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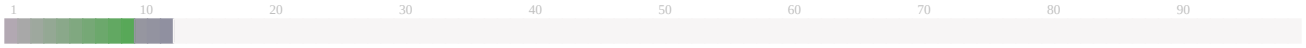

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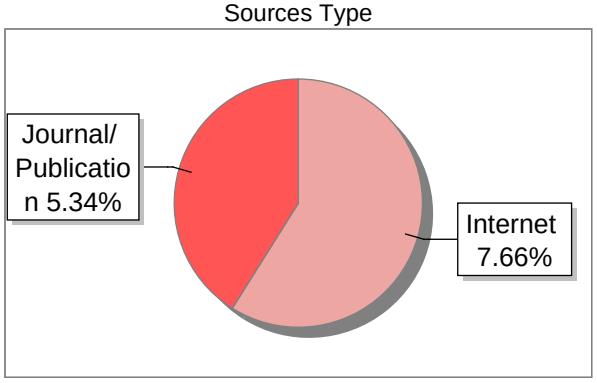

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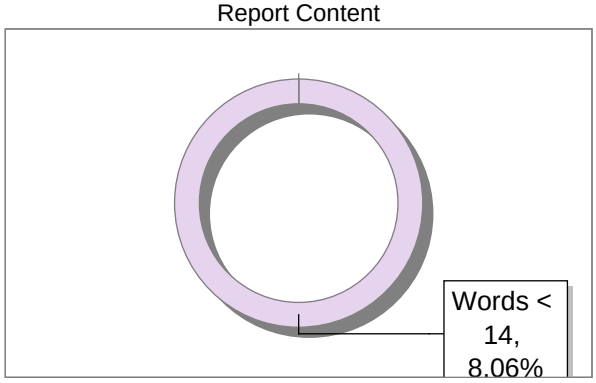

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ABSTRACT

In today's digital world, managing personal finances has become more important and challenging than ever. People often struggle to keep track of their income, expenses, and savings due to a lack of time or proper tools. The AI-Powered Budget Management System is developed to solve these problems by providing a smart, easy-to-use, and efficient solution for budget tracking.

This web-based application allows users to create multiple budgets, add income and expense records, and monitor their financial habits using interactive charts and dashboards. One of the key features of this system is the integration of Artificial Intelligence using the Google Gemini API, which enables users to scan receipts and automatically extract transaction details. This helps reduce manual entry and improves accuracy.

The system is built using modern technologies like React.js for the frontend, Node.js and Express.js for the backend, MySQL for data storage, and Prisma ORM for easy and type-safe database interactions. It also includes secure login using JWT authentication and a responsive design that works on all devices.

This project aims to make financial management simple, secure, and intelligent for students and working individuals, helping them make better spending decisions and achieve their financial goals.

Keywords:

Budget Tracker
AI Receipt Scanner
React.js
Node.js
Prisma ORM
MySQL
Financial Dashboard
JWT Authentication

1. INTRODUCTION

1.1 Overview

In our daily life, managing money is very important. Many people earn money but do not track how they are spending it. Sometimes, people spend more than what they earn and face problems later. In the past, people used books or Excel sheets to manage money. But now, with smartphones and the internet, we can use apps to manage our budget. Our project, AI-Powered Budget Management System, is one such application that helps users track their income and expenses. It also shows them charts and graphs so that they can understand where their money is going. The best part is that it uses AI to scan receipts. If a user buys something and takes a picture of the bill, the system reads the data and adds it automatically.

1.2 Problem Statement

Most budgeting apps in the market need users to enter each and every detail manually. This takes time and is boring. Also, many people don't know how to group their expenses or plan budgets for different needs like food, travel, etc. Some apps do not show clear graphs or summaries, so users cannot understand their spending habits. Our project solves these problems. It automatically reads data from bills, puts transactions into the correct category, and shows users clear reports using graphs and charts.

1.3 Objectives

The main goal of our project is to help users:

- Create and manage multiple budgets
- Track income and expenses under different categories
- Scan receipts using AI and add transactions automatically
- Login securely using JWT tokens
- See their financial report in easy-to-understand charts
- Use the app easily on phone, tablet, or computer

1.4 Motivation

We got the idea for this project by observing how people around us struggle to manage money. Many students spend without planning and later regret it. Working professionals forget where they spent their money. So, we wanted to build a tool that is simple, smart, and helpful. With the use of AI and modern web technologies, we believed we could make a difference in personal financial management.

2. LITERATURE SURVEY

The literature survey plays a vital role in understanding the current development in research and technological advancements in disaster response and relief systems. The literature survey involves reviewing the existing platforms, tools and methodologies in identifying gaps, challenges and opportunities in this field. This section presents a comparative analysis various research papers and systems that uses technologies like Artificial Intelligence , Machine Learning , Internet of Things, and Cloud Computing for real-time disaster management. These insights from the survey have a significant influence in design and development of the proposed system.

Sl. No	Author(s) & Year	Title	Method Used	Results/Remarks
1	S. Bhardwaj et al., 2024	Personal Expense Tracker	MERN stack, real-time tracking	Efficient UI and predictive analytics
2	Pooja Bhatt et al., 2024	Smart Approach to Track Daily Expense	Bookkeeping + data visualization	Focus on expense categorization
3	Phat Tran, 2023	Expense Tracker using MERN	Authentication, CRUD,	

			Redux	Robust architecture for financial apps	
4	Dewan et al., 2024	FinanceVUE Dashboard	MERN + dashboard + security	Enterprise-level analytics and UX	
5	Tapkir & Pathak, 2024	Expense Tracking Using MERN	MongoDB, React, Express	High performance and intuitive UI	

Table 1: Literature survey table

3. PROBLEM ANALYSIS & DESIGN

3.1 Existing System

The MERN-based Personal Expense Tracker addresses key app limitations with:

- **Real-time tracking – Updates expenses instantly for better management.**
- **Automated categorization – Sorts expenses automatically to save time.**
- **Predictive analytics – Helps users set goals based on spending patterns.**
- **User-friendly interface – Simple and easy for quick navigation.**
- **Strong security – Protects user data with robust privacy measures.**

3.2 Proposed System

Our system solves the above problems by:

- **Using Google Gemini API to read receipts**
- **Automatically adding and categorizing transactions**
- **Allowing multiple budgets**
- **Showing clear bar and pie charts for analysis**
- **Having JWT login for user security**
- **Designing with a clean and modern look**

4. IMPLEMENTATION

4.1 Overview of System Implementation

The AI-Powered Budget Management System was implemented using modern web technologies. The system has two main parts: the frontend and the backend. The frontend is built using React.js and styled using Tailwind CSS, which helps make the application look neat and work well on different devices. The backend is built using Node.js and Express.js, where we write all the logic for user authentication, budget handling, transaction recording, and AI integration. The database is handled using MySQL, and Prisma is used to connect and manage the database easily.

The system allows users to register, log in securely, create and manage their budgets, upload receipts for automatic transaction entry, and view data in graphs. The architecture is designed in such a way that each module works independently, which makes the system scalable and easy to maintain.

4.2 Module Description

The project is divided into several modules:

- **User Module: Handles user registration and login with JWT-based authentication.**
- **Budget Module: Allows users to create, update, and delete different budgets.**
- **Transaction Module: Lets users manually or automatically (via AI) add and categorize income and expenses.**
- **AI Receipt Module: Uses Google Gemini API to scan uploaded receipts and convert them into structured data.**
- **Dashboard Module: Shows graphs and charts (like pie and bar charts) to visualize spending patterns and savings.**

7. CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSION

The AI-Powered Budget Management System represents a modern solution to a longstanding problem in personal finance: the challenge of tracking income and expenses in a consistent, efficient, and intelligent way. With the increasing complexity of individual financial activities and the digital shift in financial behavior, traditional methods of budgeting—such as notebooks and spreadsheets—have become outdated and insufficient.

This mini-project successfully achieves its primary objectives by combining the power of Artificial Intelligence and modern full-stack web development to deliver a user-centric, scalable, and secure budgeting tool. One of the most notable innovations is the integration of the Google Gemini API, which empowers the system to scan and interpret receipts automatically. This not only reduces manual workload for users but also enhances data accuracy and usability. Additionally, features such as secure JWT-based login, interactive dashboards with financial visualizations, and modular architecture using React.js, Node.js, Express.js, MySQL, and Prisma ORM make the system robust, responsive, and adaptable to various use cases.

The system is particularly useful for students, young professionals, and anyone looking to gain better control over their financial habits. By enabling users to create multiple budgets, categorize spending patterns, and analyze data through bar and pie charts, the system promotes better financial literacy and proactive decision-making. The modularity of the backend also ensures future expansion and maintenance without disrupting existing features.

7.2 FUTURE SCOPE

While the current version of the AI-Powered Budget Management System effectively addresses key challenges in personal finance management, there is considerable potential for future enhancement and expansion. As technology and user needs evolve, integrating additional features and capabilities can significantly increase the system's impact, accessibility, and intelligence. The following improvements are envisioned as part of the system's future roadmap:

1. Bank Account Integration :
To further automate financial tracking, the system can be integrated with user bank accounts through secure APIs. This would allow real-time synchronization of transaction data, reducing the need for manual input and providing a more comprehensive financial picture.

2. Personalized Financial Insights and Tips :
Using data analytics and user behavior patterns, the system can provide intelligent suggestions and spending tips tailored to each user. Monthly summaries, budgeting advice, and alerts for unusual spending activity would further empower users to make informed decisions.

3. Voice-Based Expense Entry :
To improve accessibility and convenience, especially for mobile users, a voice interface could be added. This would allow users to record transactions verbally, increasing ease of use in on-the-go situations.

4. Mobile Application Development :
A dedicated mobile application for Android and iOS platforms can provide a more seamless experience. With features like push notifications for budget limits, camera support for receipt scanning, and offline capabilities, the mobile version would significantly enhance user engagement.

5. Multi-User and Family Budgeting

Support for collaborative budgeting among family members or shared households could be implemented. This would enable multiple users to contribute to and monitor the same budget with appropriate permissions and roles.

6. Machine Learning for Predictive Budgeting

By analyzing historical spending trends, machine learning algorithms can be employed to predict future expenses and suggest proactive budgeting strategies. This feature can help users anticipate and prepare for recurring or seasonal financial patterns.

7. Gamification and Goal Tracking

Introducing gamified elements such as savings challenges, badges for staying within budget, and reward milestones can increase user motivation and long-term retention. Users can also set financial goals (e.g., saving for a trip) and track their progress visually.

8. Data Export and Report Generation

Users could benefit from features that allow exporting their financial data in various formats (PDF, Excel) and generating detailed reports for tax filing, financial planning, or personal archiving.

9. Multi-Currency and Localization Support

Expanding the platform to support multiple currencies and local languages would make it more accessible to a global audience and better suited for users in diverse regions.