

PERSONAL EXPENSE TRACKER APPLICATION

IBM-Project-3145-1658503036

**NALAIYA THIRAN PROJECT BASED LEARNING ON
PROFESSIONAL READLINESS FOR INNOVATION,
EMPLOYNMENT AND ENTERPRENEURSHI**

**PROJECT REPORT
BY**

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Category: Cloud App Development

Team ID : PNT2022TMID35494

SKILLS REQUIRED:

IBM Cloud,HTML,Javascript,IBM Cloud Object Storage,Python- Flask,Kubernetes,Docker,IBM DB2,IBM Container

PROJECT DESCRIPTION :

In simple words, personal finance entails all the financial decisions and activities that a Finance app makes your life easier by helping you to manage your finances efficiently. A personal finance app will not only help you with budgeting and accounting but also give you helpful insights about money management.

Personal finance applications will ask users to add their expenses and based on their expenses wallet balance will be updated which will be visible to the user. Also, users can get an analysis of their expenditure in graphical forms. They have an option to set a limit for the amount to be use for that particular month if the limit is exceeded the user will be notified with an email alert.

1.2 PURPOSE

Personal expense management plays a very important role. Without an expense tracker ,one may miss out the ability to manage the finances wisely and effortlessly. So the expenses may go through the roof. With a help of a proper expense tracker, one becmes aware of how ,when and why the amount is being is spent.So, an expense tracker is a software or application that helps to keep an accurate record of your money inflow and outflow. Many people in India live on a fixed income, and they find that towardsthe end of the month they don't have sufficient money to meet their needs. While this problem can arise due to low salary, invariably it is due to poor money management skills. Using a daily expense manager can help you keep track of how much you spend every day and on what. At the end of the month, you will have a clear picture where your money is going. This is one of the best ways to get your expenses under control and bring some semblance of order to your finances.Today, there are several expense manager applications in the market. Before you decide to go in for a money manager, it is important to decide the type you want.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM:

In a study conducted by Forrester in 2016 surveying small and medium businesses(SMBs) across the world, 56% companies reported expense management as being the biggest challenge for their finance departments. In another survey conducted by Levvel Research in 2018 in North America, respondents reported the following pain points in expense management before adopting automation:

- Manual entry and routing of expense reports (62%)
- Lack of visibility into spend data (42%)
- Inability to enforce travel policies (29%)
- Lost expense reports (24%)
- Lengthy expense approval system and reimbursement

2.2 REFERENCES:

S.No	TITLE	PROPOSED WORK	TOOLS USED/ ALGORITHM	TECHNOLOGY	ADVANTAGES/ DISADVANTAGES
1.	EXPENSE MANAGER APPLICATION. (2020)	To Develop A Moblie Application That Keeps Record Of User Personal Expenses Contribution In Group Expenditure Top Investment Options View Of The Current Stock Market ,Read Authenticated Financial News	Android Studio	Cloud Application	Advantages: ➤ Keeps Track All Of Your Daily Transactions, Keeps Track Of Your Money Lent Or Borrowed. Disadvantages: ➤ Occupy Lot Of Space.
2.	A NOVEL EXPENSE TRACKER USING STATISTICAL ANALYSIS. (2021)	To Maintain And Manage Data Of Daily Expenditure In A More Precise Way.	SQL Lite	Cloud Application	Advantages: ➤ Its Suggest You With The Most Effective Investment Options. Disadvantages: ➤ The Work Done Being Is Not Accurate.

S.No	TITLE	PROPOSED WORK	TOOLS USED/ ALGORITHM	TECHNOLOGY	ADVANTAGES/ DISADVANTAGES
3.	EXPENSE TRACKER. (2021)	Facilitates The User To Keep Track And Manage Their Personal As Well As Business Expenses.	Android OS	Cloud Application	Advantages: ➤ Become Aware Of Poor Spending Habits And Take Care Of Your Finances Saving And Investment. Disadvantages: ➤ Searching And Referencing Is Difficult And Time-consuming.
4.	EXPENSE TRACKER. (May 2021)	The Application Keeps The Track Of The Income And Expenses Both Of User On A Day To Day Bases	Java	Cloud Application	Advantages: ➤ The Project Effectively Keeps Away From The Manual Figuring. Disadvantages: ➤ Report Generation Is A Tedious Process.

2.3 PROBLEM STATEMENT DEFINITION:

Tracking the expenses throughout the month is essential because it provides insight about the way in which the money is spent and also helps to frame a better budgeting plan for the upcoming days. Thus, personal expense tracker application has made tracking and managing expenses a breeze.

Who does the problem affect?	Investors, savers, big spenders, debtors ,shoppers, budget conscious consumers.
What are the boundaries of the problem?	Expense tracker for working individuals, students, common people.
What is the issue?	To be vigilant about the expense spent, increases financial stress. Being indecisive about the finances may result in less financial security and exceed the budget.
When does this issue occur?	When using wrong budgeting techniques. When not tracking the expenses doesn't help you to know the amount that is actually spent.
Where is the issue occurring?	Working individuals who find it difficult to track their expenses
Why is it important that we fix the problem?	Fixing this issue, brings accountability and helps to be intentional with the income by assign it to spending, saving and giving. This leads to financial stability.

- Abella ,who is a shopaholic ,finds it hard to control her desire to shop .To stop her from overindulging in impulsive purchases, she needs to track her expenses and hold herself accountable.
- John, who is interested to invest in stocks, finds it difficult to figure out the expense that he can spend on investing stocks. With the help of expense tracking, he can easily plan out the expenses for investing in an efficient way.
- Akshay, is a high school student, who usually gets a limited allowance from his parents. So tracking his expenses and good budgeting technique allows him to spend on his regular expenses as well as on himself.
- Udhay ,who is a novice budgeter, finds it tedious to track and manage the expenses amongst his busy schedule . Prioritizing his expenses will help him to curtail his unnecessary expenditures.

3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

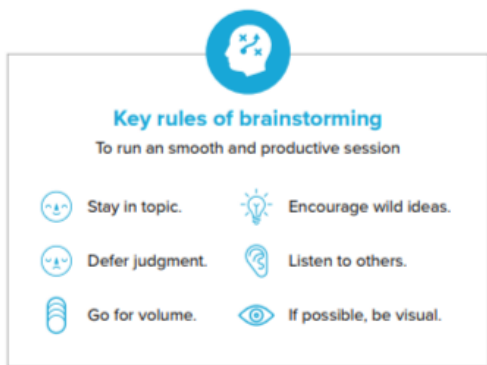
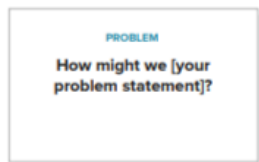


3.2 IDEATION AND BRAINSTORMING:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

STEP 1: DEFINE YOUR PROBLEM STATEMENT

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm



STEP 2: BRAINSTORMING

Write down any ideas that come to mind that address your problem statement

Shylu

To allow multiple users to login at the same time

A friendly bot to remind about the upcoming bills and assist you with financial expenses

To ensure data security and prevent third party interference.

To have an easy navigate to interface

To automatically add the recurring expenses like rent, loan, etc., instead of adding them manually every month

Varththini

To upload photocopy or e-receipts of expenses

To give view/ edit/ comment access of a expense list to others

keep track of payment method i.e., card or UPI or cash, etc

Can have graphical representation for kind of expenses

To hold more than one bank account under different bank holder's name

Can have credit and debit in same page

Create an account using mobile number or e-mail id that is registered with bank account or with social media accounts

jameela

synchronization feature so that we can track expenses from any device we use (cloud data)

option to set a start and end date like daily, weekly, monthly etc

no restrictions on the number of accounts used

option for goal setting

to use both in online and offline mode and should be free of bugs and adds

option to add by which mode the payment has been made and the user should have the report to track it

Madhumidha

home page that shows both budget and expenses side by side

a pop up showing the balance amount in budget of the category every time we add an expense in that specific category

reminder to remind the user in any part of the day regularly to develop the habit of capturing and tracking expenses

comparing all the categories of our budget and suggesting the ways to balance corresponding amount on one category with reducing expenses in another suggested category

adding tags like essential and non-essential for each expense recorded to get an overall idea of how the money is spent

adding things to buy and cost to calculate how much it will take from the budget to get a preview of the expense before spending money on expensive things

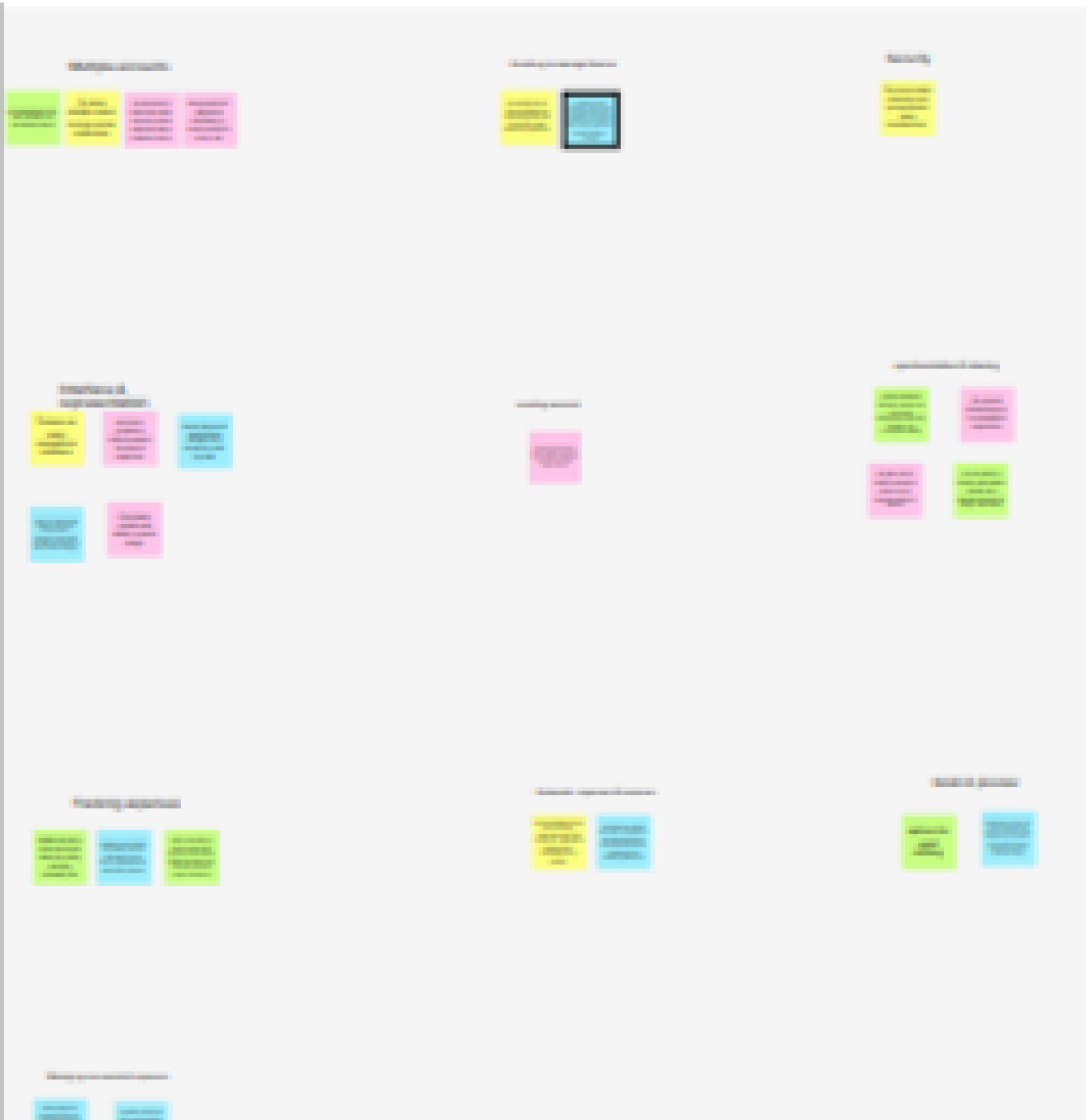
reminder for weekly or monthly review sessions as per user's preference to track their finance

a place to record the non-essential shopping list in order to reduce the temptation to buy

Activate Windows

STEP 3: GROUP IDEAS

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.



STEP
4:
IDEA

PRIORITIZATION

Prioritize Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.



3.3 PROPOSED SOLUTION:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The problem to be solved is that people find it hard to keep track of the monthly expenses and also to prevent compulsive spending.

2.	Idea / Solution description	Personal expense tracker application allows the user to add the income and expenses. Accordingly, the expense wallet gets updated. An analysis of the expenditure in graphical form could be obtained. The user also gets notified if the monthly limit for the budget is exceeded.
3.	Novelty / Uniqueness	The personal expense tracker application helps the user not only in budgeting and accounting; it also provides the insights about money management through the analysis. The user also gets notified if the monthly limit is exceeded.
4.	Social Impact / Customer Satisfaction	The application allows the user to budget, account and get insights on money management. So the users get satisfied with efficient planning.
5.	Business Model (Revenue Model)	The application can have free and premium version where the user can upgrade to premium version to access additional features. Also, the premium version may be advertisement free.
6.	Scalability of the Solution	This application is not only applicable for personal use but also can be extended to business organisations.

3.4 PROBLEM SOLUTION FIT:

Problem-Solution fit canvas 2.0			Purpose / Vision	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Who is your customer? i.e. working parents of 0-5 y.o. kids Students, Adults and Families Organizations, Individuals	6. CUSTOMER CONSTRAINTS CC What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. Even with constant tracking of one's spending habits, there is no guarantee that financial goals will be met. So they might think it is useless to use an expense tracker. Expense tracker might need internet connection to access the user's database.	5. AVAILABLE SOLUTIONS AS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital note-taking. Manually calculate the daily expenses using a notebook and a pen. They can use a budget calculator.	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Which jobs-to-be-done (or problems) do you address for your customer? There could be more than one, explore different sides. Users need to login and register so that the database can easily identify their previous expenses. Users need to provide their receipts and bills which shows the amount they spent. User needs to set a savings goal that will prevent them from spending more than their budget for the month.	9. PROBLEM ROOT CAUSE RC What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. If you don't check your spending and create a budget, you will have no control whatsoever on your money. Instead, money will control you, and you will either have perpetual lack of funds or you will end up steeped in debt. With proper tracking of your finances, you will not be able to determine unnecessary spending. This spending, if saved, can easily add up to quite a bit.	7. BEHAVIOUR BE What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer; calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace). Collect receipts regularly without fail. Know your budget for each month and set appropriate savings goal.	
	3. TRIGGERS TR What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. When they realise they don't have enough money to spend for either themselves or during outing with acquaintances.	10. YOUR SOLUTION SL If you are working on an existing business, write down your current solution first. Fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. Tracks expenses through bank statements and details provided by the user and sends notification alerts when the suggested savings goal set by the user themselves is crossed.	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7. Reduced turnaround time and faster reimbursements 8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.	
Identify strong TR & EM	4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? i.e. feel, measure + confident, in control - see it in your communication strategy & design. fear, guilt, shame and envy-->happy, contented		Expense tracker provides the option to set up custom reminders and notifications to remind they have reached the savings goal.	Extract online & offline CH of BE

4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT :

Following are the functional requirements of the proposed solution.

4.2 NON FUNCTIONAL REQUIREMENTS :

Following are the non functional requirements of the proposed solution.

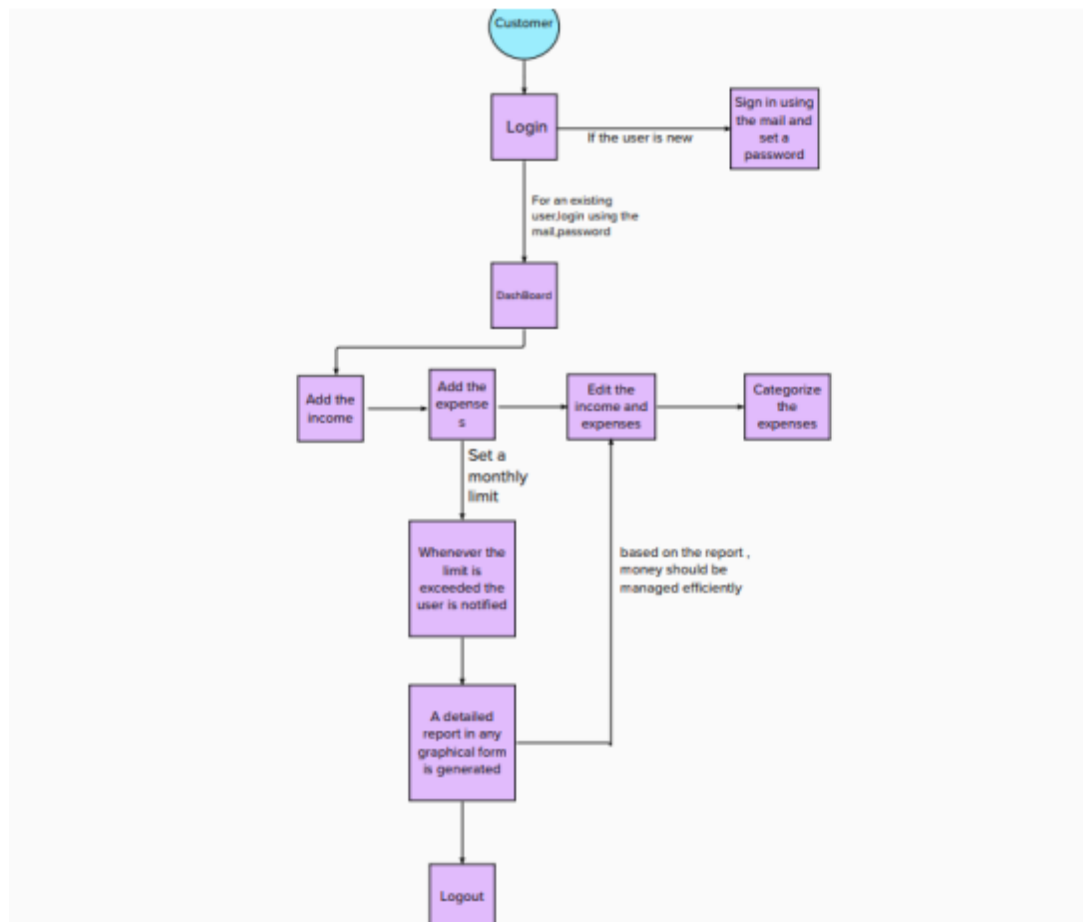
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The interface must be user friendly that makes it easy to use for all types of users.The basic features must be available free of cost to users.
NFR-2	Security	The application should have multi- factor authentication when logging in.Also, banking data must be secured by some encryption technology.
NFR-3	Reliability	The transaction must rollback if there is any technical or network issue .The data must be saved when updation of data fails in between the process. Even if there is a failure,it should be restored within a few minutes.
NFR-4	Performance	The application must not take more than 30 seconds to load. The response time should be quick even when there is heavy traffic.
NFR-5	Availability	When the app is being updated,except for the module that is being updated,the rest can be used.
NFR-6	Scalability	The app must be designed to work efficiently even when there is heavy traffic.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

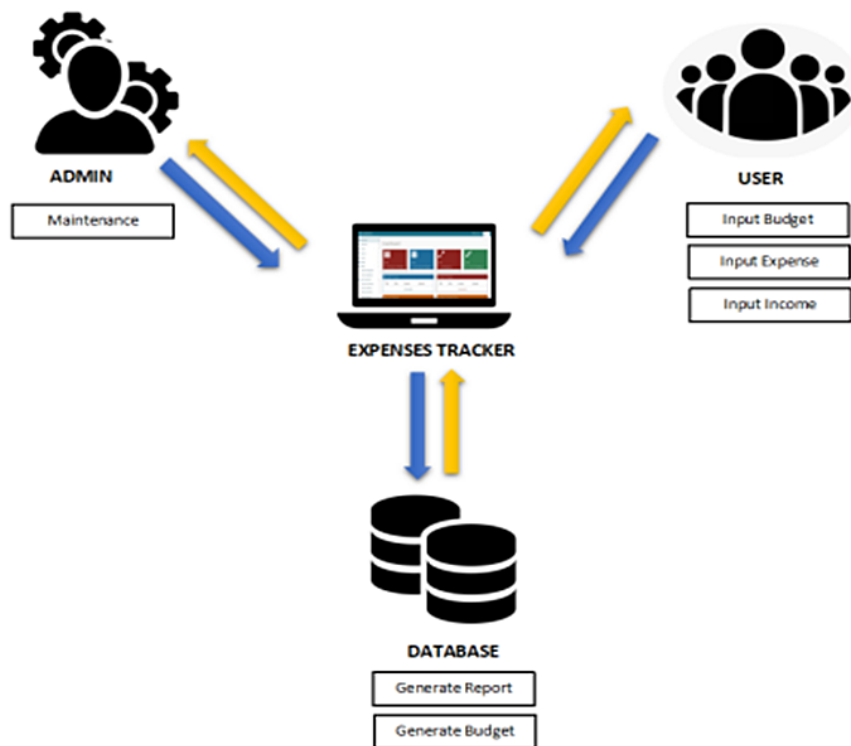
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enter and leaves the system, what changes the information, and where data is

stored.



5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

SOLUTION ARCHITECTURE:



TECHNICAL ARCHITECTURE :

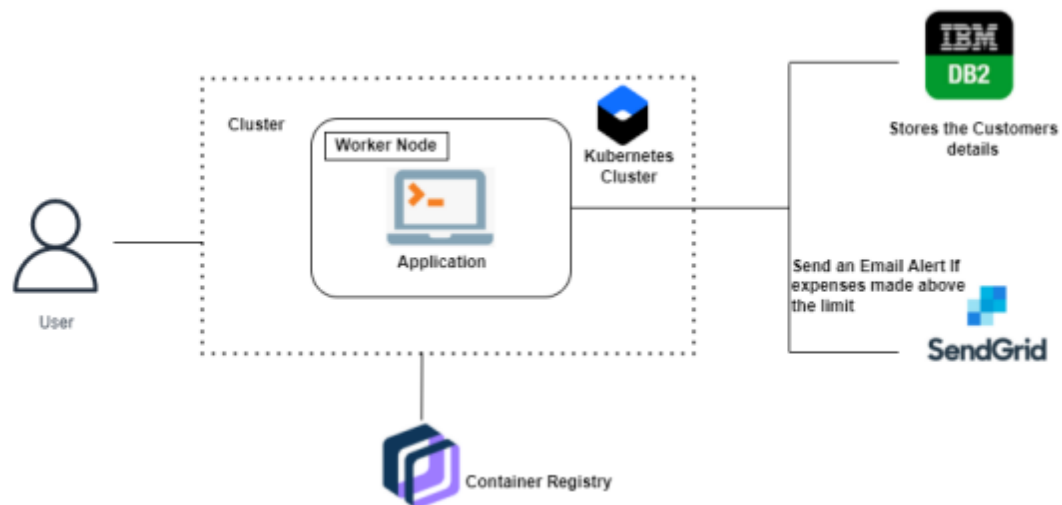


Table-1: Components and technology :

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application	HTML , CSS , Javascript , Python - Flask
2.	User Login	Users can login either using their gmail account or the app server account	Google OAuth for google sign in . Hashed password in DB
3.	Graph visualisation	Users will get the analysis of their expenditure in graphical forms	Seaborn , Matplotlib
4.	Database	Data Type, Configurations etc	NoSQL database
5.	Cloud Database	Database Service on Cloud	IBM DB2 can be used to store user details and expense entries
6.	SendGrid	A cloud based SMTP is used to send email alert if user exceeds the spending limit without the need to maintain email servers	SendGrid is used to send an email alert to user if a particular condition (spending limit) is met.
7.	Google OAuth	OAuth 2.0 allows the user to share only specific data with the application . They can keep their personal information like username,passwords as private.	Allows login through gmail account
8.	Cloud Deployment	Application deployment done on cloud server	Docker , Kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Flask - A python web framework, defined as microframework since it does not need particular tools / libraries	Python Flask Framework
2.	Security Implementations	Passwords cannot be shared as plaintext for secured usage so it is hashed.	BCrypt
3.	Scalable Architecture	Containerized application is deployed to rapidly increase scale on demand	Docker
4.	Availability and Performance	Kubernetes is an open-source container orchestration system for automating software deployment , scaling and management Enhances user experience	Kubernetes

5.3 USER STORIES:

Use the below template to list all the user stories for the products.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail	I can access my account	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can access the dashboard	High	Sprint-1
	Dashboard	USN-5	As a user, I can add income and expenses in the application	I can keep track of the expenses	high	Sprint-1
		USN-6	As a user, I can change the expenses as I spend and can even categorise them	I can keep track, account and budget for the expenses	High	Sprint-1
	Alerting	USN-7	As a user, I can set a limit on the amount of money that can be spent.	Whenever the limit is exceeded, the user gets notified through mail or text messages.	High	Sprint-1
	Reporting	USN-8	As a user, the expense that is spent can be categorised and a report (in any graphical form) can be generated.	I can manage money efficiently from the report	High	Sprint-1
Customer(Mobile user)	Accounting	USN-9	As a user, the income and expenses can be added and categorised	From the report generated, money management could be done	Medium	Sprint-2
Administrator	Supervising and updating	USN-10	As an administrator, I supervise and update from the user feedback	Updating the app makes it more user friendly	Medium	Sprint-1

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Shylu M E
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Madhumidha S
Sprint-1		USN-3	As a user, I can register for the application through Gmail	1	High	Jameela A
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	2	High	Varththini V
Sprint-2	Workspace	USN-1	Workspace for personal expense tracking	2	High	Shylu M E
Sprint-2	Charts	USN-2	Creating various graphs and statistics of customer's data	1	Medium	Madhumidha S
Sprint-2	Connecting to IBM DB2	USN-3	Linking database with dashboard	2	High	Jameela A
Sprint-2		USN-4	Making dashboard interactive with JS	2	High	Varththini V
Sprint-3		USN-1	Wrapping up the server side works of frontend	1	Medium	Shylu M E
Sprint-3	Watson Assistant	USN-2	Creating Chatbot for expense tracking and for calrifying user's query	1	Medium	Madhumidha S
Sorint-3	SendGrid	USN-3	Using SendGrid to send mail to the user about their expenses	1	Low	Jameela A
Sprint-3		USN-4	Integrating both frontend and backend	2	High	Varththini V
Sprint-4	Docker	USN-1	Creating image of website using docker	2	High	Shylu M E
Sprint-4	Cloud Registry	USN-2	Uploading docker image to IBM Cloud registry	2	High	Madhumidha S
Sprint-4	kubernetes	USN-3	Create container using the docker image and hosting the site	2	High	Jameela A
Sprint-4	Exposing	USN-4	Exposing IP/Ports for the site	2	High	Varththini V

6.2 SPRINT DELIVERY SCHEDULE :

Project Tracker, Velocity & Burndown Chart: (4 Marks)

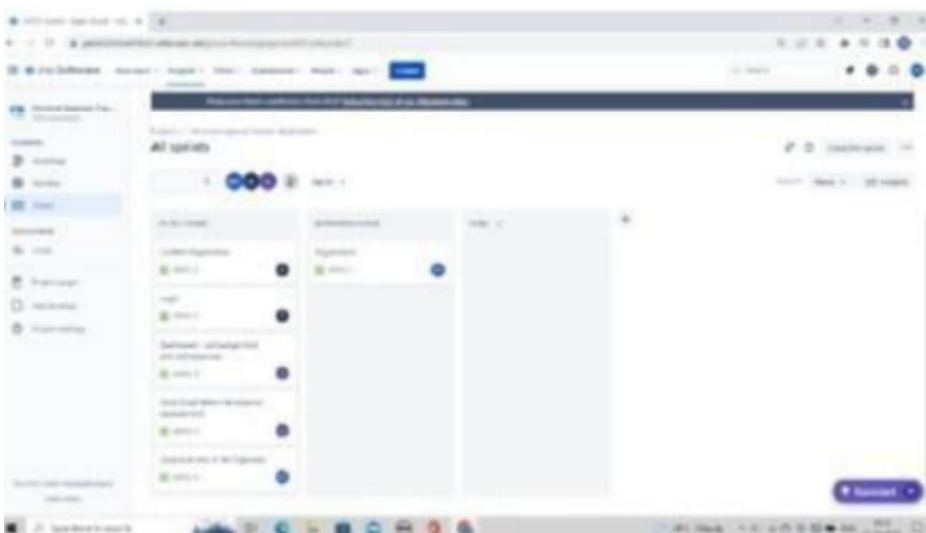
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \text{Sprint Duration} / \text{Velocity} = 20/6 = 3.33$$

6.3 REPORTS FROM JIRA :



7.CODING & SOLUTIONING

7.1 FEATURE - 1

Data visualization on methods for expenditure are added. The pie chart is a pictorial representation of data that makes it possible to visualize the relationships between the parts and the whole of a variable .The pie chart have been used to represent the monthly expenses.

The recommended use for pie charts is two- dimensional, as three-dimensional use can be confusing.The dimensions form sectors of the measurement values.They can have one or two sizes and up to two measures.

The first dimension is used to define the angle of each sector that makes up the chart and the second dimension optionally determines the radius of each sector. Additionally, these plots are useful for comparing data over a fixed period since they do not show changes over time.

Therefore, their use should be considered if:

1. You are looking to categorize and compare a set of data.
2. You only have positive values.
3. You have less than seven categories since a larger number can make it difficult to perceive each segment.

CODE:

#DISPLAY---graph

```
@app.route("/display")
```

```
def display():
```

```
    print(session["username"],session['id'])
```

```
    param = "SELECT * FROM Expense WHERE userid = " + str(session['id']) + " ORDER BY date DESC"
```

```
    res = ibm_db.exec_immediate(ibm_db_conn, param)
```

```
    dictionary = ibm_db.fetch_assoc(res)
```

```
    expense = []
```

```
    while dictionary != False:
```

```
        temp = []
```

```
        # temp.append(dictionary["ID"])
```

```
        temp.append(dictionary["USERID"])
```

```
        temp.append(dictionary["DATE"])
```

```
        temp.append(dictionary["EXPENSENAME"])
```

```

temp.append(dictionary["AMOUNT"])
temp.append(dictionary["PAYMODE"])
temp.append(dictionary["CATEGORY"])
expense.append(temp)
print(temp)
dictionary = ibm_db.fetch_assoc(res)

return render_template('display.html', expense = expense)

#delete---the---data

@app.route('/delete/<string:id>', methods = ['POST', 'GET' ])
def delete(id):
    param = "DELETE FROM Expense WHERE userid = " + id
    res = ibm_db.exec_immediate(ibm_db_conn, param)

    print('deleted successfully')
    return redirect("/display")

#UPDATE---DATA

@app.route('/edit/<id>', methods = ['POST', 'GET' ])
def edit(id):
    param = "SELECT * FROM Expense WHERE userid = " + id
    res = ibm_db.exec_immediate(ibm_db_conn, param)
    dictionary = ibm_db.fetch_assoc(res)
    row = []
    while dictionary != False:
        temp = []
        # temp.append(dictionary["ID"])
        temp.append(dictionary["USERID"])
        temp.append(dictionary["DATE"])
        temp.append(dictionary["EXPENSENAME"])
        temp.append(dictionary["AMOUNT"])
        temp.append(dictionary["PAYMODE"])
        temp.append(dictionary["CATEGORY"])
        row.append(temp)
        print(temp)
        dictionary = ibm_db.fetch_assoc(res)

    print(row[0])
    return render_template('edit.html', expenses = row[0])

```

7.2 FEATURE - 2

Email notifications will be sent to the users once they cross the expenditure limit through send grid mail system. Most notifications are transactional, meaning a recipient's action or account activity triggers them. But some notifications are marketing related, encouraging the recipient to take a specific action.

Ecommerce product notifications inform recipients about new products or discounts. Plus, unlike general marketing emails, these are highly personalized and focus on a single product. For example, if a customer views an item on your website and that item goes on sale, you can send the customer a notification to let them know this is the best time to buy.

Users can also opt into receiving notifications when an out-of-stock item is back in stock. Notification emails tend to perform well because the content is highly relevant to the recipient.

But the only way for the recipient to know this is if you state the content clearly in the subject line. For example, the subject line "New Sign-in to Your Account" gets straight to the point, letting the user know why you sent this notification.

CODE:

```
# email part
```

```
param = "SELECT * FROM Expense WHERE MONTH(date) = MONTH(current timestamp) AND YEAR(date) =  
YEAR(current timestamp) ORDER BY date DESC"  
res = ibm_db.exec_immediate(ibm_db_conn, param)  
dictionary = ibm_db.fetch_assoc(res)  
expense = []  
while dictionary != False:  
    temp = []  
    # temp.append(dictionary["ID"])  
    temp.append(dictionary["USERID"])  
    temp.append(dictionary["DATE"])  
    temp.append(dictionary["EXPENSENAME"])  
    temp.append(dictionary["AMOUNT"])  
    temp.append(dictionary["PAYMODE"])
```

```

temp.append(dictionary["CATEGORY"])
expense.append(temp)
print(temp)
dictionary = ibm_db.fetch_assoc(res)

total=0
for x in expense:
    total += int(x[3])

param = "SELECT userid, limit FROM limit WHERE userid = " + str(session['id'])
res = ibm_db.exec_immediate(ibm_db_conn, param)
dictionary = ibm_db.fetch_assoc(res)
row = []
s = 0
while dictionary != False:
    temp = []
    temp.append(dictionary["LIMIT"])
    row.append(temp)
    dictionary = ibm_db.fetch_assoc(res)
    s = temp[len(temp)-1]

if total > int(s):
    msg = "Hello " + session['username'] + " , " + "you have crossed the monthly limit of Rs. " + str(s) + "/- !!!" +
"\n" + "Thank you, " + "\n" + "Team Personal Expense Tracker."
    sendmail(msg,session['email'])

```

7.3 DATABASE SCHEMA TABLES :

1) ADMIN

```

id INT NOT NULL GENERATED ALWAYS AS IDENTITY,
username VARCHAR(32) NOT NULL,
email VARCHAR(32) NOT NULL,
password VARCHAR(32) NOT NULL

```

2) EXPENSE

```

id INT NOT NULL GENERATED ALWAYS AS IDENTITY,
userid INT NOT NULL, date TIMESTAMP(12) NOT NULL,
expensename VARCHAR(32) NOT NULL,
amount VARCHAR(32) NOT NULL,
paymode VARCHAR(32) NOT NULL,
category VARCHAR(32) NOT NULL

```


3) LIMIT

id INT NOT NULL GENERATED ALWAYS AS IDENTITY,
userid VARCHAR(32) NOT NULL,
limit VARCHAR(32) NOT NULL

8.TESTING

8.1 TEST CASES

TEST CASE ID	PURPOSE	TESTCASES	RESULT
TC1	Authentication	Password with length less than 4 characters	Password cannot be less than 4 characters
TC2	Authentication	User Name with length less than 2 characters	User name cannot be less than 2 characters
TC3	Authentication	Valid user name with minimum 2 characters	User name accepted
TC4	Authentication	User name is blank	User name cannot be empty
TC5	Authentication	password field is blank	Password cannot be empty
TC6	Authentication	Minimum 4 characters valid password	Password accepted
TC7	Authentication	Password and confirm password did not match	Please enter same password
TC8	Authentication	Confirm password field is blank	Please enter same password

8.2 USER ACCEPTANCE TESTING

Technical Requirement Document (TSD)

Test Case ID	Test Case Description
TC_001	Verify if user is able to order single product.
TC_002	Verify if user is able to order multiple products.
TC_003	Verify if user can apply single or multiple filters
TC_004	Verify if user can apply different sort by
TC_005	Verify if user is able to pay by Master Card
TC_006	Verify if user is able to pay by Debit Card
TC_007	Verify if user is able to pay fully by reward points
TC_008	Verify if user is able to pay partially by reward points

9.RESULTS

9.1 PERFORMANCE METRICS

- Tracking income and expenses: Monitoring the income and tracking all expenditures (through bank accounts, mobile wallets, and credit & debit cards).
- Transaction Receipts: Capture and organize your payment receipts to keep track of your expenditure.
- Payments & Invoices: Accept and pay from credit cards, debit cards, net banking, mobile wallets, and bank transfers, and track the status of your invoices and bills in the mobile app itself. Also, the tracking app sends reminders for payments and automatically matches the payments with invoices.
- Reports: The expense tracking app generates and sends reports to give a detailed insight about profits, losses, budgets, income, balance sheets, etc.,
- E-commerce integration: Integrate your expense tracking app with your eCommerce store and track your sales through payments received via multiple payment methods.
- Access control: Increase your team productivity by providing access control to particular users through custom permissions.
- Vendors and Contractors: Manage and track all the payments to the vendors and contractors added to the mobile app.
- Organizing Taxes: Import your documents to the expense tracking app, and it will streamline your income and expenses under the appropriate tax categories.
- Track Projects: Determine project profitability by tracking labor costs, payroll, expenses, etc., of your ongoing project.
- In-depth insights and analytics: Provides in-built tools to generate reports with easy-to-understand visuals and graphics to gain insights about the performance of your business.
- Recurrent Expenses: Rely on your budgeting app to track, streamline, and automate all the recurrent expenses and remind you

10.ADVANTAGES & DISADVANTAGES

1. Achieve your business goals with a tailored mobile app that perfectly fits your business.
2. Scale-up at the pace your business is growing.
3. Deliver an outstanding customer experience through additional control over the app.
4. Control the security of your business and customer data
5. Open direct marketing channels with no extra costs with methods such as push notifications.
6. Boost the productivity of all the processes within the organization.
7. Increase efficiency and customer satisfaction with an app aligned to their needs.
8. Seamlessly integrate with existing infrastructure.
9. Ability to provide valuable insights.
- 10.Optimize sales processes to generate more revenue through enhanced data collection

11.CONCLUSION

From this project, we are able to manage and keep tracking the daily expenses as well as income. While making this project, we gained a lot of experience of working as a team. We discovered various predicted and unpredicted problems and we enjoyed a lot solving them as a team. We adopted things like video tutorials, text tutorials, internet and learning materials to make our project complete.

12.FUTURE

The project assists well to record the income and expenses in general. However, this project has some limitations:

- This application does not provide higher decision capability.
- The application is unable to maintain the backup of data once it is uninstalled.

To further enhance the capability of this application, we recommend the following features to be incorporated into the system:

- Mobile apps

- Multiple language interface.
- Provide backup and recovery of data.
- Better user interface for user.

13.APPENDIX

SOURCE CODE GITHUB LINK :

<https://github.com/IBM-EPBL/IBM-Project-3145-1658503036>