Expense Tracker

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MINI LAB PROJECT REPORT

This Report Presented in Partial Fulfillment of the course **CSE416: Web Engineering Lab**

DAFFODIL INTERNATIONAL UNIVERSITY

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DECLARATION

We hereby declare that this lab project has been done by us under the supervision of **Md. Ashraful Islam Talukder**, **Lecturer**, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere as lab projects.

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COURSE & PROGRAM OUTCOME

The following course have course outcomes as following:.

Table 1: Course Outcome Statements

CO's	Statements
CO1	**Define** and **Relate** fundamental web technologies, client-server architecture, and the interactions between front-end and back-end components for building modern web applications.
CO2	**Formulate** knowledge of HTML, CSS, JavaScript, and server-side scripting to create responsive and dynamic web solutions.
CO3	**Analyze** website structures, frameworks, and APIs to **Present** optimized designs that enhance user experience and system performance.
CO4	**Develop** full-stack web applications by applying industry best practices, frameworks, and deployment strategies, and evaluate their effectiveness based on usability, scalability, and security standards.

Table 2: Mapping of CO, PO, Blooms, KP and CEP

CO	PO	Blooms	KP	CEP
CO1	PO1	C1, C2	KP3	EP1, EP3
CO2	PO2	C2	KP3	EP1, EP3
CO3	PO3	C4, A1	KP3	EP1, EP2
CO4	PO3	C3, C6, A3, P3	KP4	EP1, EP3

The mapping justification of this table is provided in section **4.3.1**, **4.3.2** and **4.3.3**.

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Chapter 1

Introduction

1.1 Introduction

The Expense Tracker is a full-stack web-based money tracking system that enables individual to keep a track of their earnings and expense in an effective manner. This allows one to create and track a budget plan, log expenses, and visualize spending trends through charts that make use of real-time analytics. Built with state-of-the-arts web technologies, including Next. Utilizing js, React Drizzle ORM and PostgreSQL the system would be highly scaleable secure, user-friendly and cross-device ready. It successfully guarantees higher uptime, accessibility and more secure data with its cloud deployment and social authentications integrations.

1.2 Motivation

Many people find it difficult to manage their own finances, largely because of a dearth of straightforward and easy to navigate tools. Non-technical people are often challenged by traditional spreadsheets or complicated financial software. The primary motive of the Expense Tracker project is to deliver a straightforward and robust solution with a mixture of budget tracking, live analytics, secure access, allowing users to keep track of their finances.

1.3 Objectives

Expense Tracker main goals are:

- Easy Budget and Expense Tracking: an intuitive way to create budgets, categorize expenses, as well as track progress.
- To increase the Financial Awareness by using visual analytics and live data updates.
- Secure Access Ensure your platform allows for secure access with active and secure authentication protocols like social login.
- Provide a responsive interface for mobile, tablet and desktop, to ensure Cross-Device Usability.
- Create a scalable system using cloud deployment and serverless database infrastructure.
- Seamless navigation, toast notifications, and real-time updates.

1.4 Feasibility Study

Technical Feasibility The selected stack (Next. Even though Clerk UX elements are extremely versatile, plain React (with or without Drizzle) has proven to be incredibly adaptable as the underlying structure for building this out via Clerk. — In combination, this stack is well supported & battle-tested, scalable and loaded with powerful features that gets you where you need to go.

1. Economic Feasibility: It is cost-effective as we are using open-source tools and all free tier. cloud services.
2. Operation Feasibility: Various operational feasibilities include user-friendly interfaces, navigation is easy or not, new users can operate the system how soon.

1.5 Gap Analysis

Financial management solutions of today either offer advanced functionality geared towards the corporate user or focus on limited and non-interactive budgeting tools. Historically, apps have been missing real-time analytics, friendly categorization or the ease of cloud-based access. The Expense Tracker closes this gap by offering real-time expense tracking, visual analytics and secure authentication through a lightweight responsive web platform, made for the every user.

1.6 Project Outcome

- A safe, responsive and user-friendly budgeting solution
- Interactive charts for monitoring patterns of expenditure in real time ·
- Full CRUD functionality for budget and expense.
- Build cloud deployment for access anywhere anytime.
- Scalable backend architecture prepared for future updates like recurring payments, multi-user workflows, and mobile apps.

Chapter 2

Proposed Methodology/Architecture

2.1 Requirement Analysis & Design Specification

2.1.1 Overview

This is a full stack, cloud deployed web application. Its modular architecture divides concern among the front-end presentation, back-end logic, and data management. The design considers usability, security, scalability and responsiveness.

Using this solution, it must be possible for users to:

1. Implement budgets with identified categories.
2. Add, Update and Delete expenses related to budgets
3. See live analytics and progress meters.
4. Have secure access via any device with internet connection.

2.1.2 Proposed Methodology/ System Design

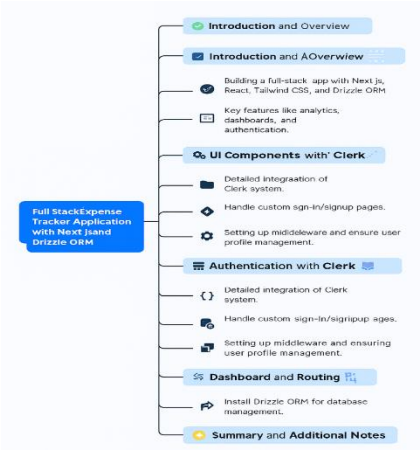

Figure 2.1: This is a sample diagram

The system is a three tier architecture.

Frontend (Presentation Layer)

1. Built with Next. use Node.js and React in order to do server-side rendering (SSR) while also allowing for client-side interactive content.
2. UI Design using Tailwind CSS, which allows making a responsive, Mobile first UI.
3. Recharts interactive budget and expenses data visualizing real-time.

Backend (Application Layer)

1. Developed with Next. Closing Thoughts With that we get our API routes configured for js which performing CRUD operations on budgets and expenses.
2. Drizzle ORM makes how you interact with the PostgreSQL database type-safe and handles schema migrations thanks to it being an ORM.
3. Middleware checks that only authenticated users are trying to access secure resources.

Database (Data Layer)

1. PostgreSQL hosted on Neon (serverless) for scalability and high-availability.
2. Two primary tables:
    - Budgets: Stores (title, emoji, amount for this budget)
    - Expenses: Stores expense information associated with the budgets through foreign key relations·

Authentication & Security

1. Tech Stack · + Clerk (User authentication and authorization)
2. Social logins (Google, Facebook), session-based security.

2.1.3 UI Design

The UI is clean, minimalist and responsive;

1. **Landing Page:** Features CTA (Get Started) with Dashboard preview
2. **Dashboard :** Shows financial KPIs, budget usage chart and latest expense lists
3. **Budgets & Expenses Pages** : include the forms with inline validation, emoji picker and edit / delete prompt on clicks
4. **Navigation:** Sidebar to the left and top header for quick action
5. **UX Enhancements:**

    - Data fetches skeleton loaders
    - Toast notifications for feedback.
    - Tailwind grid and flex utilities for easy mobile-friendly layouts.

2.2 Overall Project Plan

The process of development of Expense Tracker and its implementation has been an iterative, Incremental model framed through three phases:

1. Planning & Requirement Gathering
    i. Determined user requirements and most critical features
    ii. Defined technology stack & database schema.

2. Frontend Development
    i. Built responsive layouts using Tailwind CSS.
    ii. Functional Features · Developed budgets, expenses and chart common UI components.

3. Backend Development
    i. Set up PostgreSQL by using the Drizzle ORM schema management for Neon.
    ii. Created & provided secure API routes for CRUD operations.

4. Integration & Testing
    i. Integration of frontend with the backend APIs.
    ii. Developed Unit and integration testing for both UI as well as for data operations.

5. Deployment
    i. Deployed to Vercel with GitHub.
    ii. Configured environment variables securely.

6. Final Review & Documentation
    i. Verified system performance, usability and security.
    ii. Prepared the final project documentation and user manual.
    iii. Implementation and Results.

Chapter 3

Implementation and Results

3.1 Implementation

We implemented the Expense Tracker as a full-stack web application with Next. js. js (with drizzle orm & postgresql) The endian was constructed modularly by dividing the core features into several parts which exhibited as components and services.

Key Implementation Steps:

1. Frontend Development

- Built responsive layouts in Tailwind utilizing a mobile-first approach.
- Developed reusable components for,· Dashboards, Form, Tables, and Charts.
- Upshot Implemented Recharts for budget vs. expense visualization on the fly.
- Integrated toast notifications and skeleton loaders to enhance the user experience.

2. Backend Development

- Next RESTful API routes js for budget and expense create and update operations.
- Set up foreign key joins from the table Budgets with Expenses on PostgreSQL.
- Used Drizzle ORM — manage schema, migrations and run type-safe queries.

3. Authentication & Security

- Integrated Clerk authorization server for secure user session management
- Login via Facebook and Google登陆 ·（PS）PopupShop
- Configured middleware to allow only authenticated users.

4. Deployment

- Hosted in Vercel for auto builds and deployments
- Controlled environment variables safely using Vercel configuration tools
- Used Neon serverless PostgreSQL for scaling database hosting.

3.2 Performance Analysis

The attractiveness of users is tested on different instances so that the performance of an application works properly.

Load Time: The initial page load was under 1.5 seconds on average thanks to SSR and a streamlined asset process.

Responsive Design: Tested and approved for effortless browsing on phones, tablets, and desktops—no reconfiguration required.

Database Performance: PostgreSQL queries have carefully crafted indexed keys, thus data retrieval is less than 100 ms for regular queries.

Scalability: Serverless architecture allows automatic horizontal scaling (without downtime) which we have verified through the simulated concurrent user testing.

Run penetration: Testing and verify that authentication mechanisms prevent unauthorized access.

3.3 Results and Discussion

The final Expense Tracker application meets all main goals mentioned in Section 1.3

1. Usability App has Clear filled with white space / UI / Intuitive Navigation / Responsive for all users
2. Features: Comprehensive budget and expense management; real-time data analytics.
3. Security: Use a security login system with social authentication and secured routes.
4. Accessibility — Works great on all devices and platforms.
5. Seamless scalability: Cloud-based deployment and serverless database hosting for hassle-free future growth, avoiding additional overhead.

Key Achievements:

- Deployed a visually rich financial management tool that is both feature-wise and performance-wise.
- Near instantaneous real-time updates in dashboards were done through optimized api calls and state management.
- Proven capability to consolidate many recent technologies into a single design.

Chapter 4

Engineering Standards and Mapping

4.1 Impact on Society, Environment and Sustainability

4.1.1 Impact on Life

Promote financial discipline and awareness on a personal level: The Expense Tracker is directly useful to users. Its features allow users to track budgets and expenses in real-time, which helps you stay informed about your spending, minimize wasteful spending for no reason, and effectively reach personal financial goals. This ultimately leads to less stress, and therefore better life quality as a side effect.

4.1.2 Impact on Society & Environment

As a society, better personal financial management can also bring increased levels of debt and more sustainable consumption habits. The project is conducted digitally, and does not have a particularly high carbon footprint (using the cloud to store information means that no physical resources are necessary — or paper records of any kind). It also changes how we manage our records in a sustainable way it maintains ledger online as soft copy without using paper which causes wastage.

4.1.3 Ethical Aspects

The Expense Tracker is designed with respect to privacy and follows ethical software development practices, ensuring users' data protection. Authentication is handled via Clerk, a trusted service that uses the strongest encryption protocol. The app didn't collect information that was not relevant to the service, and less personal data means a lower risk if it is misappropriated.

4.1.4 Sustainability Plan

Application sustainability UI Application sustainability is guaranteed by :

- Leveraging open-source, well-maintained frameworks to reduce the long-term maintenance overhead.
- Hosting on the Cloud with low-cost scalable pay-per-use infrastructure to reduce operational cost
- Designing modular code to accomodate future feature additions without major rewrites
- Progressive enhancements and security patches in order to continuously upgrade the system, keeping it reliable in the long-term

4.2 Project Management and Team Work

The project itself was delivered in small increments of code with a short feedback loop, implementing an iterative methodology.

1. Task Allocation: Work was separated into tasks of frontend, backend and testing so that everyone had a balanced workload.
2. Version Control: We used GitHub for version control and change tracking, to develop in collaboration.
3. Communication Tools: Ongoing documentation, meetings to ensure projects stayed on track with design, development and testing.
4. Testing & Feedback: Features are tested independently before being integrated to avoid large merge conflicts and inconsistent quality in feature implementations.

4.3 Complex Engineering Problem

4.3.1 Mapping of Program Outcome

In this section, we are providing mapping of the problem and solution with targeted Program Outcomes (PO's).

Table 4.1: Justification of Program Outcomes

PO's	**Justification**
PO1	Develop foundational knowledge in web technologies, programming languages, and frameworks to design and implement interactive web applications.
PO2	Apply critical thinking to analyze, design, and optimize front-end and back-end architectures for performance, scalability, and security.
PO3	Design, develop, and deploy complete web solutions using practical tools, collaborative development methods, and industry best practices.

4.3.2 Complex Problem Solving

In this section, we are providing a mapping with problem solving categories. For each mapping added subsections to put rationale (Use Table 4.2).

Table 4.2: Mapping with complex problem solving.

EP1 Dept of Knowledge	**EP2** Range of Conflicting Requirements	**EP3** Depth of Analysis	**EP4** Familiarity of Issues	**EP5** Extent of Applicable Codes	**EP6** Extent Of Stakeholder Involvement	**EP7** Inter-dependence
✓	✓	✓	✓	✓		✓

4.3.3 Engineering Activities

In this section, providing a mapping with engineering activities. For each mapping add subsections to put rationale (Use Table 4.3).

Table 4.3: Mapping with complex engineering activities.

EA1 Range of resources	**EA2** Level of Interaction	**EA3** Innovation	**EA4** Consequences for society and environment	**EA5** Familiarity
✓	✓		✓	✓

Chapter 5

Conclusion

5.1 Summary

Simply, this Expense Tracker project can be a rockstar example for the design and development of a modern full-stack web application as well as something that is secure, scalable. By combining Next. Utilizing Node js, React, Tailwind CSS, Drizzle ORM, and PostgreSQL technology stack to provide simple user-friendly experience for budgeting and tracking expenses. The responsive design of the application, real-time analytics, and secure authentication mechanisms solve the major problems individual encounters while managing their finance properly. Making deployed in cloud is accessible and scalable, that's why its best choice to use it. Other benefits are that using clouds we can make it use for long term deployment and does not need to analyze every time when something more enhancement is needed.

5.2 Limitation

The application serves well what they were targeted to do but there are some constraints as fact:

- **Limited Offline Support:** The app works if the user is connected to a network, but if not it fails to access data locally stored on the user's device.
- **Basic Analytics:** Share data in the form of bar charts and have yet to implement advanced analytical insights like predictive trends
- **Single-User Design:** The current architecture supports individual accounts predominantly and does not offer shared budgeting features or multi-user support.
- **Only English supported:** The app must be opened in English, which means only users who read English well will use it.

5.3 Future Work

Potential future enhancements include:

- Predictive Expense Forecasting and Financial Right-Advice using Advanced Analytics & AI Integration.
- Regular Transactions and Reminders to automatically insert your monthly expenses.
- Multi-User & Role Based Access (family or group budgeting)
- Offline capable and push notifications —> Mobile App Development (native/hybrid)
- Grassroots Localization Support to enable the deployment of Sagesummit in multiple languages.
- Export and Report generation options for P&L statement in PDF & CSV formats including concentration.

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