	<p style="text-align: center;"><b>PROJECT REPORT</b></p> <p>Code: .-. .-. --- .-. .-. - - - / ..--- --- .--- ...- ...- .--- .---</p> <p style="text-align: center;">--- .--- .---</p> <p style="text-align: center;">Version: 0001</p> <p>Author: *****</p> <p>Adviser: *****</p> <p>Entity: *****</p> <p>Country: *****</p> <p>City: *****</p> <p>date: *****</p>
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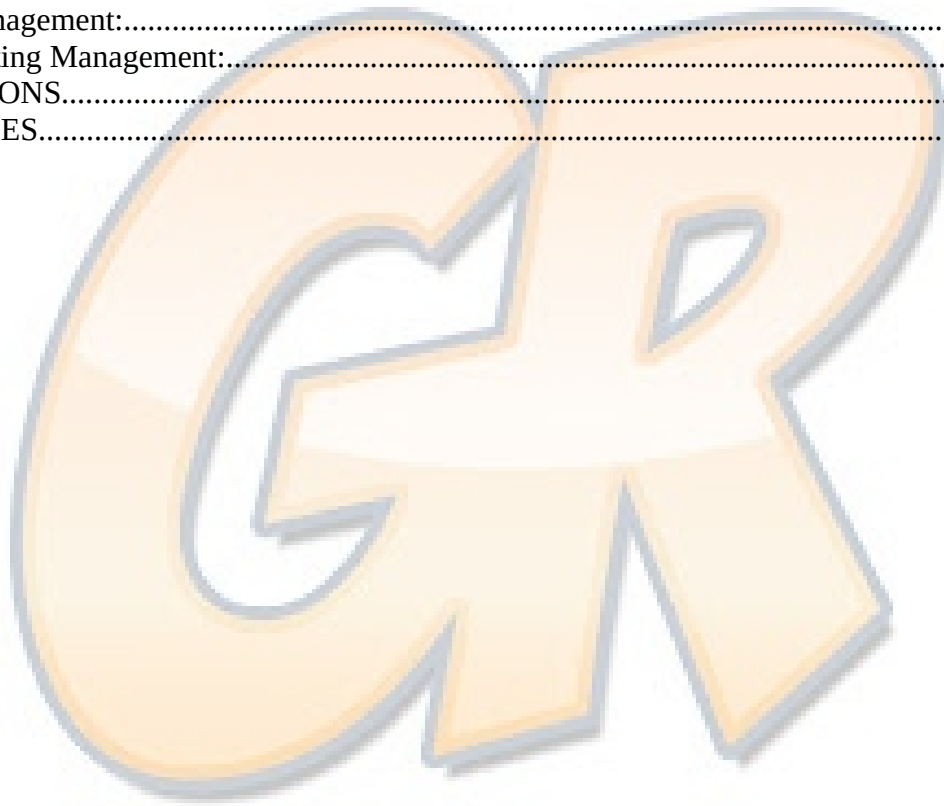
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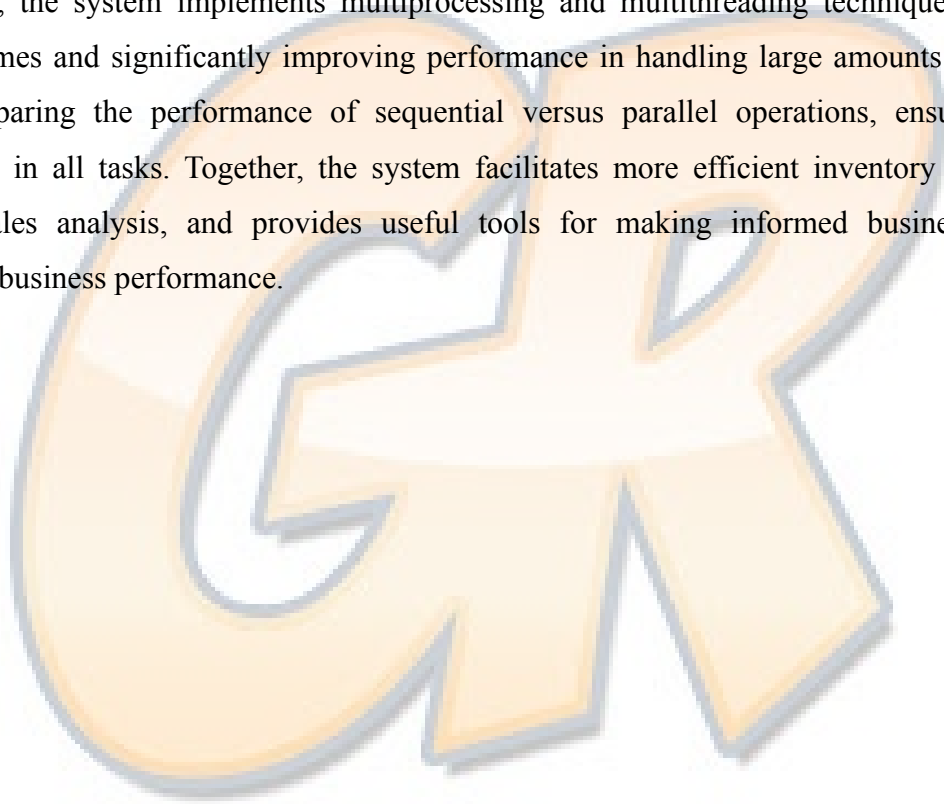
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## SUMMARY

The sales registration and management system for a **tool** store is designed to optimize the processing of large volumes of data through the use of parallel algorithms. It uses MySQL, managed via XAMPP, which allows efficient and organized access to the sales database. The system's graphical interface, developed with Tkinter and customtkinter, offers an intuitive user experience, allowing users to query sales records, sort products according to different criteria (such as sales number, product name, or code), and generate detailed reports for strategic decision-making.

Additionally, the system implements multiprocessing and multithreading techniques, optimizing execution times and significantly improving performance in handling large amounts of data. This allows comparing the performance of sequential versus parallel operations, ensuring optimal performance in all tasks. Together, the system facilitates more efficient inventory management, improves sales analysis, and provides useful tools for making informed business decisions, maximizing business performance.



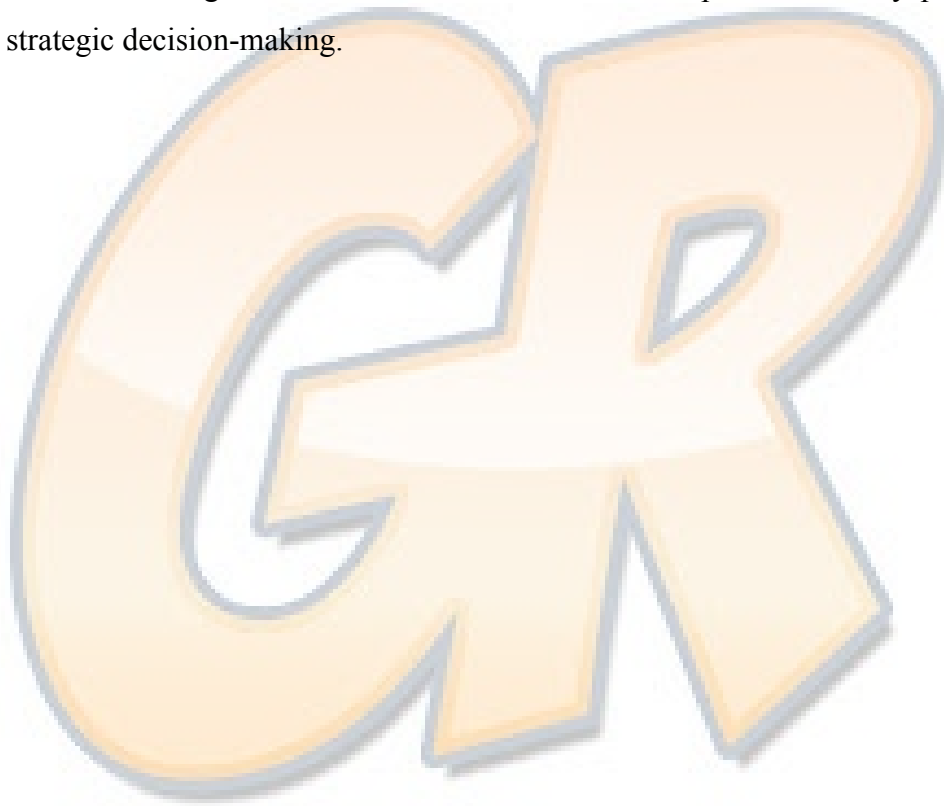
## INTRODUCTION

This sales registration and management system for a **tool** store was developed to improve the efficiency in handling large volumes of data, optimizing both the processing and querying of information through parallel algorithms. Using MySQL and managed via XAMPP, it facilitates fast and organized access to sales records. The graphical interface, created with Tkinter and customtkinter, allows users to easily interact to sort products, query sales, and generate detailed reports. Additionally, it implements multiprocessing and multithreading techniques, improving performance by comparing sequential and parallel operations. This report details the system's features and benefits, highlighting how it helps optimize the management of sales and inventory, as well as supporting strategic decision-making to maximize business performance.



## JUSTIFICATION

The development of this system responds to the need to optimize the handling of large volumes of data in sales and inventory management. Using parallel algorithms and a MySQL database managed via XAMPP, it ensures fast and organized access to the information, which facilitates the querying and manipulation of records. The graphical interface, built with Tkinter and customtkinter, provides an intuitive user experience that allows users to sort products, query sales, and generate reports, which speeds up decision-making. Additionally, the implementation of multiprocessing and multithreading significantly improves performance, optimizing execution times. This approach not only ensures efficient management but also maximizes business performance by providing tools that enhance strategic decision-making.



## OBJECTIVES

### ***General Objective***

Develop a sales registration and management system for a tool store that uses parallel algorithms to optimize data processing and reduce execution times, allowing for the management and sorting of information about sold products based on different criteria.

### ***Specific Objectives***

1. Optimize data processing through multiprocessing. This involves implementing multiprocessing and multithreading techniques to perform parallel sales sorting operations, improving the system's efficiency compared to a sequential approach.
2. Manage the product and sales database. This involves creating and implementing a management system using MySQL (via XAMPP) to efficiently store and retrieve information related to sold products and their respective sales records.
3. Develop a graphical user interface (GUI). This requires designing an intuitive interface with Tkinter and customtkinter, enabling the user to view and query products and their sales, as well as sort them based on criteria such as sales number, product name, and code.
4. Apply efficient sorting algorithms. This focuses on implementing advanced sorting methods to organize sold products based on sales number, product name, and code, improving speed and accuracy in data management.

## THEMATIC DEVELOPMENT

### *General Details of the System*

The sales registration and management system for a **tool** store is focused on optimizing the management of sold products and inventory, using parallel algorithms to improve performance. It focuses on three main areas: products, sales, and users. Each area is supported by specific tables in the MySQL database, managed through XAMPP. The main functionalities include:

- **Product management** (add, query, sort by different criteria such as name, code, or number of sales).
- **Sales management** (query records, generate sales reports).
- **Graphical user interface** (intuitive and accessible, developed with Tkinter and customtkinter, to facilitate product query and sorting).
- **Performance optimization** through multiprocessing and multithreading techniques, improving efficiency in operations such as product sorting).
- **Performance analysis** (comparing execution times between sequential and parallel operations).

### *Explanation of Each Database Table*

Table: Product

The product table is essential for managing the inventory of the tool store. This table stores the details of the products available for sale. Each product record contains crucial information to identify it, such as its unique code, the product name, the category it belongs to (for example, tools, fasteners, measuring instruments, etc.), its price, and the stock available in the tool store. This table allows for precise inventory control and facilitates stock management.

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#	Nombre	Tipo	Cotejamiento	Atributos	Nulo	Predeterminado	Comentarios	Extra
1	<b>CodigoProducto</b> 🔑	int(11)			No	Ninguna		AUTO_INCREMENT
2	<b>NombreProducto</b>	varchar(100)	utf8mb4_general_ci		No	Ninguna		
3	<b>Categoria</b>	varchar(50)	utf8mb4_general_ci		Sí	NULL		
4	<b>Precio</b>	decimal(10,2)			No	Ninguna		
5	<b>Stock</b>	int(11)			No	Ninguna		

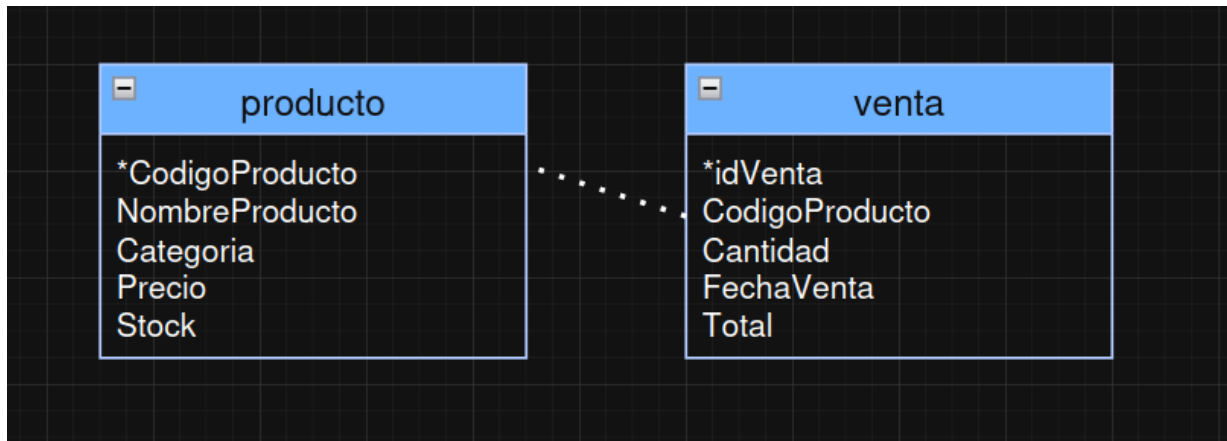
Table: Sale

The sale table contains records of all transactions made in the tool store. Each sale is linked to a specific product, its sold quantity, the date the sale was made, and the total sale amount. This table is crucial for tracking transactions, managing sales statistics, and facilitating the creation of detailed reports.

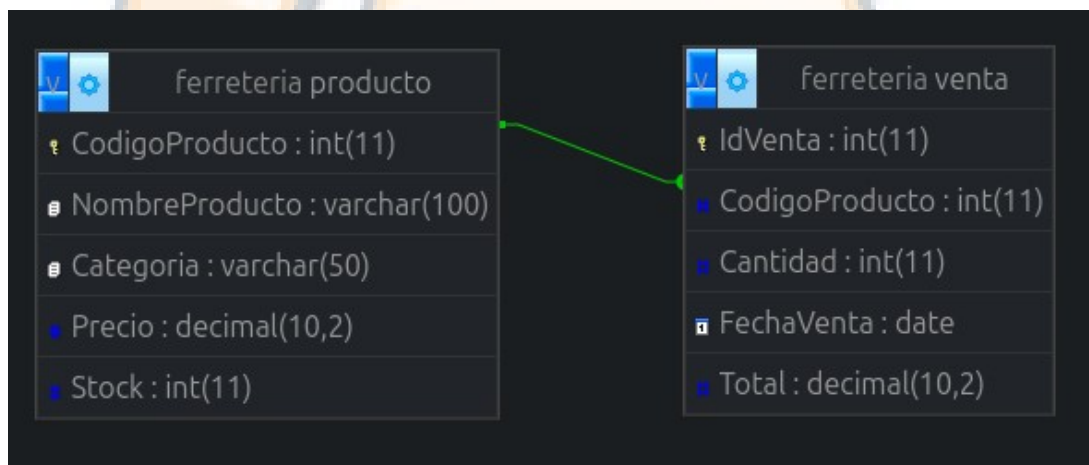
#	Nombre	Tipo	Cotejamiento	Atributos	Nulo	Predeterminado	Comentarios	Extra
1	<b>IdVenta</b> 🔑	int(11)			No	Ninguna		AUTO_INCREMENT
2	<b>CodigoProducto</b> 🔑	int(11)			No	Ninguna		
3	<b>Cantidad</b>	int(11)			No	Ninguna		
4	<b>FechaVenta</b>	date			No	Ninguna		
5	<b>Total</b>	decimal(10,2)			No	Ninguna		

### Database Diagram

Below is the logical diagram of the tool store system, which was designed using the 'draw.io' program:



Now, the physical diagram of the database is presented, which was obtained from the MySQL database management system:



### ***System Interfaces***

First, when starting the system, a section with different options will be displayed, where the user can choose between (Manage Products, Manage Sales, Sort Sales). The system will redirect the user to different interfaces depending on their selection.



#### ***1) Product Management:***

In this section, there are modules (Add Product, Delete Product, List Products, Update Stock), each with different functionalities corresponding to their name.



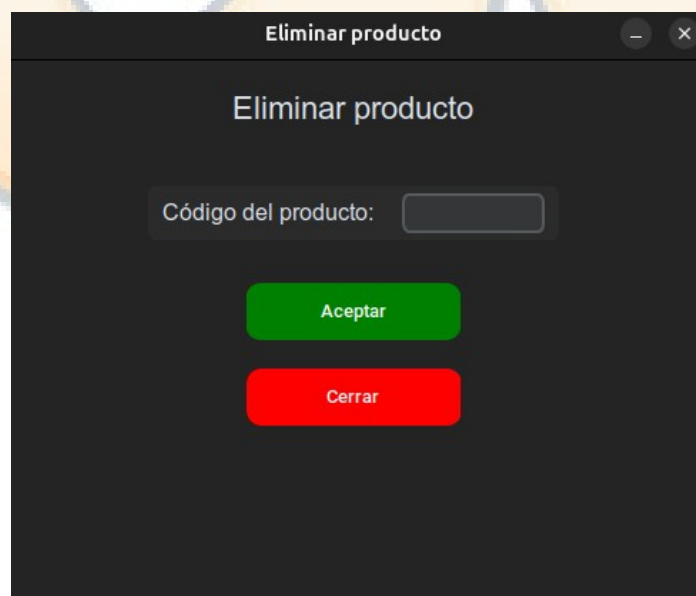
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Starting with Add New Product, the user can enter the details of the new product they wish to add to the tool store system using text boxes. Afterward, the user will have the option to accept if they have finished entering the data or cancel if they wish to exit, and the data will be saved in the database.



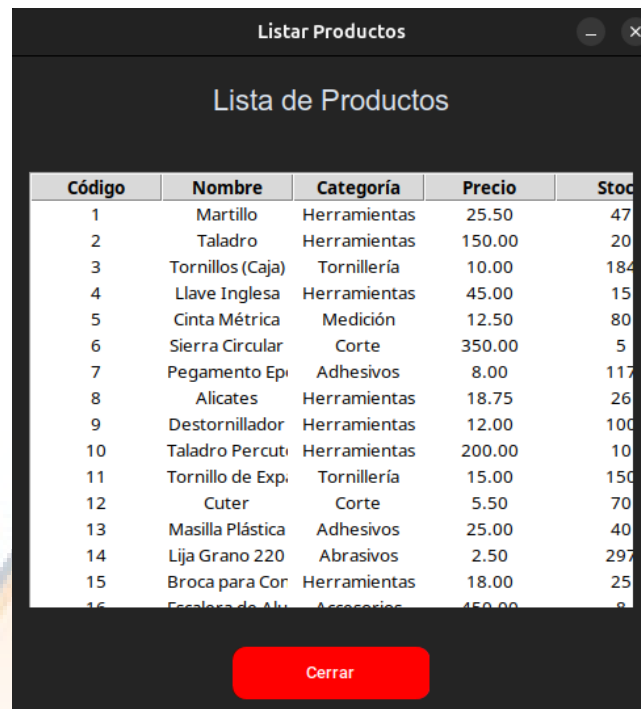
The screenshot shows a dark-themed dialog box titled "Agregar producto" with standard window controls (minimize, maximize, close). The main heading inside is "Agregar nuevo producto". Below this, there are four labeled text input fields: "Nombre:", "Categoría:", "Precio:", and "Stock:". At the bottom of the dialog, there are two buttons: a green "Aceptar" button and a red "Cerrar" button.

Continuing with Delete Product, the user will need to enter the product code that has already been previously added to the system and then press the accept option to confirm the deletion of the product.



The screenshot shows a dark-themed dialog box titled "Eliminar producto" with standard window controls (minimize, maximize, close). The main heading inside is "Eliminar producto". Below this, there is a single labeled text input field: "Código del producto:". At the bottom of the dialog, there are two buttons: a green "Aceptar" button and a red "Cerrar" button.

Next, with Product List, upon entering, a table will automatically display all the products in the tool store system along with their respective data for each product.



Código	Nombre	Categoría	Precio	Stock
1	Martillo	Herramientas	25.50	47
2	Taladro	Herramientas	150.00	20
3	Tornillos (Caja)	Tornillería	10.00	184
4	Llave Inglesa	Herramientas	45.00	15
5	Cinta Métrica	Medición	12.50	80
6	Sierra Circular	Corte	350.00	5
7	Pegamento Epoxi	Adhesivos	8.00	117
8	Alicates	Herramientas	18.75	26
9	Destornillador	Herramientas	12.00	100
10	Taladro Percutor	Herramientas	200.00	10
11	Tornillo de Expansión	Tornillería	15.00	150
12	Cutter	Corte	5.50	70
13	Masilla Plástica	Adhesivos	25.00	40
14	Lija Grano 220	Abrasivos	2.50	297
15	Broca para Corrosión	Herramientas	18.00	25
16	Escalera de Aluminio	Accesorios	450.00	8

Now, with Update Product Stock, if the user wishes to update the stock of products in the system, they will have this interface where they can enter the new stock for the product, thus updating it according to the values entered by the user.



Actualizar stock de producto

Código del producto:

Valor del nuevo stock:

Aceptar

Cerrar

**2) Sales Management:**

In this section, the user will have different options mainly related to the sales management of the tool store system to choose from, including (Register New Sale, Delete Sale, List Sales).

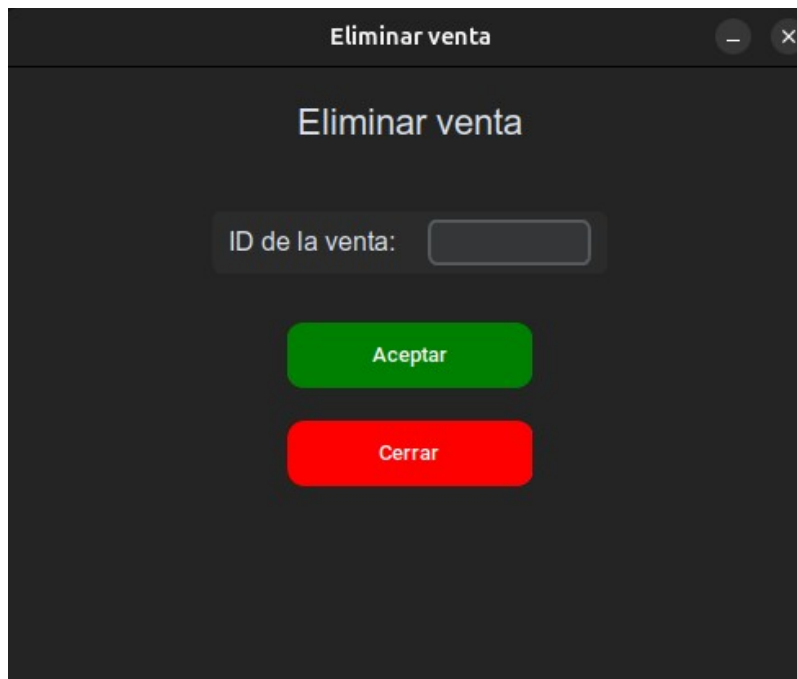


In Add New Sale, when the user wants to add a new sale, they will enter the necessary data for the sale through the text boxes. This way, the sale will be added as the user enters the information.

A screenshot of a software interface titled "Agregar nueva venta" (Add new sale). The window has a title bar that says "Agregar venta" with standard window controls. The background is dark gray. The form contains three input fields with labels to their left: "Código de producto:" (Product code), "Cantidad:" (Quantity), and "Fecha:" (Date). Below the input fields, there are two buttons: a green button labeled "Aceptar" (Accept) and a red button labeled "Cerrar" (Close).

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*If the user needs to delete a sale, they can delete it by entering the sale ID in the text box and confirming by clicking the accept option to completely remove the sale.*



Eliminar venta

Eliminar venta

ID de la venta:

Aceptar

Cerrar

Then, with List Sales, a table will display all the sales made along with all their corresponding unique data for each sale. This way, everything will be recorded in the tool store system.



Listar Ventas

Lista de Ventas

ID	Código del prod	Cantidad	Fecha	Total
4	28	1	2024-11-15	25.0
5	23	5	2024-06-06	2750.0
6	21	2	2024-01-29	16.0
7	14	3	2024-11-18	6.00
8	7	3	2024-07-11	24.0
9	26	1	2024-05-18	10.0
10	8	9	2024-02-16	162.0
11	1	3	2024-06-12	75.0
12	3	16	2024-12-12	160.0

Cerrar

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### 3) Sales Sorting Management:

With this section, the user will have different options to sort by various criteria, including (Sort by quantity of sales made, Sort alphabetically by product name, Sort by product code).



Here, in Sort by Product Quantity, all products have their respective quantities, and with this option, they will be sorted and displayed in a list depending on their quantity.

Lista de Ventas - Orden por cantidad de productos

Código	Nombre	Cantidad	Fecha de venta	Precio total
28	Sierra Manual	1	2024-11-15	25.00
26	Cinta Aislante (Pa	1	2024-05-18	10.00
21	Mascarilla FFP2	2	2024-01-29	16.00
14	Lija Grano 220	3	2024-11-18	6.00
7	Pegamento Epóx	3	2024-07-11	24.00
1	Martillo	3	2024-06-12	75.00
23	Esmeril Angular	5	2024-06-06	2750.00
8	Alicates	9	2024-02-16	162.00
3	Tornillos (Caja)	16	2024-12-12	160.00

Cerrar

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Next, with Sort by Product Name, to sort all the products in the system, the criterion of their name will be used. The products will be sorted alphabetically from A to Z based on the first letter of each product name.

Lista de Ventas - Orden por nombre de producto

Código	Nombre	Cantidad	Fecha de venta	Precio total
8	Alicates	9	2024-02-16	162.00
26	Cinta Aislante (Pa	1	2024-05-18	10.00
23	Esmeril Angular	5	2024-06-06	2750.00
14	Lija Grano 220	3	2024-11-18	6.00
1	Martillo	3	2024-06-12	75.00
21	Mascarilla FFP2	2	2024-01-29	16.00
7	Pegamento Epóx	3	2024-07-11	24.00
28	Sierra Manual	1	2024-11-15	25.00
3	Tornillos (Caja)	16	2024-12-12	160.00

Cerrar

Then, with Sort by Product Code, since each product has a unique code, this code will be used to sort and display the products in the list. The sorting will start with number 1 and continue sequentially up to the last product code in the tool store system.

Lista de Ventas - Orden por nombre de producto

Código	Nombre	Cantidad	Fecha de venta	Precio total
1	Martillo	3	2024-06-12	75.00
3	Tornillos (Caja)	16	2024-12-12	160.00
7	Pegamento Epóx	3	2024-07-11	24.00
8	Alicates	9	2024-02-16	162.00
14	Lija Grano 220	3	2024-11-18	6.00
21	Mascarilla FFP2	2	2024-01-29	16.00
23	Esmeril Angular	5	2024-06-06	2750.00
26	Cinta Aislante (Pa	1	2024-05-18	10.00
28	Sierra Manual	1	2024-11-15	25.00

Cerrar

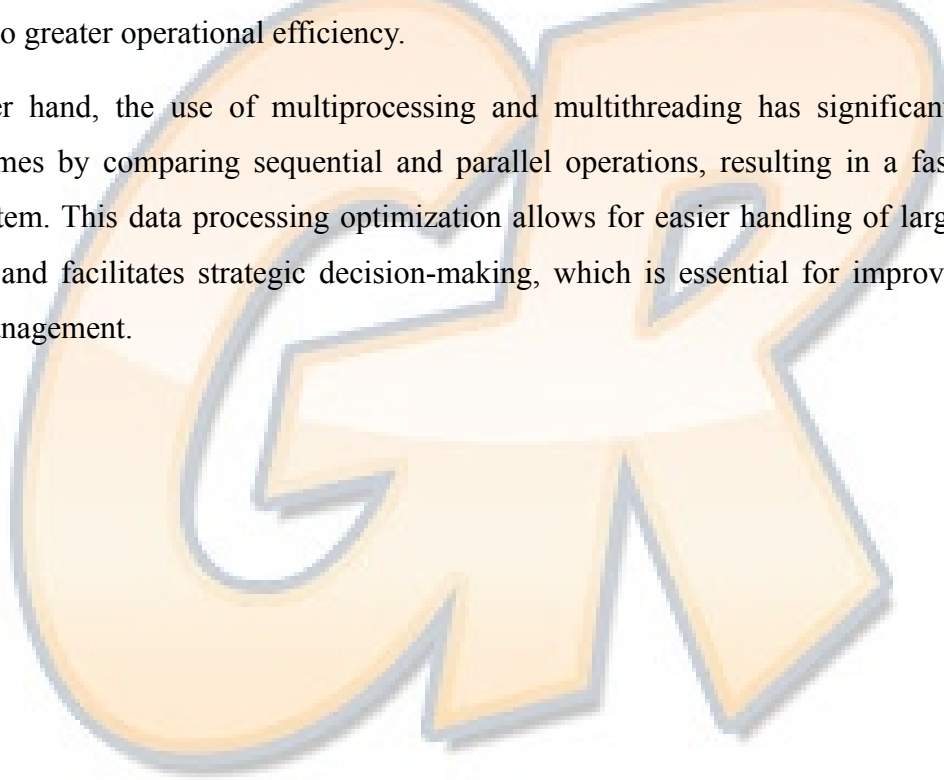
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## CONCLUSIONS

The sales registration and management system developed for the **tool** store has successfully achieved its main objective: optimizing the processing of large volumes of data through the use of parallel algorithms. The integration of MySQL with XAMPP has allowed for efficient and well-organized access to the database, improving the querying and manipulation of sales and product records.

The implementation of the graphical user interface using Tkinter and customtkinter has provided an intuitive user experience, making it easier to interact with the system to query sales, sort products, and generate detailed reports. This has not only improved accessibility and usability but has also contributed to greater operational efficiency.

On the other hand, the use of multiprocessing and multithreading has significantly optimized execution times by comparing sequential and parallel operations, resulting in a faster and more efficient system. This data processing optimization allows for easier handling of large amounts of information and facilitates strategic decision-making, which is essential for improving inventory and sales management.



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