



# TKINTER EXPENSE MANAGER

Documentation

**Author:**

Matías Falconaro

**2024-01-01**

# Index

<b>Index</b>	<b>2</b>
<b>1. Introduction</b>	<b>3</b>
<b>2. Execution</b>	<b>3</b>
2.1 Creating virtual environment	3
2.2 Activación entorno virtual	3
2.3 Installing dependencies	4
2.4 Running the application	4
<b>3. Usage</b>	<b>4</b>
3.1 Starting the application	4
3.2 Features	5
3.2.1 Adding records	5
3.2.2 Viewing records	7
3.2.3 Deleting records	7
3.2.4 Modifying records	9
3.2.5 Querying records	11
3.2.6 Cumulative report	12
3.2.7 Graph	13
<b>4. Characteristics</b>	<b>13</b>
<b>5. Technical design</b>	<b>14</b>
<b>5.1 Design patterns</b>	<b>14</b>
5.2 Project structure	15
5.3 Database	15
5.3.1 Database features	15
5.3.2 Data model	16
5.4 Event handling	16
<b>6. Functional design</b>	<b>16</b>
6.1 User interface (UI)	16
6.2 User experience (UX)	17
<b>7. Testing</b>	<b>17</b>

# 1. Introduction

The "Python Expense Manager" is a tool designed for tracking and managing personal or business expenses. Its interface allows users to enter, consult, modify, delete, persist, and analyze their expenses.

# 2. Execution

This project is a Python-developed expense management application using Tkinter for the user interface and SQLite3 for the database. To execute the project correctly, follow these steps:

## Environment Preparation

- **Clone the Repository or Download the Source Code:** Ensure you have the source code available on your local machine. This may involve cloning a Github repository or downloading and unzipping the project's ZIP file.

```
git clone https://github.com/GonzaloMartin/UTN-Python-TP1.git
```

- **Install Python:** If you haven't done so already, install Python on your machine. This project has been developed with Python 3, so Python 3.9 or higher is recommended.

## 2.1 Creating virtual environment

- **Navigate to the Project Directory:** Open a terminal and navigate to the directory where the project's source code is located.
- **Create a Virtual Environment (Optional but Recommended):** To avoid conflicts with other Python dependencies on your system, it is advisable to create a virtual environment. This can be done with the following command:

```
python -m venv <virtual environment name>
```

## 2.2 Activación entorno virtual

- On Windows:

```
<virtual environment name>\Scripts\activate
```

- On macOS/Linux:

```
source <virtual environment name>/bin/activate
```

## 2.3 Installing dependencies

Install all necessary dependencies by executing the following command:

```
pip install -r requirements.txt
```

This will install the dependencies listed in the requirements.txt file.

## 2.4 Running the application

Once all dependencies are installed, execute the main script with the following command:

```
python app/tkinter_expense_manager.py
```

This will start the user interface of the expense management application.

# 3. Usage

## 3.1 Starting the application

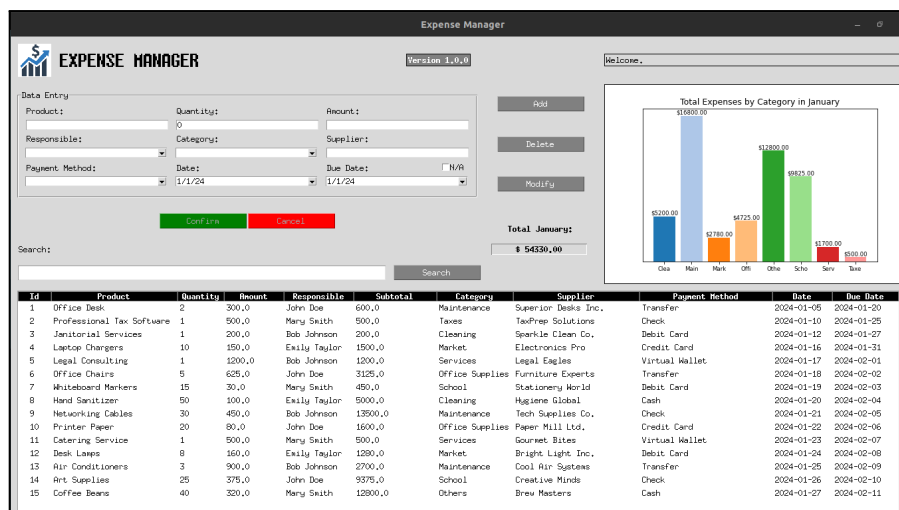
This is an ABMC (Create, Read, Update, Delete) type application that allows users to manage and store information.

Users can:

- **Create** (Add) new records, such as adding details of an expense.
- **Delete** (Remove) existing records.
- **Update** (Modify) existing records, such as modifying the details of an already entered expense.
- **Search** (Query) or view existing records, allowing review and analysis of stored information.

This basic data interaction provides a structured and organized way to handle information, facilitating tasks such as tracking purchases, managing expenses, or maintaining records in a database.

Upon starting the application, a welcome message is found in the status box at the top center of the application.



3.2 Features

3.2.1 Adding records

In the 'Data Entry' section, complete all necessary fields.

Data Entry

Product:

Quantity:

0

Amount:

Responsible:

Category:

Supplier:

Payment Method:

Date:

12/31/23

Due Date:

12/31/23

☐ N/A

All numeric entries with decimals must be expressed using a period '.'.

Responsible:

Emily Taylor

Bob Johnson

John Doe

Mary Smith

Category:

Maintenance

Taxes

Services

Market.

Office Supplies

Cleaning

School

Others

Payment Method:

Cash

Virtual Wallet

Check

Credit Card

Debit Card

Transfer

Other

Although the fields 'Responsible', 'Category', and 'Payment Method' offer predefined options in a dropdown list for selection, the capability to introduce custom values not listed is also incorporated, providing greater flexibility and adaptability to the specific needs of the users.

Date:

1/28/24

1

January

2024

Mon

Tue

Wed

Thu

Fri

Sat

Sun

1

2

3

4

5

6

7

2

8

9

10

11

12

13

14

3

15

16

17

18

19

20

21

4

22

23

24

25

26

27

28

5

29

30

31

1

2

3

4

6

5

6

7

8

9

10

11

Due Date:

2/2/24

☐ N/A

2

February

2024

Mon

Tue

Wed

Thu

Fri

Sat

Sun

5

29

30

31

1

2

3

4

6

5

6

7

8

9

10

11

7

12

13

14

15

16

17

18

8

19

20

21

22

23

24

25

9

26

27

28

29

1

2

3

10

4

5

6

7

8

9

10

The 'Due Date' field also contemplates the option of selecting 'Not Applicable' (N/A) with a checkbox in case the expense has no due date. This functionality disables the calendar for selecting the due date of the expense.

Due Date: ☐ N/A  
2/2/24

Due Date: ☒ N/A  
2/2/24

Once all fields in 'Data Entry' are completed, click on 'Add' (Button panel to the right of the form) to register the expense. The 'Confirm' and 'Cancel' buttons will be enabled to verify if you wish to proceed with the addition.

Confirm Cancel

Confirm Cancel

Botones deshabilitados

Botones habilitados

Data Entry					
Product:	Quantity:	Amount:			
Ergonomic Keyboards	10	200.00			
Responsible:	Category:	Supplier:			
Emily Taylor	Office Supplies	ErgoTech Solutions			
Payment Method:	Date:	Due Date:	<input type="checkbox"/> N/A		
Cash	1/28/24	2/2/24			
<p>Confirm Cancel</p>				<p>Add</p> <p>Delete</p> <p>Modify</p>	
				Total January:	


If you proceed by executing the 'Confirm' button, the new record will be added.

Confirm Cancel

If you proceed by executing the 'Cancel' button, the addition process is interrupted, and the form is reset.

Confirm Cancel

Once the record is created, the status box message will change to 'Record added with ID: <selected record ID>'.

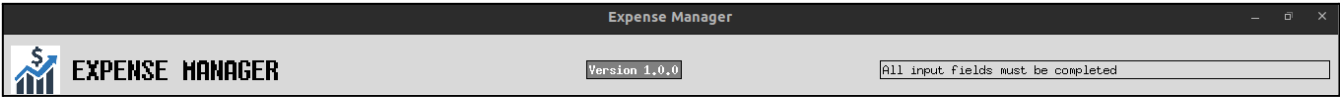
Expense Manager		
 <b>EXPENSE MANAGER</b>	Version 1.0.0	Record added with ID: 16

Error Handling:

If you try to execute the 'Add' button without having completed all fields in the 'Data Entry' section, the application will display an error popup message.



Once the popup message is closed, the status box message will change to 'All input fields must be completed.'



3.2.2 Viewing records

At the bottom of the screen, the database records are displayed in an interactive table.

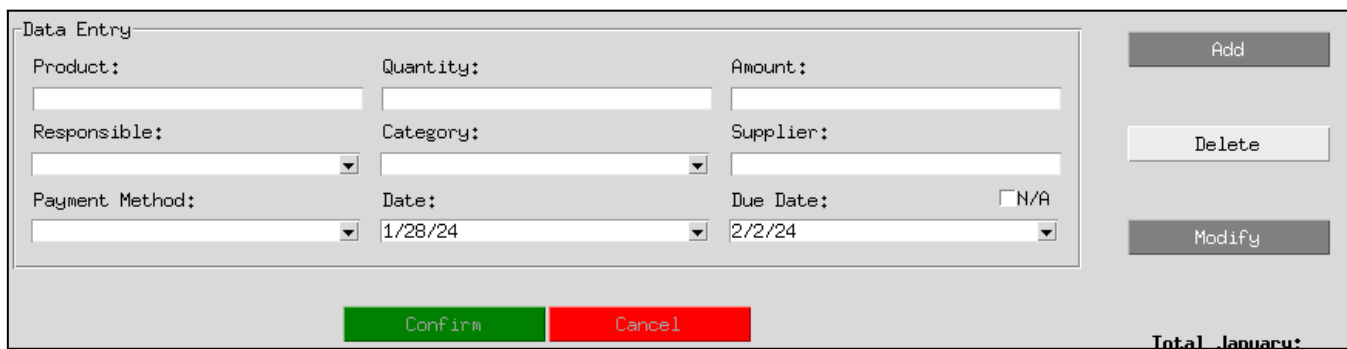
Id	Product	Quantity	Amount	Responsible	Subtotal	Category	Supplier	Payment Method	Date	Due Date
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
2	Professional Tax Software	1	500,0	Mary Smith	500,0	Taxes	TaxPrep Solutions	Check	2024-01-10	2024-01-25
3	Janitorial Services	1	200,0	Bob Johnson	200,0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
4	Laptop Chargers	10	150,0	Emily Taylor	1500,0	Market	Electronics Pro	Credit Card	2024-01-16	2024-01-31
5	Legal Consulting	1	1200,0	Bob Johnson	1200,0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625,0	John Doe	3125,0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
7	Whiteboard Markers	15	30,0	Mary Smith	450,0	School	Stationery World	Debit Card	2024-01-19	2024-02-03
8	Hand Sanitizer	50	100,0	Emily Taylor	5000,0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80,0	John Doe	1600,0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
11	Catering Service	1	500,0	Mary Smith	500,0	Services	Gourmet Bites	Virtual Wallet	2024-01-23	2024-02-07
12	Desk Lamps	8	160,0	Emily Taylor	1280,0	Market	Bright Light Inc.	Debit Card	2024-01-24	2024-02-08
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375,0	John Doe	9375,0	School	Creative Minds	Check	2024-01-26	2024-02-10
15	Coffee Beans	40	320,0	Mary Smith	12800,0	Others	Brew Masters	Cash	2024-01-27	2024-02-11
16	Ergonomic Keyboards	10	200,0	Emily Taylor	2000,0	Office Supplies	ErgoTech Solutions	Cash	2024-01-28	2024-02-02

3.2.3 Deleting records

To delete a record, select the record you wish to modify from the table by clicking on it.

Id	Product	Quantity	Amount	Responsible	Subtotal	Category	Supplier	Payment Method	Date	Due Date
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
2	Professional Tax Software	1	500,0	Mary Smith	500,0	Taxes	TaxPrep Solutions	Check	2024-01-10	2024-01-25
3	Janitorial Services	1	200,0	Bob Johnson	200,0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
4	Laptop Chargers	10	150,0	Emily Taylor	1500,0	Market	Electronics Pro	Credit Card	2024-01-16	2024-01-31
5	Legal Consulting	1	1200,0	Bob Johnson	1200,0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625,0	John Doe	3125,0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
7	Whiteboard Markers	15	30,0	Mary Smith	450,0	School	Stationery World	Debit Card	2024-01-19	2024-02-03
8	Hand Sanitizer	50	100,0	Emily Taylor	5000,0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80,0	John Doe	1600,0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
11	Catering Service	1	500,0	Mary Smith	500,0	Services	Gourmet Bites	Virtual Wallet	2024-01-23	2024-02-07
12	Desk Lamps	8	160,0	Emily Taylor	1280,0	Market	Bright Light Inc.	Debit Card	2024-01-24	2024-02-08
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375,0	John Doe	9375,0	School	Creative Minds	Check	2024-01-26	2024-02-10
15	Coffee Beans	40	320,0	Mary Smith	12800,0	Others	Brew Masters	Cash	2024-01-27	2024-02-11
16	Ergonomic Keyboards	10	200,0	Emily Taylor	2000,0	Office Supplies	ErgoTech Solutions	Cash	2024-01-28	2024-02-02

Then click on the 'Delete' button.



The screenshot shows the 'Data Entry' form with the following fields and buttons:

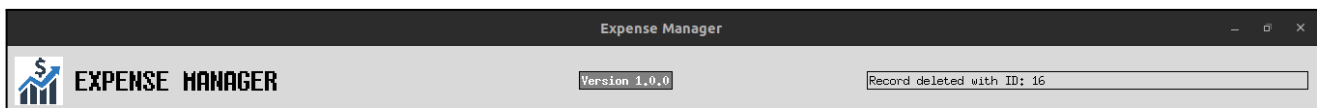
Product:	Quantity:	Amount:
<input type="text"/>	<input type="text"/>	<input type="text"/>
Responsible:	Category:	Supplier:
<input type="text"/>	<input type="text"/>	<input type="text"/>
Payment Method:	Date:	Due Date:
<input type="text"/>	<input type="text"/>	<input type="text"/>

Buttons: Add, Delete, Modify, Confirm, Cancel. Total January:

The 'Confirm' and 'Cancel' buttons will be enabled to verify if you wish to proceed with the deletion.

If you proceed by executing the 'Confirm' button, the new record will be deleted. If you proceed by executing the 'Cancel' button, the deletion process is interrupted.

If the 'Delete' is executed correctly, the status box message will change to 'Record deleted with ID: <selected record ID>'.

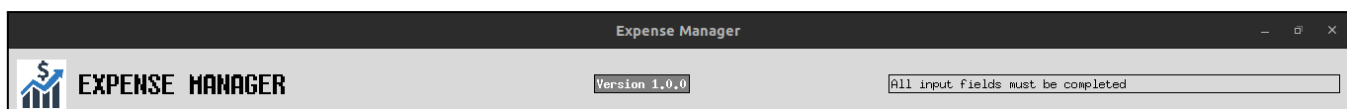


### Error Handling:

If you try to execute the 'Confirm' button after 'Delete' without having selected a record from the table, the application will display an error popup message.



Once the popup message is closed, the status box message will change to 'A record must be selected for deletion.'





3.2.4 Modifying records

To modify a record, select the record you wish to modify from the table by clicking on it.

Id	Product	Quantity	Amount	Responsible	Subtotal	Category	Supplier	Payment Method	Date	Due Date
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
2	Professional Tax Software	1	500,0	Mary Smith	500,0	Taxes	TaxPrep Solutions	Check	2024-01-10	2024-01-25
3	Janitorial Services	1	200,0	Bob Johnson	200,0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
4	Laptop Chargers	10	150,0	Emily Taylor	1500,0	Market	Electronics Pro	Credit Card	2024-01-16	2024-01-31
5	Legal Consulting	1	1200,0	Bob Johnson	1200,0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625,0	John Doe	3125,0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
7	Whiteboard Markers	15	30,0	Mary Smith	450,0	School	Stationery World	Debit Card	2024-01-19	2024-02-03
8	Hand Sanitizer	50	100,0	Emily Taylor	5000,0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80,0	John Doe	1600,0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
11	Catering Service	1	500,0	Mary Smith	500,0	Services	Gourmet Bites	Virtual Wallet	2024-01-23	2024-02-07
12	Desk Lamps	8	160,0	Emily Taylor	1280,0	Market	Bright Light Inc.	Debit Card	2024-01-24	2024-02-08
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375,0	John Doe	9375,0	School	Creative Minds	Check	2024-01-26	2024-02-10
15	Coffee Beans	40	320,0	Mary Smith	12800,0	Others	Brew Masters	Cash	2024-01-27	2024-02-11
16	Ergonomic Keyboards	10	200,0	Emily Taylor	2000,0	Office Supplies	ErgoTech Solutions	Cash	2024-01-28	2024-02-02

Then click on the 'Modify' button.

Product:

Quantity:

Amount:

Responsible:

Category:

Supplier:

Payment Method:

Date:

1/28/24

Due Date:

2/2/24

N/A

Add

Delete

Modify

Confirm

Cancel

Total January:

When the modification is executed:

- The 'Data Entry' form auto-completes with the information from the selected record.
- The message in the status box will change to 'Modifying record ID: <selected record ID>'.
- The 'Confirm' and 'Cancel' buttons will be enabled to verify if you wish to proceed with the modification.

Product:

Ergonomic Keyboards

Quantity:

10

Amount:

200,0

Responsible:

Emily Taylor

Category:

Office Supplies

Supplier:

ErgoTech Solutions

Payment Method:

Credit Card

Date:

1/28/24

Due Date:

2/2/24

N/A

Add

Delete

Modify

Confirm

Cancel

Total January:

Then modify the value of the corresponding item for the selected record.

Data Entry

Product:  
Ergonomic Keyboards

Quantity:  
5

Amount:  
200.0

Responsible:  
Emily Taylor

Category:  
Office Supplies

Supplier:  
ErgoTech Solutions

Payment Method:  
Credit Card

Date:  
1/28/24

Due Date:  
2/2/24

☐ N/A

Confirm

Cancel

Add

Delete

Modify

Total January:

Finally, apply the modification by clicking on the 'Confirm' button.

Upon confirming or canceling the modification, the buttons will be disabled again, and the form will be reset.

Data Entry

Product:

Quantity:

Amount:

Responsible:

Category:

Supplier:

Payment Method:

Date:  
1/28/24

Due Date:  
2/2/24

☐ N/A

Confirm

Cancel

Add

Delete

Modify

Total January:

The modification made can be immediately viewed in the table.

ID	Product	Quantity	Amount	Responsible	Subtotal	Category	Supplier	Payment Method	Date	Due Date
1	Office Desk	2	300.0	John Doe	600.0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
2	Professional Tax Software	1	500.0	Mary Smith	500.0	Taxes	TaxPrep Solutions	Check	2024-01-10	2024-01-25
3	Janitorial Services	1	200.0	Bob Johnson	200.0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
4	Laptop Chargers	10	150.0	Emily Taylor	1500.0	Market	Electronics Pro	Credit Card	2024-01-16	2024-01-31
5	Legal Consulting	1	1200.0	Bob Johnson	1200.0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625.0	John Doe	3125.0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
7	Whiteboard Markers	15	30.0	Mary Smith	450.0	School	Stationery World	Debit Card	2024-01-19	2024-02-03
8	Hand Sanitizer	50	100.0	Emily Taylor	5000.0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04
9	Networking Cables	30	450.0	Bob Johnson	13500.0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80.0	John Doe	1600.0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
11	Catering Service	1	500.0	Mary Smith	500.0	Services	Gourmet Bites	Virtual Wallet	2024-01-23	2024-02-07
12	Desk Lamps	8	160.0	Emily Taylor	1280.0	Market	Bright Light Inc.	Debit Card	2024-01-24	2024-02-08
13	Air Conditioners	3	900.0	Bob Johnson	2700.0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375.0	John Doe	9375.0	School	Creative Minds	Check	2024-01-26	2024-02-10
15	Coffee Beans	40	320.0	Mary Smith	12800.0	Others	Brew Masters	Cash	2024-01-27	2024-02-11
16	Ergonomic Keyboards	5	200.0	Emily Taylor	1000.0	Office Supplies	ErgoTech Solutions	Credit Card	2024-01-28	2024-02-02

Once the record is modified, the status box message will change to 'Record modified with ID: <selected record ID>'.

Expense Manager

EXPENSE MANAGER

Version 1.0.0

Record modified with ID: 16

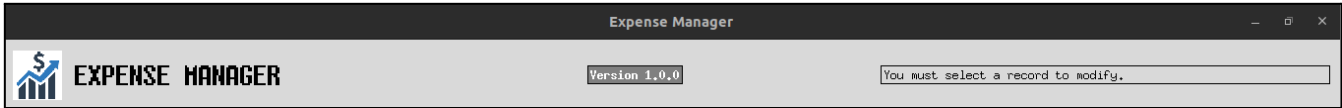
If you proceed by executing the 'Cancel' button, the modification process is interrupted.

Error Handling:

If you try to execute the 'Modify' button without having selected a record from the table, the application will display an error popup message.



Once the popup message is closed, the status box message will change to 'A record must be selected for modification.'

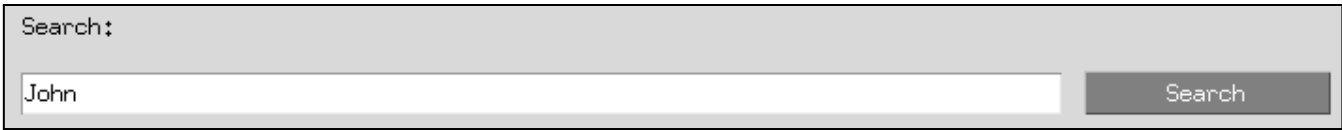


3.2.5 Querying records

Access the 'Query' section and enter a word, term, or value related to the query you want to perform. Then click on 'Search'.

When entering a string of characters, the search activates to locate and return all records containing that specific sequence of characters, regardless of their position within the data entry. This functionality is not limited to complete words or exact terms; it extends its reach to any partial match within the columns and rows of the database, whether they are letters, numbers, or special symbols. The search ensures that users can obtain relevant results with any search term.

It is possible to write the word, phrase, or value you want in full.



Id	Product	Quantity	Amount	Responsible	Subtotal	Category	Supplier	Payment Method	Date	Due Date
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
3	Janitorial Services	1	200,0	Bob Johnson	200,0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
5	Legal Consulting	1	1200,0	Bob Johnson	1200,0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625,0	John Doe	3125,0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80,0	John Doe	1600,0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375,0	John Doe	9375,0	School	Creative Minds	Check	2024-01-26	2024-02-10

It is also possible to perform the search by looking for a fragment of the desired query. In this way, the table will show every result that contains the included term in any of its data.

Search:

main

Search

<div>Id</div>	<div>Product</div>	<div>Quantity</div>	<div>Amount</div>	<div>Responsible</div>	<div>Subtotal</div>	<div>Category</div>	<div>Supplier</div>	<div>Payment Method</div>	<div>Date</div>	<div>Due Date</div>
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09

The search also contemplates special characters and date formats.

Search:


01-20

Search

<div>Id</div>	<div>Product</div>	<div>Quantity</div>	<div>Amount</div>	<div>Responsible</div>	<div>Subtotal</div>	<div>Category</div>	<div>Supplier</div>	<div>Payment Method</div>	<div>Date</div>	<div>Due Date</div>
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
8	Hand Sanitizer	50	100,0	Emily Taylor	5000,0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04

Once the query is executed, the status box message will change to 'Search results for: <search term used>'.

Expense Manager

EXPENSE MANAGER

Version 1.0.0

Search results for: 01-20

To reset all data in the table, perform a search using the asterisk '\*' or a blank search and click on search again.

Search:


\*

Search

<div>Id</div>	<div>Product</div>	<div>Quantity</div>	<div>Amount</div>	<div>Responsible</div>	<div>Subtotal</div>	<div>Category</div>	<div>Supplier</div>	<div>Payment Method</div>	<div>Date</div>	<div>Due Date</div>
1	Office Desk	2	300,0	John Doe	600,0	Maintenance	Superior Desks Inc.	Transfer	2024-01-05	2024-01-20
2	Professional Tax Software	1	500,0	Mary Smith	500,0	Taxes	TaxPrep Solutions	Check	2024-01-10	2024-01-25
3	Janitorial Services	1	200,0	Bob Johnson	200,0	Cleaning	Sparkle Clean Co.	Debit Card	2024-01-12	2024-01-27
4	Laptop Chargers	10	150,0	Emily Taylor	1500,0	Market	Electronics Pro	Credit Card	2024-01-16	2024-01-31
5	Legal Consulting	1	1200,0	Bob Johnson	1200,0	Services	Legal Eagles	Virtual Wallet	2024-01-17	2024-02-01
6	Office Chairs	5	625,0	John Doe	3125,0	Office Supplies	Furniture Experts	Transfer	2024-01-18	2024-02-02
7	Whiteboard Markers	15	30,0	Mary Smith	450,0	School	Stationery World	Debit Card	2024-01-19	2024-02-03
8	Hand Sanitizer	50	100,0	Emily Taylor	5000,0	Cleaning	Hygiene Global	Cash	2024-01-20	2024-02-04
9	Networking Cables	30	450,0	Bob Johnson	13500,0	Maintenance	Tech Supplies Co.	Check	2024-01-21	2024-02-05
10	Printer Paper	20	80,0	John Doe	1600,0	Office Supplies	Paper Mill Ltd.	Credit Card	2024-01-22	2024-02-06
11	Catering Service	1	500,0	Mary Smith	500,0	Services	Gourmet Bites	Virtual Wallet	2024-01-23	2024-02-07
12	Desk Lamps	8	160,0	Emily Taylor	1280,0	Market	Bright Light Inc.	Debit Card	2024-01-24	2024-02-08
13	Air Conditioners	3	900,0	Bob Johnson	2700,0	Maintenance	Cool Air Systems	Transfer	2024-01-25	2024-02-09
14	Art Supplies	25	375,0	John Doe	9375,0	School	Creative Minds	Check	2024-01-26	2024-02-10
15	Coffee Beans	40	320,0	Mary Smith	12800,0	Others	Brew Masters	Cash	2024-01-27	2024-02-11
16	Ergonomic Keyboards	5	200,0	Emily Taylor	1000,0	Office Supplies	ErgoTech Solutions	Credit Card	2024-01-28	2024-02-02

Once the query is executed, the status box message will change to 'Showing all records.'

Expense Manager

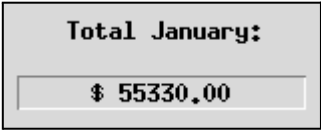
EXPENSE MANAGER

Version 1.0.0

All records are shown.

3.2.6 Cumulative report

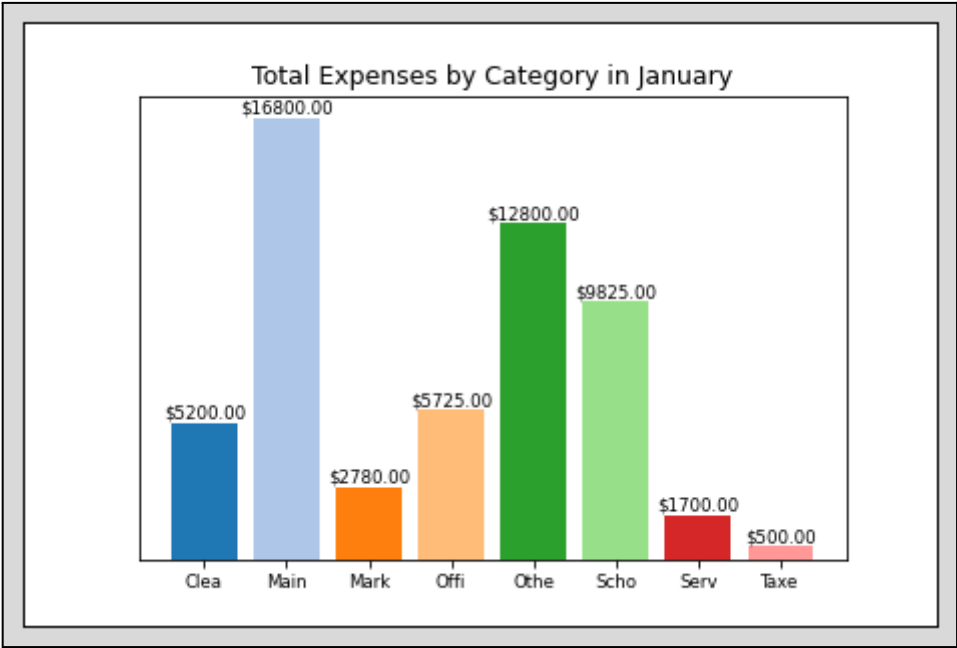
In the center of the application, there is the section 'Total accumulated <current month>'. This is the report of the total accumulated expenses for the current month.



The cumulative total is calculated based on the sum of the subtotals of each record in the database.

3.2.7 Graph

A bar graph is implemented that breaks down the expenses incurred in different categories during the current month. The graph, positioned in the upper right corner of the interface, offers an immediate visual comparison between the categories. Each bar, identified with different colors, corresponds to a specific expense category called "category". The height of each bar reflects the total amount spent in that category, with the exact figure displayed at the top of the bar for quick reference. The categories are abbreviated and aligned horizontally along the x-axis for clear and simple identification. This format allows users to understand and analyze spending patterns at a glance.



## 4. Characteristics

The expense management application offers a series of functional and user features that facilitate the tracking and control of personal or business expenses:

- **Expense Management:**

Offers the possibility to register, visualize, modify, delete, and persist expenses, providing details such as product/service, quantity, amount, among others.

- **Expense Categorization:**

Enables the classification of expenses into different categories for better organization and budget tracking

- **Date Handling:**

Includes the ability to record transaction dates and due dates using an interactive calendar to facilitate data entry.

- **Status Reports:**

Displays status messages to inform the user about the outcome of their actions within the application.

- **Form Actions:**

Allows clearing all form fields with a single click, as well as loading previously saved data for review or modification.

- **Record Search:**

Offers the functionality to search for specific records within the database based on search terms.

- **Data Visualization:**

Presents expense data in a treeview table that facilitates the visualization and handling of multiple records.

## 5. Technical design

Technology	Application	Version
Python	Language	3.9.16
SQLite3	Database manager	3.41.2
Tkinter	User interfaz manager	8.6.0
Tkcalendar	Calendars manager	1.6.1
Pillow	Images manager	10.1.0
Matplotlib	Graph manager	3.8.2

## 5.1 Design patterns

The expense management application is designed following several key code design principles and PEP8 and PEP20 guidelines, reflected in its structure and organization:

- **Adherence to PEP8 and PEP20:**

The code follows PEP8 style guides, ensuring consistency and readability.

- **Application of an Approach to MVC Pattern:**

An approach to the Model-View-Controller (MVC) pattern is implemented, a software architecture paradigm that separates business logic (Model) from the user interface (View), mediated by the Controller. This separation promotes modularity and facilitates scalability and maintenance.

- **Modularity and Cohesion:**

The code is modularized into distinct functional blocks, each encapsulating a specific functionality.

- **Intuitive and Descriptive Nomenclature:**

Descriptive nomenclature is used for variables and functions, improving the code's self-documentation and facilitating understanding and maintenance.

- **Resource Management:**

The application carefully manages resources such as database connections and user interface elements.

- **Validation and Error Handling:**

Input validations and error handling are implemented.

- **Use of Standard and External Libraries:**

External libraries are used for effective integration of tools, leveraging their capabilities to optimize development.

- **Documentation and Comments:**

The code includes comments to explain the logic.

- **Consistency in Function Structure:**

Functions present a coherent structure and are logically organized. Each has a well-defined purpose, facilitating their use, testing, and maintenance.

- **SOLID Design Principles:**

The code shows indications of following SOLID principles, such as single responsibility (each function has a clear purpose) and open/close (the code is open for extension but closed for modification, facilitated by the use of patterns like MVC).

## 5.2 Project structure

.	ROOT
└─ app	LOGIC LAYER
└─ rsc	Visual resources
└─ tkinter_app_logo.png	App logo
└─ tkinter_expense_manager.py	Source code
└─ database	PERSISTENCE LAYER
└─ database.db	Database
└─ docs	Documentation
└─ tkinter_expense_manager.pdf	Documentation PDF file
└─ requirements.txt	requirements

## 5.3 Database

The application uses SQLite3 as a database management system.

### 5.3.1 Database features

- SQL
- Transactional
- Serverless
- Non-columnar
- Portable

### 5.3.2 Data model

Class Diagram in Data Definition Language (DDL)

expenses	
PK	id INTEGER AUTOINCREMENT
	product_service TEXT
	quantity INTEGER
	amount FLOAT
	responsible TEXT
	subtotal FLOAT
	category TEXT
	supplier TEXT
	payment_method TEXT
	date DATE
	due_date DATE



## 5.4 Event handling

The application manages the interface and data state, updating the view based on user interactions.

Event handling takes care of both user feedback and the management of error-triggering events.

# 6. Functional design

## 6.1 User interface (UI)

The expense management application presents an optimized graphical user interface (GUI) for tracking and managing personal or business expenses.

The visual components and interactivity have been designed with the following features:

- **Layout and Organization:**

The interface is structured into defined sections for data entry, record visualization, and graphical representation of accumulated data. A grid layout is maintained for an orderly appearance and easy navigation.

- **Interactive Elements:**

Action controls such as buttons, dropdown fields, and interactive calendars are designed to be intuitive and accessible, improving user efficiency when interacting with the application.

- **Data Visualization:**

A bar graph is included to provide an immediate visual representation of expenses by category, facilitating quick analysis.

- **Typography and Readability:**

Clear and legible typography is used with appropriate font sizes for comfortable reading and descriptive labels for each input field and control.

## 6.2 User experience (UX)

The application is designed with an intuitive user experience in mind, with a logical flow guiding the user through

- **Intuitive Navigation:**

The sequence of operations follows a logical order that aligns with common expense management tasks, from data entry to the visualization and analysis of accumulated expenses.

- **Defined Actions:**

The action buttons are prominent and color-coded for easy identification of their corresponding functions, such as adding a new expense, deleting an existing expense, or modifying a record.

- **User Feedback:**

The system provides immediate feedback through real-time updates of the total accumulated and the changes reflected in the record table and the bar chart.

- **Accessibility:**

The interactive elements are accessible, and the application is designed to be easily used by users with various abilities and preferences.

- **Ease of Use and Learning:**

The application is designed to be intuitive, reducing the learning curve and allowing users to start managing their expenses efficiently from the first use.

## 7. Testing

Exploratory tests of the application were conducted in Windows 10 22H2 and Ubuntu 22.04 environments, adopting the role of end-users. We adopted the perspective of the users for whom the application was designed. By stepping into their role, we followed the paths and processes they are likely to undertake, anticipating and experimenting with a variety of real-use scenarios. This approach led us to discover and document organic workflows and to identify friction points that might hinder the user experience. Our tests went beyond individual functionalities; we sought to understand and improve the overall cohesion of the application. The findings from these exploratory sessions have been fundamental in mapping out opportunities for improvement and now form the basis of our action plan to optimize the application in the next phases of development.