source: *Own work* (2025).

At this stage, a meeting was held with the Purchasing and IT departments to establish the objectives to be considered in the project and to review the scope of the system. The following goals were established:

- Develop a web application for filling out vouchers.
- Manage who can use the system
- Assign roles to each user depending on whether they are an ordinary user or an administrator
- Manage vouchers generated by employees
- Generate Excel and PDF files with voucher data
- Graph showing the most requested materials
- View and modify existing materials
- Search filters
- Notification in the application that a new voucher has been generated

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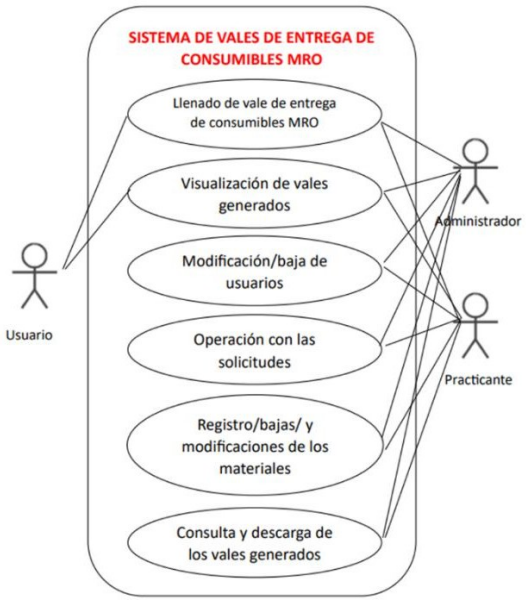
Front-end design

For the design of the "login" system, colors were used that matched the plant's logo to make it look cleaner and not hurt the eyes of viewers when using the system. This was decided jointly with the IT, Purchasing, and MRO departments. For the MRO consumables delivery voucher system, information security was taken into account, and therefore the voucher can only be accessed if it is registered in the system or if the user has the option to register, with two roles being considered: "user" and "administrator." Depending on each role, there will be more or less functionality to manipulate the system. Below is the use case diagram considering the roles and thus defining the access privileges to different sections of the system. See image 1.

Image 1. *System use cases*.



Source: *Own work* (2025).

Creation or completion of MRO consumables delivery voucher

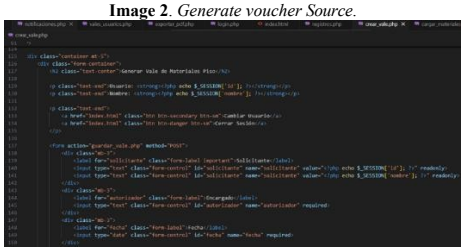
One of the main functions of the system is filling out/generating a voucher for the delivery of the requested material. Filling out the voucher in the system would require the necessary information, such as the physical delivery to MRO, but now you don't have to go to the MRO area to request a voucher and then fill it out.

In order for the user to fill out the voucher, they must first log in with their username and password. The system will validate that the user exists and that the password matches; otherwise, they will not be able to access the system. *Login*

In this section, credentials such as your username and password must be validated, otherwise you will not be able to access the system to fill out the voucher for the delivery of consumables at MRO.

Next, image 2 shows the fields that must be filled in on the labels, which are essential data for the voucher to be generated. In this first part, the function of automatically filling in the "id" and "name" fields with the data used to log in has been added.

Image 2. *Generate voucher Source*.



Source: *Own creation* (2025).

The fields for the materials to be requested by the user are registered. The "Requested Material" label now has an autocomplete feature, which helps us when typing the name of a material by showing us the existing materials that match what we have typed. The "Part Number" label is automatically filled in according to the material selected previously. See image 3.

Image 3. *Auto-complete function for labels*.

Source: *Own work* (2025).

In the "Users" section, which only administrators can see, a filter function has been added to search by "ID" or "name" to make it easier to find a specific user. The function is shown in image 4.

Image 4. *Search filters*.

```php
// Variables para los filtros
$search_id = isset($_GET['search_id']) ? $_GET['search_id'] : '';
$search_nombre = isset($_GET['search_nombre']) ? $_GET['search_nombre'] : '';

// Consulta SQL para incluir los filtros de búsqueda
$sql = "SELECT id, nombre, password, rol FROM usuarios WHERE 1=1";

// Aplicar filtro de búsqueda por ID si está presente
if (!empty($search_id)) {
    $sql .= " AND id LIKE '%" . $conn->real_escape_string($search_id) . "%'";
}

// Aplicar filtro de búsqueda por Nombre si está presente
if (!empty($search_nombre)) {
    $sql .= " AND nombre LIKE '%" . $conn->real_escape_string($search_nombre) . "%'";
}

$result = $conn->query($sql);
?>

<?php
include('config.php');
session_start();

// Verificar si el usuario ha iniciado sesión
if (!isset($_SESSION['id'])) {
    header("Location: login.php");
    exit();
}
?>
```

Source: *Own creation* (2025).

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Image 5 shows the "Add other material" buttons, which will add more tags so that other materials can be added to that voucher, and the "Generate voucher" button, which sends all the data that has been entered in the voucher tags to the MRO manager so that they can deliver the requested materials.

Image 5. *"Add another material" and "Generate voucher" buttons.*

```
            <!-- Botón para agregar más materiales -->
            <button type="button" class="btn btn-success mb-3" id="agregarMaterial">Agregar otro material</button>

            <!-- Botón de envío -->
            <button type="submit" class="btn btn-primary w-100">Generar Vale</button>
        </form>
    </div>

    <div class="image-container">
<img src="tennecocleanair.png" width="500px" height="600px" alt="">
<img src="cc.png" width="300px" height="300px" alt="">
</div>
```

Source: *Own creation* (2025).

A notifications section has been added to the system that only administrators will be able to view, as they are the ones responsible for delivering the materials requested on each voucher and this will provide them with a simpler way of seeing if new vouchers have been generated, see image 6.

Image 6. *Notifications.*

```
<?php
// Contar notificaciones no leídas
$sql_count = "SELECT COUNT(*) AS total FROM notificaciones WHERE leido = 0";
$result_count = $conn->query($sql_count);
$row_count = $result_count->fetch_assoc();
$notificaciones_no_leidas = $row_count['total'];
?>
<a class="nav-link" href="notificaciones.php">
    Notificaciones
    <?php if ($notificaciones_no_leidas > 0): ?>
        <span class="badge bg-danger"><?php echo $notificaciones_no_leidas; ?></span>
    <?php endif; ?>
</a>
```

Source: *Own creation* (2025).

Administrators will not only be able to view existing users in the system, but also, in the event that an employee no longer works at the plant or their ID has been changed for any reason, they will be able to delete or modify a user, but only administrators will be able to make these modifications.

In the "vouchers generated" section, a graph has been added at the top so that you can see which materials are most requested by users within the plant. The code can be seen in image 7.

Image 7. *Graph of most requested materials.*

```
// Consulta para obtener los materiales más solicitados
$sql_materiales = "SELECT m.material, SUM(m.cantidad) AS total_cantidad
                   FROM materiales m
                   GROUP BY m.material
                   ORDER BY total_cantidad DESC
                   LIMIT 10"; // Limitar a los 10 materiales más solicitados

$result_materiales = $conn->query($sql_materiales);

// Crear arrays para almacenar nombres de materiales y sus cantidades
$materiales = [];
$cantidades = [];

// Procesar los resultados de la consulta
if ($result_materiales->num_rows > 0) {
    while ($row = $result_materiales->fetch_assoc()) {
        $materiales[] = $row['material'];
        $cantidades[] = $row['total_cantidad'];
    }
}
```

Source: *Own work* (2025).

Filters were added to this window to make it easier to search through all the vouchers requested daily. Filters for applicant, material, line, and date were added. See image 8.

Image 8. *"Vouchers generated" filters.*

ver_vales.php

```
// Variables para los filtros
$solicitante = isset($_GET['solicitante']) ? $_GET['solicitante'] : '';
$material = isset($_GET['material']) ? $_GET['material'] : '';
$linea = isset($_GET['linea']) ? $_GET['linea'] : '';
$fecha = isset($_GET['fecha']) ? $_GET['fecha'] : '';

// Consulta base
$sql = "SELECT v.id AS vale_id, v.solicitante, v.autorizador, v.fecha, v.num_vale, v.estatus,
               m.material, m.cantidad, m.codigoCC, m.num_parte, m.linea
        FROM vales v
        LEFT JOIN materiales m ON v.id = m.vale_id
        WHERE 1=1"; // Para facilitar agregar filtros dinámicos

// Filtros dinámicos
if (!empty($solicitante)) {
    $sql .= " AND v.solicitante = '$solicitante'";
}
if (!empty($material)) {
    $sql .= " AND m.material = '$material'";
}
if (!empty($linea)) {
    $sql .= " AND m.linea = '$linea'";
}
if (!empty($fecha)) {
    $sql .= " AND v.fecha = '$fecha'";
}
```

Source: *Own creation* (2025).

A button has been inserted before the "Export Excel" table. This button will download and generate an Excel file with the data from all the vouchers generated and put them in a table, but in Excel format. See the code in image 9 below.

Image 9. *"Export Excel" button.*

```
div class="container mt-5 text-center">
ef="exportar_excel.php" class="btn btn-success">Exportar a Excel</a>
```

Source: *Own creation* (2025).

Images 10 and 11 show the code that generates the Excel file.

Image 10. *"Export Excel."*

exportar_excel.php

```
// Establecer cabeceras para exportar el archivo como Excel
header("Content-Type: application/vnd.ms-excel");
header("Content-Disposition: attachment;filename=vales_generados.xls");
header("Cache-Control: max-age=0");

// Consultar los datos de la tabla
$sql = "SELECT v.num_vale, v.solicitante, v.autorizador, v.fecha, v.estatus,
        m.material, m.cantidad, m.codigoCC, m.num_parte, m.linea
        FROM vales v
        LEFT JOIN materiales m ON v.id = m.vale_id
        ORDER BY v.fecha DESC";

$result = $conn->query($sql);

// Generar tabla en formato HTML para exportar como Excel
echo "<table border='1'>";
echo "<tr>
        <th>Numero de Vale</th>
        <th>Solicitante</th>
        <th>Encargado</th>
        <th>Fecha</th>
        <th>Estatus</th>
        <th>Material</th>
        <th>Cantidad</th>
        <th>Código CC</th>
        <th>Número de Parte</th>
        <th>Línea</th>
      </tr>";
```

Source: *Own creation* (2025).

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Image 11. *"Export Excel."*

```php
// Verificar si hay resultados y escribir cada fila en la tabla
if ($result->num_rows > 0) {
    while ($row = $result->fetch_assoc()) {
        echo "<tr>";
        echo "<td>" . $row['num_vale'] . "</td>";
        echo "<td>" . $row['solicitante'] . "</td>";
        echo "<td>" . $row['autorizador'] . "</td>";
        echo "<td>" . $row['fecha'] . "</td>";
        echo "<td>" . $row['estatus'] . "</td>";
        echo "<td>" . $row['material'] . "</td>";
        echo "<td>" . $row['cantidad'] . "</td>";
        echo "<td>" . $row['codigoCC'] . "</td>";
        echo "<td>" . $row['num_parte'] . "</td>";
        echo "<td>" . $row['linea'] . "</td>";
        echo "</tr>";
    }
} else {
    echo "<tr><td colspan='10'>No hay vales generados</td></tr>";
}

echo "</table>";

// Cerrar la conexión
$conn->close();
?>
```

Source: *Own creation* (2025).

We were also asked to be able to generate a PDF. To generate the PDF, we must use a library, which is shown in image 12, for each voucher generated, in order to have an additional backup and so that the PDF contains the data from the voucher generated with the user's data and what they requested in terms of materials. The code for this function is shown in images 13, 14, and 15.

Image 12. *Library for PDF.*

exportar_pdf.php

```php
<?php
require('fpdf/fpdf.php');
```

Source: *Own work* (2025).

Image 13. *Generate PDF.*

exportar_pdf.php

```php
// Consulta para obtener los detalles del vale
$sql_vale = "SELECT v.num_vale, v.solicitante, v.autorizador, v.fecha, v.estatus,
                    m.material, m.cantidad, m.codigoCC, m.num_parte, m.linea
             FROM vales v
             LEFT JOIN materiales m ON v.id = m.vale_id
             WHERE v.id = $vale_id";

$result_vale = $conn->query($sql_vale);

if ($result_vale->num_rows > 0) {
    // Crear el objeto FPDF
    $pdf = new FPDF();
    $pdf->AddPage();

    // Agregar la imagen en la parte superior derecha (ajustar el tamaño y la posición)
    $pdf->Image('Logo2024.png', 170, 10, 30); // X, Y, Ancho

    // Título
    $pdf->SetFont('Arial', 'B', 16);
    $pdf->Cell(0, 10, 'Detalle del Vale', 0, 1, 'C');
    $pdf->Ln(10); // Salto de línea

    // Datos del vale
    $row = $result_vale->fetch_assoc();
    $pdf->SetFont('Arial', '', 12);
    $pdf->Cell(40, 10, 'Numero de Vale:', 0, 0);
    $pdf->Cell(0, 10, $row['num_vale'], 0, 1);

    $pdf->Cell(40, 10, 'Solicitante:', 0, 0);
    $pdf->Cell(0, 10, $row['solicitante'], 0, 1);
```

Source: *Own work* (2025).

Image 14. *Generate PDF.*

exportar_pdf.php

```php
if ($result_vale->num_rows > 0) {
    $pdf->Cell(40, 10, 'Autorizador:', 0, 0);
    $pdf->Cell(0, 10, $row['autorizador'], 0, 1);

    $pdf->Cell(40, 10, 'Fecha:', 0, 0);
    $pdf->Cell(0, 10, $row['fecha'], 0, 1);

    $pdf->Cell(40, 10, 'Estatus:', 0, 0);
    $pdf->Cell(0, 10, $row['estatus'], 0, 1);

    // Salto de línea
    $pdf->Ln(10);

    // Tabla con los detalles de los materiales
    $pdf->SetFont('Arial', 'B', 10);  // Fuente más pequeña para que quepan más datos

    // Celdas de la tabla
    $pdf->Cell(40, 10, 'Material', 1, 0, 'C');
    $pdf->Cell(30, 10, 'Cantidad', 1, 0, 'C');
    $pdf->Cell(30, 10, 'Codigo CC', 1, 0, 'C');
    $pdf->Cell(40, 10, 'Numero de Parte', 1, 0, 'C');
    $pdf->Cell(30, 10, 'Linea', 1, 1, 'C');

    $pdf->SetFont('Arial', '', 9);  // Reducir más la fuente si es necesario para más espacio

    $sql_materiales = "SELECT m.material, m.cantidad, m.codigoCC, m.num_parte, m.linea
                       FROM materiales m
                       WHERE m.vale_id = $vale_id";

    $result_materiales = $conn->query($sql_materiales);
```

Source: *Own creation* (2025).

Image 15. *Generate PDF.*

exportar_pdf.php

```php
if ($result_vale->num_rows > 0) {
    if ($result_materiales->num_rows > 0) {
        while ($material = $result_materiales->fetch_assoc()) {
            // Verificar si el contenido excede el tamaño de la página
            if ($pdf->GetY() > 250) {  // Si estamos cerca del final de la página
                $pdf->AddPage();  // Crear una nueva página
                $pdf->SetFont('Arial', 'B', 10);
                $pdf->Cell(40, 10, 'Material', 1, 0, 'C');
                $pdf->Cell(30, 10, 'Cantidad', 1, 0, 'C');
                $pdf->Cell(30, 10, 'Codigo CC', 1, 0, 'C');
                $pdf->Cell(40, 10, 'Numero de Parte', 1, 0, 'C');
                $pdf->Cell(30, 10, 'Linea', 1, 1, 'C');
                $pdf->SetFont('Arial', '', 9);
            }

            // Ajustar las celdas para cada material
            $pdf->Cell(40, 10, $material['material'], 1, 0, 'C');
            $pdf->Cell(30, 10, $material['cantidad'], 1, 0, 'C');
            $pdf->Cell(30, 10, $material['codigoCC'], 1, 0, 'C');
            $pdf->Cell(40, 10, $material['num_parte'], 1, 0, 'C');
            $pdf->Cell(30, 10, $material['linea'], 1, 1, 'C');
        }
    } else {
        $pdf->Cell(0, 10, 'No se encontraron materiales para este vale.', 0, 1, 'C');
    }

    // Salida del PDF
    $pdf->Output();
} else {
    echo "No se encontró el vale solicitado.";
}
```

Source: *Own work* (2025).

Below are screenshots of the finished system, once the requirements requested by the areas responsible for supervising the project have been completed.

The objective is to reduce voucher printing costs and centralize information in one place.

The system has two roles: the administrator, who has more privileges and options for manipulating the system, and the normal user, who can only create vouchers and view the vouchers they have created with all their data. (Image 16).

Image 16. *Administrator user login.*

Source: *Own work* (2025).

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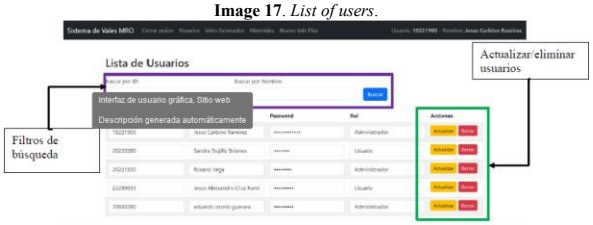
Image 16 shows the main page to which the person with the "administrator" role is redirected, where more actions are displayed and the administrator can also create vouchers.

Image 16. *Administrator main page.*

Source: *Own creation* (2025).

The administrator or those with this role will be able to view the list of users that exist within the system and could edit or delete a user if they are no longer within the plant, see image 17. You can search using the filters that were set, which are "ID" and "Name" as in image 18.

Image 17. *List of users*.



Source: *Own work* (2025).

Image 18. Search by filters

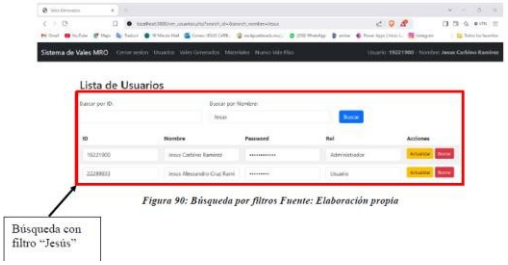
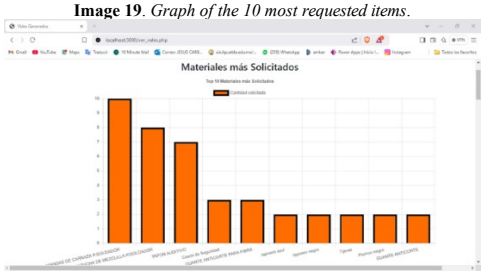


Figura 90: Búsqueda por filtros Fuente: Elaboración propia

Source: *Own creation* (2025).

Image 19 shows a graph indicating the 10 most requested materials within the entire plant from the first day a voucher was generated to the present date.

Image 19. *Graph of the 10 most requested items*.



Source: Own creation (2025).

DISCUSSION AND ANALYSIS OF RESULTS

Image 20 shows the search filters and also the options for exporting the entire table to Excel, where all the data is displayed in an Excel file (see image 21). Image 22 shows the file that is generated in PDF format and can be downloaded by clicking on the "Export PDF" button.

Image 20. *Generated voucher filters*.

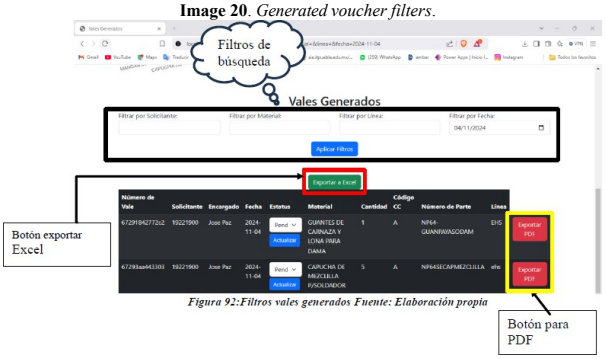
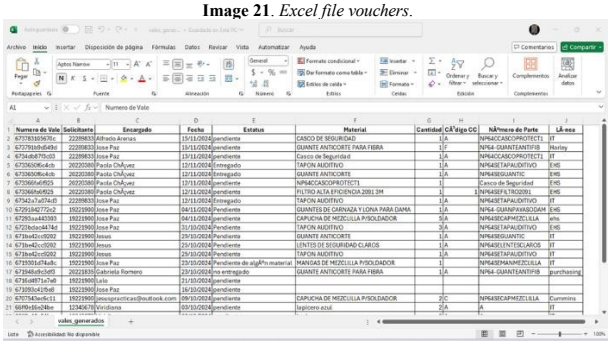


Figura 92:Filtros vales generados Fuente: Elaboración propia

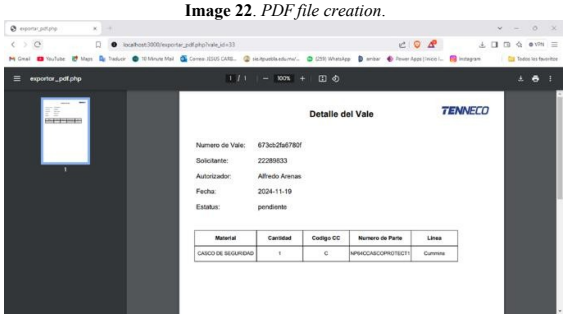
Source: *Own creation (2025).*

Image 21. *Excel file vouchers.*



Source: *Own creation* (2025).

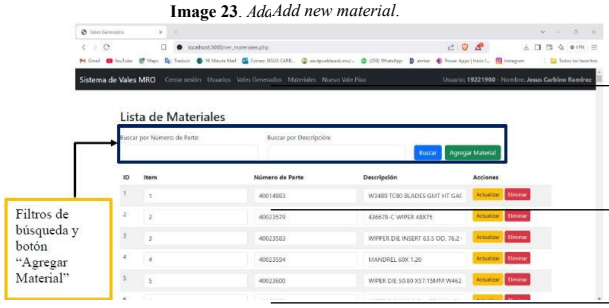
Image 22. *PDF file creation.*



Source: *Own creation* (2025).

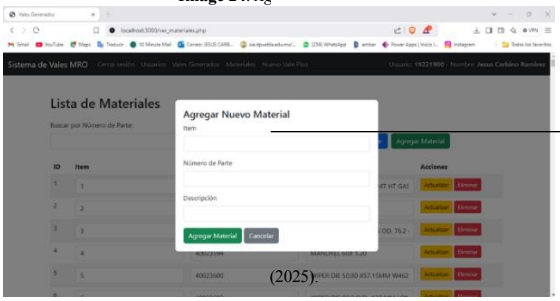
The administrator can update, delete, or add materials. Search filters have also been added, which are the part number and description of the material, as shown in image 23. Likewise, pressing the "Add Material" button displays a floating form to add the new material's data, as shown in image 24. Image 25 shows the execution screenshot when the notification is activated.

Image 23. *AdaAdd new material.*



Fuente. *Elabo own ration* (2025).

Image 24. *AgAdd new material.*



(2025).

Source. *Elabo .Notifications.*

Image 2

own ration(2025).

Source: *Elabo*

The time invested

by the route that
to the area plus the filling process
that was created, the

from any computer requires, where ir
the system centralized in a single from
any computer and with access to tha
link d system. See Table 2.

Table 2. Da

BEFORE	AFTER
printing an dphysical distribution.	Immediate access through the application.
Travel time to the MRO area to request a voucher	Notification in the system of a new voucher created and display of vouchers created
Printing vouchers for filling out	Reduction of paper and voucher printing with the web application
Loss or theft	Access with an authenticated user ID for greater security
Greater environmental impact due to production and distribution of paper.	Lower environmental impact by reducing paper use.

Source: *Elaboown calculation* (2025).

Below, we show 98 and responses in the figure to those in charge of the are according to their point of view howit works.

The time invested for the route taken to the area plus the filling process that was created, omitting what is required from any computer, where the system is centralized in a single computer from any computer and with access to the system link. See Tables 3 and 4.

The statistics in the figure were taken from a survey conducted where the project was developed, observing the application of

to request a voucher is 4 minutes from the station where the MRO is located, just for the journey, for the voucher. With the web application, it takes 4 minutes for the journey, as the application can generate the voucher that contains all the information, which will be stored and can be viewed by the application that is within the plant, the server where the

The time to request a voucher is 4 minutes

station where the
MRO, only the route, of the voucher. With the
web application
4 minutes of travel time since

he voucher can be generated
all the information will be
place and can be viewed
that is within the plant
the server where the

comparative tests.

urvey statistics.

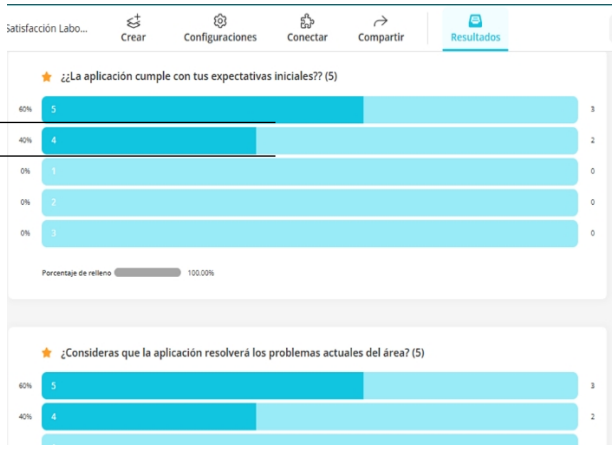
Table3.*Es*

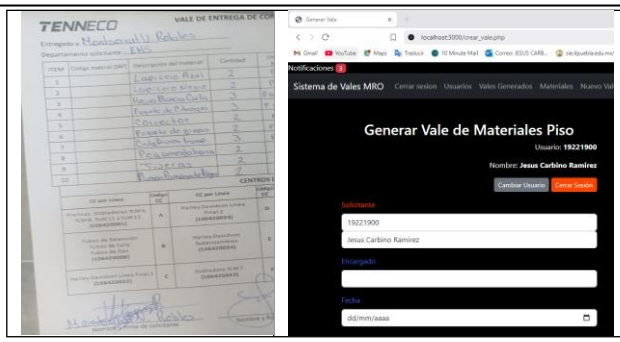
RESPUESTAS	NÚMERO DE VISTAS	PORCENTAJE DE RESPUESTA	TIEMPO PROMEDIO DE RESPUESTA
5	16	31.3%	01:55

Source.*Elabo own ration* (2025).

survey responses.

Table3.*Res*





Source: *Own elaboration (2025).own calculations* (2025).

Discussion

The topic deals with the elements of satisfaction that were measured:

Website security, according to Latinia Interactive Business [11], "strengthening cybersecurity in response to new threats" is crucial for any company connected to the internet at this time.

Automation of notifications

Creation of digital reports: their advantage lies mainly in displaying complex data simply and concisely. They allow trends, patterns, or contrasts that are complex to explain in text to be highlighted [12]. They can also save space and time.

Graphs obtained from data analysis: Statistical graphs can be used to display data series of various types of information and their origin. "Statistical graphs are key to the interpretation and analysis of data" [13].

CONCLUSIONS

The development of a web application marks a significant step towards modernization and efficiency in the management of vouchers used for the delivery of consumables, as it not only optimizes internal processes but also reduces costs associated with printed materials, time wasted in searches, and human errors in information recording. This change allows for better control, centralized information in a single location or site, a simpler and more agile user experience, as well as the ability to modify and update information from within the application itself without having to access the database directly.

In addition, the implementation of this application would promote sustainability by minimizing the use of paper and other resources, in line with current environmental responsibility initiatives. The ability to access records in real time improves decision-making by providing up-to-date and reliable data, while the automation of certain tasks significantly reduces the administrative burden.

Future work

A future line of research may focus on the development of intelligent electronic notification systems based on adaptive artificial intelligence. This approach would seek to improve the personalization and prioritization of messages through machine learning algorithms capable of predicting user priorities and optimizing the delivery of relevant information. The study could include the design of models that integrate context, behavior, and preference analysis to create more efficient, intuitive, and proactive systems in work or service environments. [14]

Another line of research could focus on the impact of the Internet of Things (IoT) on the efficiency and sustainability of the automotive industry. It could explore how the connectivity vehicular and the Over-the-air (OTA) updates influence the reduction of operating costs, data security, and vehicle lifespan. In addition, this line could examine the interoperability between IoT systems and smart industrial platforms, as well as the technical challenges technical and ethical associated with automation and remote maintenance [15] **BIBLIOGRAPHY**

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Contr Role Table **Author**

Role	Author(s)	
Conceptualization	Jesús Carbino Ramírez	
Data curation	Jesús Carbino Ramírez	
Methodology	Filiberto Gonzalez Guarneros	
Project management	María Teresa López Aburto	
Resources	Review and editing – Violeta Martínez Ramírez	
Software	Jesús Carbino Ramírez	
Supervision	Serbando Garcia Lopez	
Validation	Jesús Carbino Ramírez	
Visualization	María Teresa López Aburto	
Editorial	Original draft – Violeta Martínez Ramírez	
Editorial	Review and editing – Violeta Martínez Ramírez	