Expense Tracker

A PROJECT REPORT

Submitted by

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in partial fulfilment for the award of the degree of

Bachelor of Engineering (B.E.)

IN

Computer Science and Engineering (AI/ML)

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BONAFIDE CERTIFICATE

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Certified that this project report **"……. TITLE OF THE PROJECT……."** is the bonafide work of "**……..NAME OF THE CANDIDATE(S).……"** who carried out the project work under my/our supervision.

<<Signature of the Supervisors>>

SIGNATURE

<<Signature of the AGM-Technical>>

SIGNATURE

Submitted for the project viva-voce examination held on

INTERNAL EXAMINER

EXTERNAL EXAMINER

Expense Tracker

Project Description

Expense Tracker is a sophisticated, enterprise-grade expense management platform designed to streamline corporate expense reporting, approval workflows, and financial oversight. Built with modern web technologies and containerized architecture, the system provides a complete solution for organizations to manage employee expenses from submission to reimbursement with advanced features including OCR receipt processing, multi-currency support, and configurable approval workflows.

Technical Architecture

Frontend Technology Stack

The client-side application is built using **React 18** with **TypeScript**, providing type-safe development and enhanced developer experience. The UI framework leverages **Tailwind CSS** for responsive design and **Lucide React** for consistent iconography. The application follows a component-based architecture with context providers for state management, particularly for authentication and user session handling.

Key frontend features include:

- **Role-based navigation system** with dynamic menu generation based on user permissions (Admin, Manager, Employee)
- **Responsive design** optimized for desktop and mobile devices
- **Real-time notifications** system for approval status updates
- **File upload interface** with drag-and-drop support for receipt processing
- **Multi-currency expense forms** with automatic conversion capabilities

Backend Infrastructure

The server-side architecture is built on **Node.js** with **Express.js**, implementing a RESTful API design pattern. The backend utilizes **MySQL 8.0** as the primary database with connection pooling for optimal performance. Authentication is handled through **JWT (JSON Web Tokens)** with bcrypt password hashing for security.

Core backend capabilities:

- **OCR Processing Engine** using Tesseract.js for automatic receipt data extraction
- **Multi-file format support** including PDF parsing with pdf-parse and pdf2json libraries
- **Currency conversion API integration** with real-time exchange rates
- **Comprehensive audit logging** for compliance and tracking
- **Advanced approval workflow engine** supporting percentage-based, specific approver, and hybrid approval rules

Database Schema Design

The MySQL database implements a normalized schema with eight core tables:

Companies Table: Multi-tenant architecture supporting multiple organizations with country-specific default currencies.

Users Table: Role-based access control with hierarchical manager relationships supporting admin, manager, and employee roles.

Expenses Table: Comprehensive expense records including OCR metadata, receipt URLs, and approval status tracking with decimal precision for financial amounts.

Approvals Table: Sequential approval workflow management with status tracking and comment capabilities.

Approval Rules Table: Configurable business rules supporting percentage thresholds, specific approvers, and hybrid approval mechanisms stored as JSON for flexibility.

Notifications Table: Real-time user notification system with read status tracking and entity relationship mapping.

Expense Categories Table: Customizable expense categorization per company with default categories (Travel, Food, Office Supplies, Entertainment, Other).

Audit Logs Table: Comprehensive activity tracking for compliance with JSON detail storage for complex event data.

Core Functionality

Expense Management Workflow

The expense submission process begins with employees creating expense entries through an intuitive form interface. Users can upload receipts in various formats (images, PDFs) which are automatically processed using OCR technology to extract key information including merchant names, amounts, dates, and currencies. The system provides confidence scores for OCR accuracy and allows manual verification.

Upon submission, expenses enter the approval workflow engine which dynamically determines the required approvers based on configurable business rules. The system supports three approval rule types:

- **Percentage Rules**: Require a minimum percentage of designated approvers
- **Specific Approver Rules**: Mandate approval from particular individuals
- **Hybrid Rules**: Combine percentage thresholds with specific approver requirements

Advanced OCR and Receipt Processing

The platform integrates Tesseract.js for optical character recognition, supporting multiple image formats and PDF documents. The OCR engine extracts structured data including:

- Merchant/vendor information
- Transaction amounts and currencies
- Transaction dates
- Line item details where available
- Confidence scores for data accuracy

Processed data is stored alongside original user inputs, enabling comparison and validation workflows. The system maintains original receipt files with secure URL generation for audit purposes.

Multi-Currency Support and Exchange Rates

ExpenseTracker provides comprehensive multi-currency functionality with real-time exchange rate integration. The system supports major global currencies with automatic conversion capabilities for reporting and approval processes. Exchange rates are fetched from external APIs with fallback mechanisms and caching for reliability.

Currency features include:

- Company-specific default currency configuration
- Real-time conversion rates with provider metadata
- Historical rate tracking for audit compliance
- Multi-currency expense reporting and analytics

Role-Based Access Control and Security

The platform implements a three-tier role system:

Employees can submit expenses, upload receipts, view their submission history, and receive notifications about approval status changes.

Managers have employee capabilities plus approval authority for assigned expenses, team expense visibility, and basic reporting access.

Administrators possess full system access including user management, approval rule configuration, company settings, audit log access, and comprehensive reporting capabilities.

Security measures include JWT-based authentication, bcrypt password hashing, role-based API endpoint protection, and comprehensive audit logging for compliance requirements.

Deployment and Infrastructure

Containerization Strategy

The application utilizes Docker containerization with Docker Compose orchestration for simplified deployment and scaling. The architecture consists of three primary containers:

Frontend Container: Nginx-served React application with production optimizations and reverse proxy configuration.

Backend Container: Node.js API server with health checks and graceful shutdown handling.

Database Container: MySQL 8.0 with persistent volume storage and health monitoring.

Environment Configuration

The system supports flexible environment configuration through .env files with required variables including database credentials, JWT secrets, admin access keys, and external API keys for currency services. The Docker Compose configuration includes health checks ensuring proper startup sequencing and service dependencies.

Scalability and Performance

The architecture supports horizontal scaling through container orchestration with database connection pooling, efficient query optimization, and static asset serving through CDN-ready configurations. The system includes comprehensive error handling, graceful degradation, and monitoring capabilities for production environments.

Advanced Features and Integrations

Notification System

Real-time notification engine provides users with immediate updates on expense status changes, approval requirements, and system events. Notifications support multiple types including approval requests, rejections, escalations, and informational messages with read status tracking.

Audit and Compliance

Comprehensive audit logging captures all system activities including user actions, approval decisions, configuration changes, and data modifications. Audit logs include detailed JSON metadata for forensic analysis and compliance reporting with timestamp precision and user attribution.

Approval Workflow Engine

The sophisticated approval engine supports complex business rules with sequential and parallel approval paths. The system handles approval escalation, automatic stage progression, and dynamic approver resolution based on organizational hierarchies and business rules.

File Management and Security

Secure file upload handling with type validation, size limits, and virus scanning capabilities. Receipt files are stored with UUID-based naming for security and organized directory structures for efficient retrieval and backup operations.

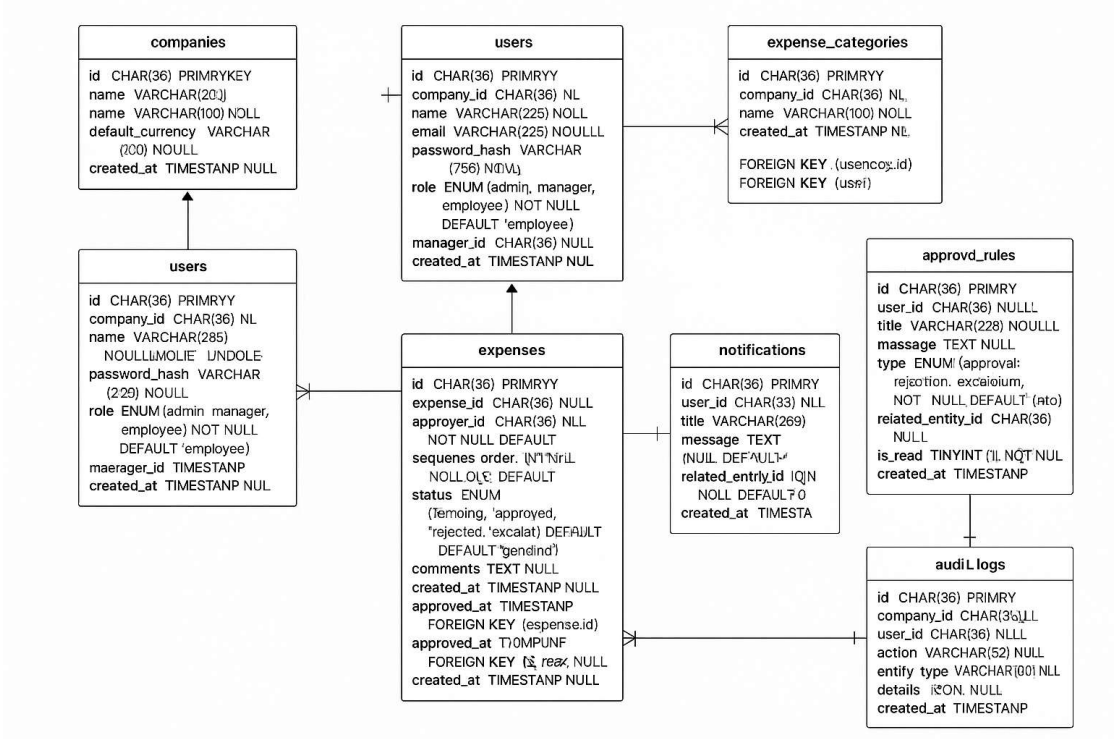
This enterprise-grade expense management platform provides organizations with a complete solution for modern expense reporting needs, combining user-friendly interfaces with powerful backend capabilities and enterprise security standards.

Software Requirements

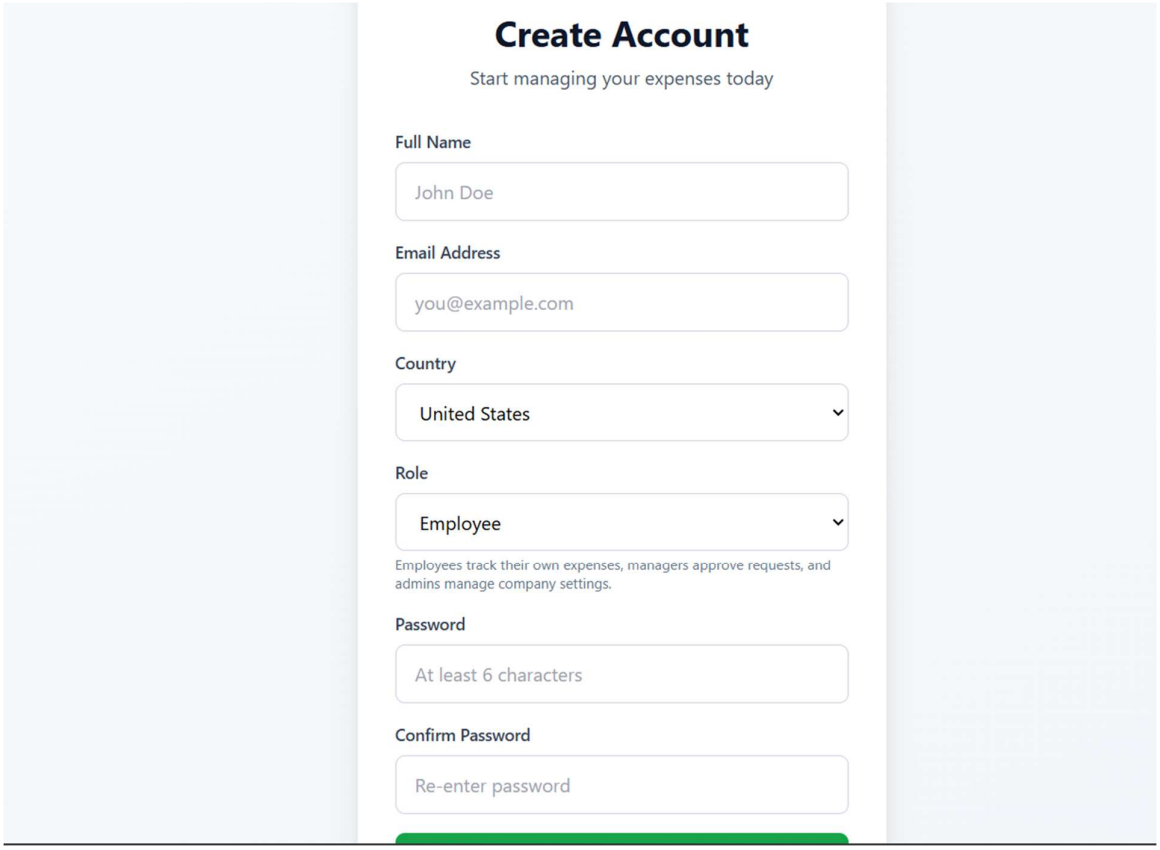
- **Operating System:** Windows / macOS / Linux
- **Node.js & npm:** For running the backend and managing packages
- **MongoDB:** Database to store application data
- **Express.js:** Backend framework for API development
- **React.js:** Frontend library for building user interfaces
- **Code Editor:** VS Code (recommended)
- **Browser:** Google Chrome (for testing)
- **Postman / Thunder Client:** For API testing
- **Git & GitHub:** For version control and collaboration

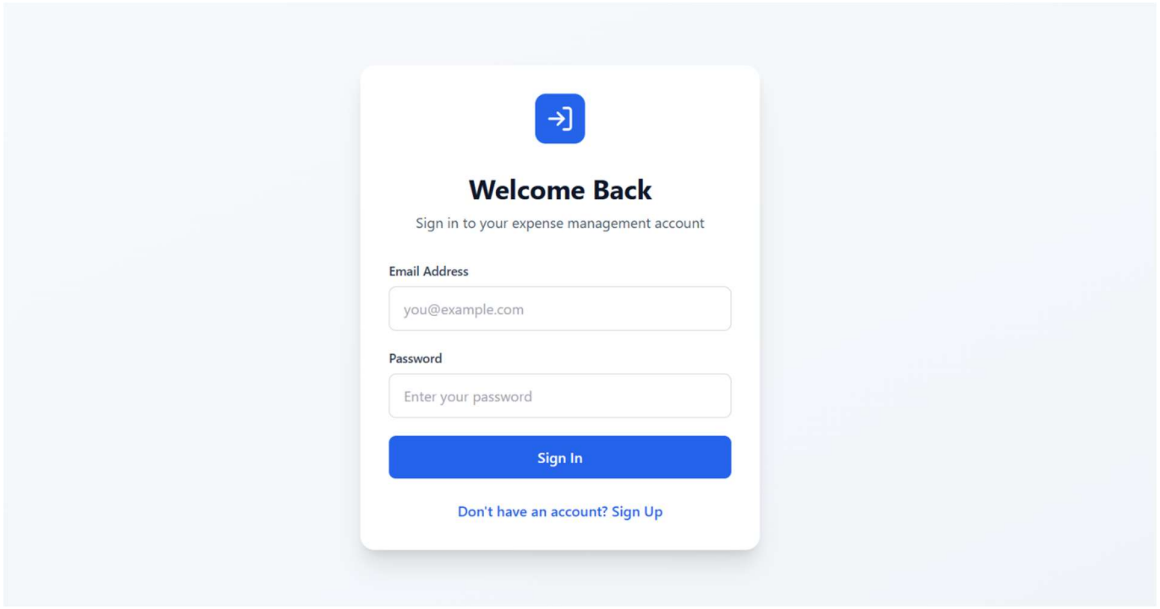
ER Diagram

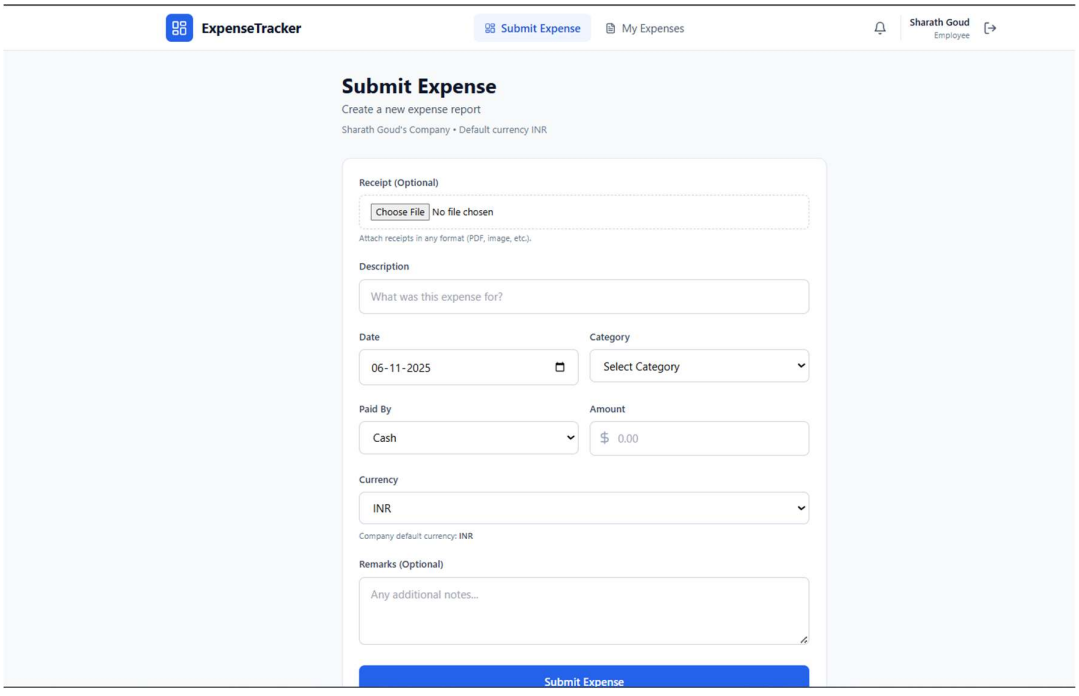
Database Schema

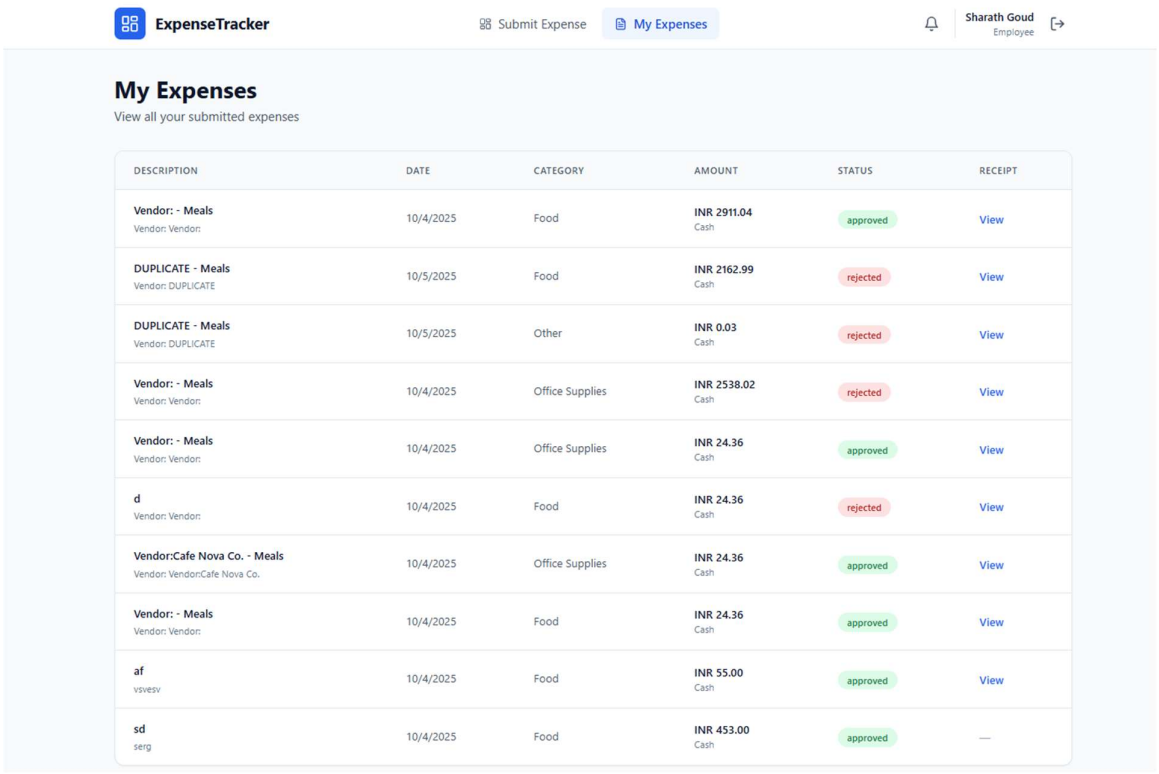


Front-End Screens




Welcome Back
Sign in to your expense management account
Email Address
you@example.com
Password
Enter your password
Sign In
Don't have an account? Sign Up


ExpenseTracker
Submit Expense
My Expenses
Sharath Goud
Employee
Submit Expense
Create a new expense report
Sharath Goud's Company • Default currency INR
Receipt (Optional)
Choose File
No file chosen
Attach receipts in any format (PDF, image, etc.).
Description
What was this expense for?
Date
06-11-2025
Category
Select Category
Paid By
Cash
Amount
$ 0.00
Currency
INR
Company default currency: INR
Remarks (Optional)
Any additional notes...
Submit Expense


ExpenseTracker
Submit Expense
My Expenses
Sharath Goud
Employee
My Expenses
View all your submitted expenses
DESCRIPTION
DATE
CATEGORY
AMOUNT
STATUS
RECEIPT
Vendor: - Meals
Vendor: Vendor:
10/4/2025
Food
INR 2911.04
Cash
approved
View
DUPLICATE - Meals
Vendor: DUPLICATE
10/5/2025
Food
INR 2162.99
Cash
rejected
View
DUPLICATE - Meals
Vendor: DUPLICATE
10/5/2025
Other
INR 0.03
Cash
rejected
View
Vendor: - Meals
Vendor: Vendor:
10/4/2025
Office Supplies
INR 2538.02
Cash
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Office Supplies
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10/4/2025
Food
INR 24.36
Cash
rejected
View
Vendor:Cafe Nova Co. - Meals
Vendor: Vendor:Cafe Nova Co.
10/4/2025
Office Supplies
INR 24.36
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Food
INR 453.00
Cash
approved
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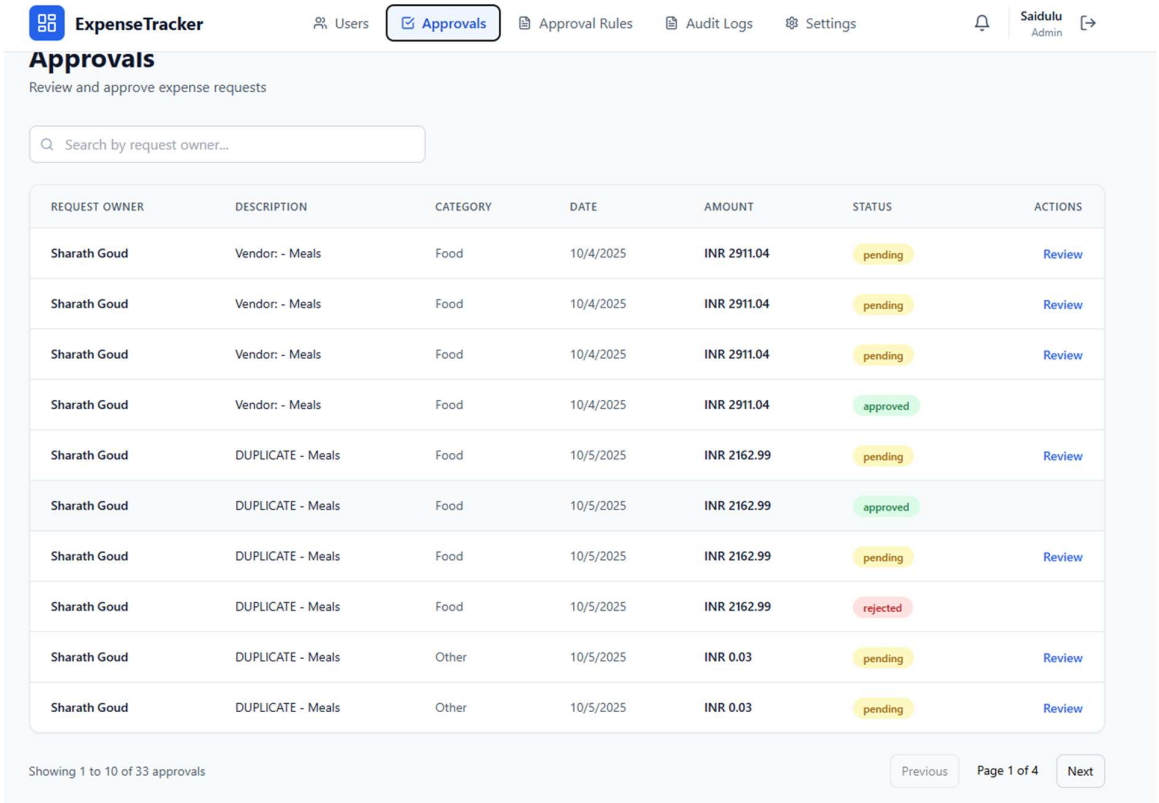
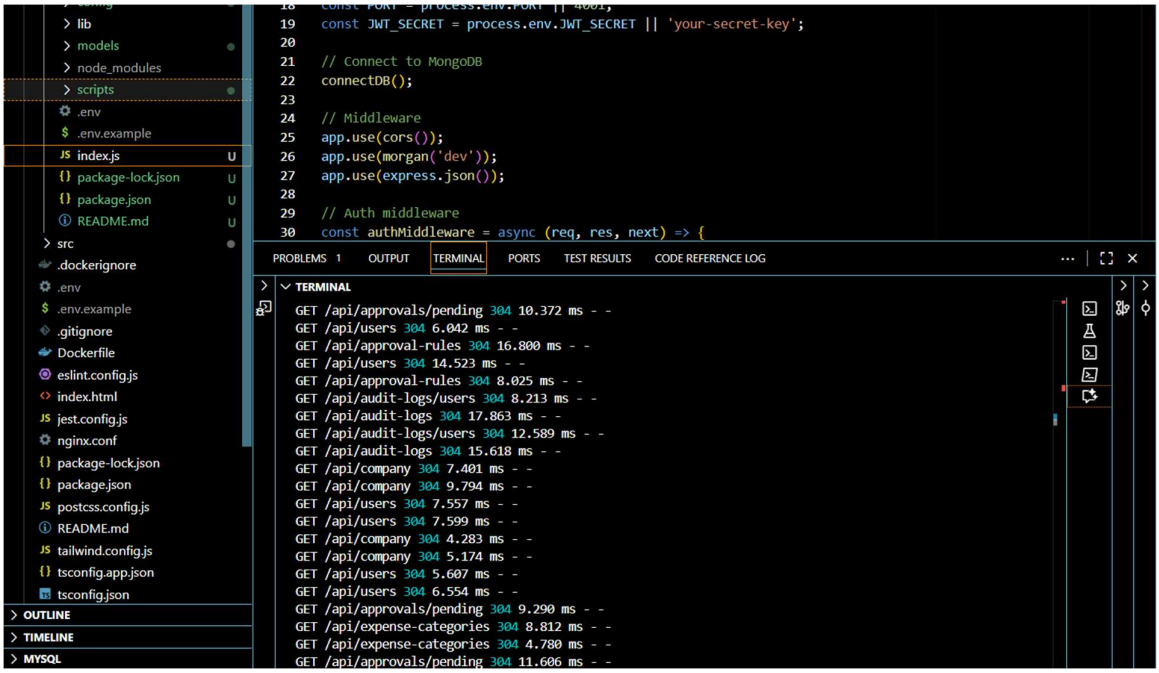

ExpenseTracker
Users
Approvals
Approval Rules
Audit Logs
Settings
Saidulu
Admin
Approvals
Review and approve expense requests
Search by request owner...
REQUEST OWNER
DESCRIPTION
CATEGORY
DATE
AMOUNT
STATUS
ACTIONS
Sharath Goud
Vendor: - Meals
Food
10/4/2025
INR 2911.04
pending
Review
Sharath Goud
Vendor: - Meals
Food
10/4/2025
INR 2911.04
pending
Review
Sharath Goud
Vendor: - Meals
Food
10/4/2025
INR 2911.04
pending
Review
Sharath Goud
Vendor: - Meals
Food
10/4/2025
INR 2911.04
approved
Sharath Goud
DUPLICATE - Meals
Food
10/5/2025
INR 2162.99
pending
Review
Sharath Goud
DUPLICATE - Meals
Food
10/5/2025
INR 2162.99
approved
Sharath Goud
DUPLICATE - Meals
Food
10/5/2025
INR 2162.99
pending
Review
Sharath Goud
DUPLICATE - Meals
Food
10/5/2025
INR 2162.99
rejected
Sharath Goud
DUPLICATE - Meals
Other
10/5/2025
INR 0.03
pending
Review
Sharath Goud
DUPLICATE - Meals
Other
10/5/2025
INR 0.03
pending
Review
Showing 1 to 10 of 33 approvals
Previous
Page 1 of 4
Next

Output Screens and Reports



Limitation & Future Scope

Current Limitations

Technical Limitations

- **Single Database Instance**: No database clustering or replication support
- **File Storage**: Local file system storage without cloud backup
- **OCR Accuracy**: Limited to Tesseract.js with basic text extraction
- **Real-time Features**: Polling-based notifications instead of WebSocket
- **Scalability**: Vertical scaling only, no horizontal distribution
- **API Rate Limiting**: No built-in rate limiting or throttling
- **Caching**: No Redis or memory caching implementation

Functional Limitations

- **Offline Support**: No offline expense submission capability
- **Mobile App**: Web-only interface, no native mobile applications
- **Integration**: Limited third-party integrations (accounting software, ERP)
- **Reporting**: Basic reporting without advanced analytics or dashboards
- **Bulk Operations**: No bulk expense import/export functionality
- **Multi-language**: English-only interface
- **Advanced OCR**: No AI-powered receipt analysis or line-item extraction

Business Limitations

- **Workflow Complexity**: Simple approval rules without complex business logic

- **Budget Management**: No budget tracking or spending limits
- **Expense Policies**: No automated policy enforcement
- **Reimbursement**: No integrated payment processing
- **Tax Compliance**: No tax calculation or compliance features
- **Mileage Tracking**: No GPS-based mileage calculation

Future Scope & Enhancements

Phase 1: Core Improvements (3-6 months)

- **Enhanced OCR**: AI-powered receipt analysis with line-item extraction
- **Mobile Applications**: Native iOS/Android apps with offline support
- **Advanced Reporting**: Interactive dashboards and analytics
- **Bulk Operations**: CSV import/export for expenses and users
- **Real-time Notifications**: WebSocket implementation
- **API Rate Limiting**: Request throttling and security enhancements

Phase 2: Integration & Automation (6-12 months)

- **Accounting Integration**: QuickBooks, SAP, Oracle integration
- **Payment Processing**: Automated reimbursement via banking APIs
- **Credit Card Integration**: Direct expense import from corporate cards
- **Email Integration**: Expense submission via email forwarding
- **Calendar Integration**: Automatic expense categorization based on calendar events
- **Expense Policies**: Configurable policy rules with automatic validation

Phase 3: Advanced Features (12-18 months)

- **AI/ML Analytics**: Spending pattern analysis and fraud detection
- **Budget Management**: Department budgets with real-time tracking
- **Mileage Tracking**: GPS-based automatic mileage calculation
- **Multi-currency Hedging**: Currency risk management tools
- **Blockchain Integration**: Immutable audit trails
- **Voice Interface**: Voice-activated expense submission

Phase 4: Enterprise Scale (18+ months)

- **Microservices Architecture**: Service decomposition for scalability
- **Multi-tenant SaaS**: White-label solution for multiple organizations
- **Advanced Workflow Engine**: Complex approval workflows with conditions
- **Compliance Modules**: SOX, GDPR, industry-specific compliance
- **Global Localization**: Multi-language and regional tax support

- **Enterprise SSO**: SAML, LDAP, Active Directory integration

Technology Roadmap

Infrastructure Enhancements

- **Cloud Migration**: AWS/Azure deployment with auto-scaling
- **Database Optimization**: Read replicas, sharding, caching layers
- **CDN Integration**: Global content delivery for file storage
- **Monitoring**: Application performance monitoring (APM) tools
- **Security**: Advanced threat detection and prevention

Architecture Evolution

- **Event-Driven Architecture**: Asynchronous processing with message queues
- **API Gateway**: Centralized API management and versioning
- **Container Orchestration**: Kubernetes deployment
- **Serverless Functions**: Lambda functions for specific operations
- **GraphQL API**: Flexible data querying capabilities

Data & Analytics

- **Data Warehouse**: Historical data analysis and reporting
- **Machine Learning**: Predictive analytics for expense forecasting
- **Business Intelligence**: Executive dashboards and KPI tracking
- **Data Export**: API integrations for external analytics tools

Market Expansion Opportunities

- **Industry Verticals**: Healthcare, construction, consulting-specific features
- **Geographic Expansion**: Region-specific compliance and currency support
- **Partner Ecosystem**: Third-party app marketplace and integrations
- **White-label Solutions**: Customizable platform for resellers

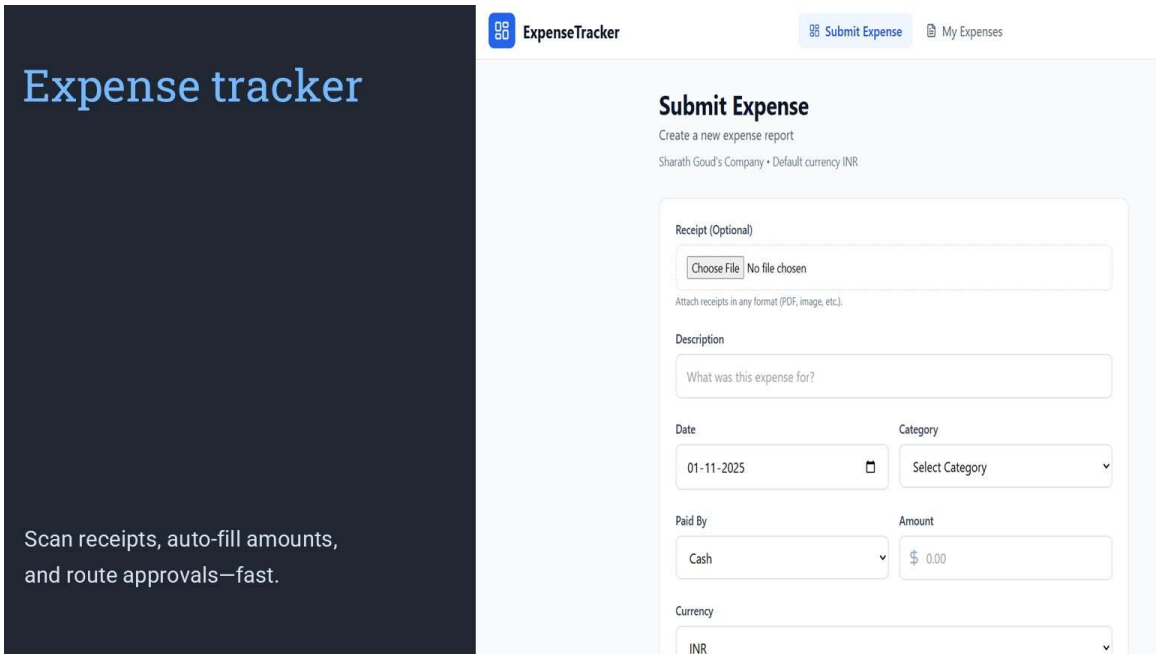
Success Metrics for Future Development

- **User Adoption**: 10,000+ active users within 2 years
- **Processing Volume**: $10M+ in expense processing monthly
- **Integration Count**: 50+ third-party integrations
- **Global Reach**: Support for 20+ countries and currencies
- **Performance**: Sub-second response times at scale
- **Reliability**: 99.9% uptime SLA achievement

GitHub URL

https://github.com/sharath2004-tech/hack-main

Presentation Slides



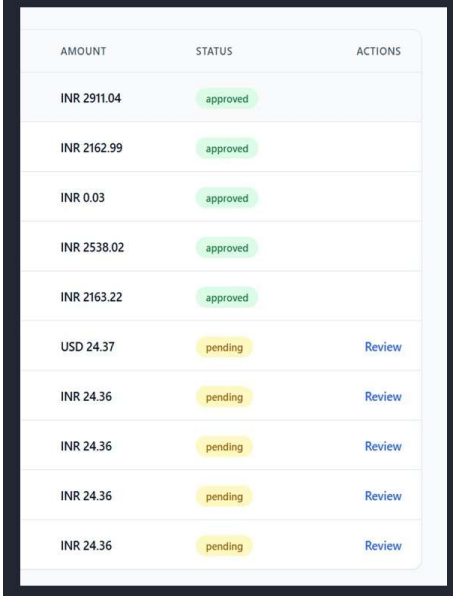
Core Goals & Success Metrics

Our Objectives

- Accurate capture directly from receipts
- Automatic currency normalization
- Configurable, rule-based approvals
- Complete audit trail for compliance

How We Measure Success

- Reduce manual entry time by 80%
- Decrease data-entry errors to near zero
- Cut approval cycles from days to hours
- Enable full regulatory traceability



AMOUNT	STATUS	ACTIONS
INR 2911.04	approved	
INR 2162.99	approved	
INR 0.03	approved	
INR 2538.02	approved	
INR 2163.22	approved	
USD 24.37	pending	Review
INR 24.36	pending	Review
INR 24.36	pending	Review
INR 24.36	pending	Review
INR 24.36	pending	Review

Feature Overview

Receipt OCR

Scan PDFs or images; OCR extracts vendor, date, amount, and currency with resilient fallback parsing.

Auto FX Conversion

Detects non-company currencies and converts to default denomination instantly.

Smart Approvals

Rule-based routing: percentage thresholds, specific approvers, or hybrid logic with auto-escalation.

Audit & Compliance

Complete logs of all actions, edits, and approvals for regulatory confidence and dispute resolution.

Technical Architecture

01

Frontend Layer

React + Vite + TypeScript + Tailwind for responsive, fast UI with receipt upload and real-time form management.

02

Backend APIs

Express.js with JWT authentication, role-based access control, and comprehensive health checks for reliability.

03

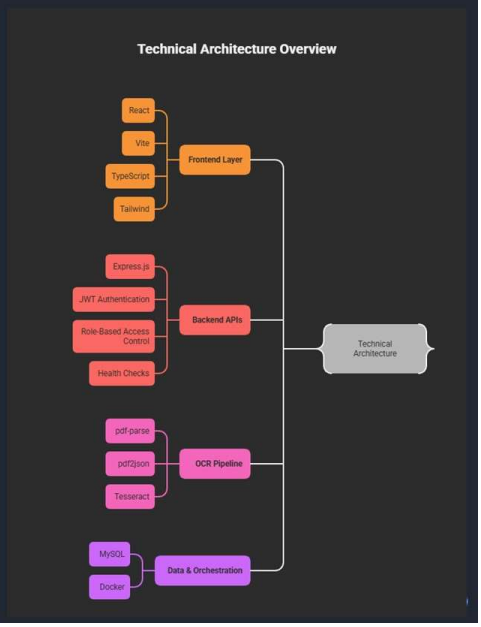
OCR Pipeline

Multi-stage parsing: pdf-parse primary, pdf2json fallback for malformed files, tesseract for image confidence scoring.

04

Data & Orchestration

MySQL for relational storage; Docker containerization for local development and production consistency.



Data Model: The Foundation

Our schema captures every dimension of the expense lifecycle—from capture through approval to archival:

Entity	Primary Purpose	Key Fields
Users	Identity and roles	ID, email, role (admin/manager/employee), company
Expenses	Unified expense record	ID, vendor, amount (normalized), currency, date, status, user_id
Approvals	Approval workflow state	ID, expense_id, approver_id, stage, decision, timestamp
Approval Rules	Routing logic	ID, rule_type, threshold, approver_group, company_id
Audit Logs	Compliance trail	ID, action, user_id, resource_id, timestamp, details
Categories	Expense classification	ID, name, company_id

Receipt OCR & Smart Parsing

How It Works

Upload a receipt (PDF or image). Our pipeline intelligently extracts:

- **Vendor name** — recognized merchant
- **Transaction date** — when expense occurred
- **Amount & currency** — total and denomination
- **Description** — line items or category hints

Confidence scores displayed for image-based captures via Tesseract. Manual overrides always allowed.

SAMPLE RECEIPT — FOR TESTING PURPOSES ONLY

THIS IS A FAKE/DEMO RECEIPT. DO NOT USE FOR REAL TRANSACTIONS.

Vendor: Cafe Nova Co.
Receipt #: RCPT-777857
Date: 2025-10-04
Payment Method: Card (VISA **** 4242)

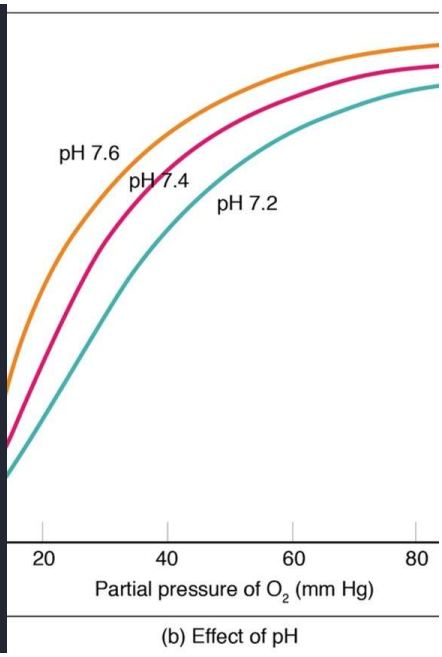
Billed To: Uma Maheshwari

Item	Qty	Unit Price	Amount
Cappuccino	2	USD 3.50	USD 7.00
Caesar Salad	1	USD 7.25	USD 7.25
Sandwich (Veg)	1	USD 5.00	USD 5.00
Bottled Water	2	USD 1.25	USD 2.50

Subtotal:	USD 21.75
Tax (7%):	USD 1.52
Service (5%):	USD 1.09
Total:	**USD 24.36**

Currency Conversion: Seamless Normalization

1. **Receipt Detected**
   Foreign currency identified (e.g., EUR, GBP, JPY)
2. **Live Rate Fetch**
   ExchangeRate API queried; timestamp recorded for audit
3. **Auto-Convert**
   Amount converted to company default; user sees both original and normalized
4. **One-Click Submit**
   Minimal friction; normalized amount pre-filled and ready for approval



(b) Effect of pH

Approval Workflow: Intelligent Routing

Expenses follow rule-based approval chains that activate automatically based on amount, department, and user role:

Percentage Rules

Route to specific approver if amount exceeds threshold (e.g., >$500 to Director).

Real-Time Notifications

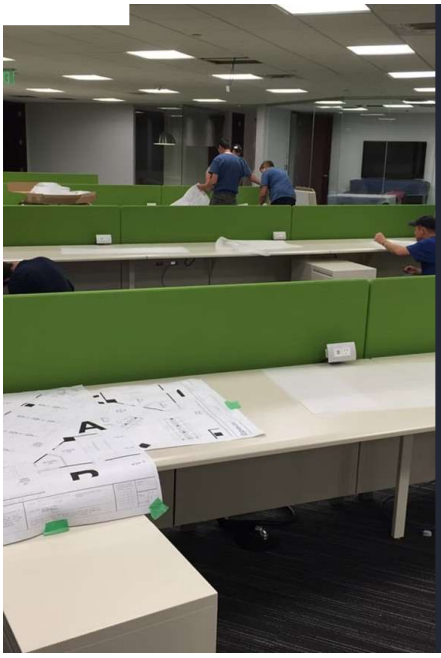
Approvers notified instantly; requester sees status updates at each stage.

Specific Approver

Assign fixed approver for certain expense categories or departments.

Hybrid Logic

Combine rules—e.g., <$200 auto-approve, $200–$1K to manager, >$1K to executive.



Roadmap & Next Steps

Phase 1: MVP Launch

Receipt OCR, currency conversion, rule-based approvals, and audit logs live in production.

Phase 2: Reporting & Insights

Export capabilities, analytics dashboard, spending trends, and compliance reports by department.

Phase 3: Integrations & Scale

Slack/email alerts, mobile-ready capture, SSO, rate limiting, and enhanced observability.

Expected Outcomes: 80% reduction in entry time, near-zero data errors, approval cycles cut from days to hours, and full regulatory traceability—ready for questions and feedback.

Project Code

Authentication & JWT

JWT Token Creation & Validation

```
// server/index.js - JWT Authentication
import jwt from 'jsonwebtoken';
import bcrypt from 'bcryptjs';

const createToken = (user) =>
  jwt.sign(
    {
      sub: user.id,
      companyId: user.company_id,
      role: user.role,
    },
    JWT_SECRET,
    { expiresIn: '7d' }
  );

const authMiddleware = (req, res, next) => {
  const header = req.headers.authorization;
  if (!header || !header.startsWith('Bearer ')) {
    return res.status(401).json({ error: 'Unauthorized' });
  }

  const token = header.slice(7);
  try {
    const payload = jwt.verify(token, JWT_SECRET);
    req.auth = {
      userId: payload.sub,
      companyId: payload.companyId,
      role: payload.role,
    };
    next();
  } catch (error) {
    return res.status(401).json({ error: 'Invalid or expired token' });
```

```
  }
};

// Login endpoint
app.post('/api/auth/login', async (req, res, next) => {
  const { email, password } = req.body;

  try {
    const [rows] = await pool.query('SELECT * FROM users WHERE email = ?',
[email]);
    if (rows.length === 0) {
      return res.status(401).json({ error: 'Invalid credentials' });
    }

    const user = rows[0];
    const passwordMatches = await bcrypt.compare(password, user.password_hash);

    if (!passwordMatches) {
      return res.status(401).json({ error: 'Invalid credentials' });
    }

    const token = createToken(user);
    res.json({ token, user: sanitizeUser(user) });
  } catch (error) {
    next(error);
  }
});
```

Database Schema

Core Tables Definition

```
-- Complete database schema
CREATE TABLE IF NOT EXISTS companies (
  id CHAR(36) PRIMARY KEY,
  name VARCHAR(255) NOT NULL,
  country VARCHAR(100) NOT NULL,
  default_currency VARCHAR(10) NOT NULL,
  created_at TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
);

CREATE TABLE IF NOT EXISTS users (
  id CHAR(36) PRIMARY KEY,
  company_id CHAR(36) NOT NULL,
  name VARCHAR(255) NOT NULL,
  email VARCHAR(255) NOT NULL UNIQUE,
  password_hash VARCHAR(255) NOT NULL,
  role ENUM('admin', 'manager', 'employee') NOT NULL DEFAULT 'employee',
  manager_id CHAR(36) NULL,
  created_at TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
```

```
  FOREIGN KEY (company_id) REFERENCES companies(id),
  FOREIGN KEY (manager_id) REFERENCES users(id)
);

CREATE TABLE IF NOT EXISTS expenses (
  id CHAR(36) PRIMARY KEY,
  company_id CHAR(36) NOT NULL,
  user_id CHAR(36) NOT NULL,
  description VARCHAR(255) NOT NULL,
  date DATE NOT NULL,
  category_id CHAR(36) NULL,
  paid_by VARCHAR(100) NOT NULL,
  amount DECIMAL(12,2) NOT NULL,
  currency VARCHAR(10) NOT NULL,
  remarks TEXT NULL,
  receipt_url VARCHAR(500) NULL,
  status ENUM('pending', 'approved', 'rejected') NOT NULL DEFAULT 'pending',
  created_at TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
  updated_at TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE
CURRENT_TIMESTAMP,
  FOREIGN KEY (company_id) REFERENCES companies(id),
  FOREIGN KEY (user_id) REFERENCES users(id),
  FOREIGN KEY (category_id) REFERENCES expense_categories(id)
);

CREATE TABLE IF NOT EXISTS approvals (
  id CHAR(36) PRIMARY KEY,
  expense_id CHAR(36) NOT NULL,
  approver_id CHAR(36) NOT NULL,
  sequence_order INT NOT NULL DEFAULT 1,
  status ENUM('pending', 'approved', 'rejected', 'escalated') NOT NULL DEFAULT
'pending',
  comments TEXT NULL,
  created_at TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
  approved_at TIMESTAMP NULL,
  FOREIGN KEY (expense_id) REFERENCES expenses(id),
  FOREIGN KEY (approver_id) REFERENCES users(id)
);
```

Expense Management

Expense Creation with OCR

```
// server/index.js - Expense creation endpoint
app.post('/api/expenses', authMiddleware, attachUser,
uploadReceipt.single('receipt'), async (req, res, next) => {
  const { description, date, category_id, paid_by, amount, currency, remarks } =
req.body;
  const receiptFile = req.file || null;
  const receiptDiskPath = receiptFile ? path.join(receiptsDir,
receiptFile.filename) : null;

  if (!description || !date || !category_id || !amount || !currency) {
    await removeFileQuietly(receiptDiskPath);
    return res.status(400).json({ error: 'Missing required fields' });
  }

  const normalizedAmount = Number(amount);
  if (Number.isNaN(normalizedAmount) || normalizedAmount <= 0) {
    await removeFileQuietly(receiptDiskPath);
    return res.status(400).json({ error: 'Amount must be a positive number' });
  }

  const receiptUrl = receiptFile ? `/uploads/receipts/${receiptFile.filename}` :
null;
  let ocrAnalysis = null;

  // OCR Processing
  if (receiptFile) {
    try {
      ocrAnalysis = await analyzeReceipt(receiptDiskPath, receiptFile.mimetype);
    } catch (error) {
      console.warn('Failed to analyze receipt for OCR suggestions', error);
    }
  }

  const connection = await pool.getConnection();
  try {
    await connection.beginTransaction();

    const expenseId = crypto.randomUUID();
    const now = currentSqlTimestamp();

    // Insert expense
    await connection.query(
      `INSERT INTO expenses (id, company_id, user_id, description, date,
category_id, paid_by, amount, currency, remarks, receipt_url, status, created_at,
updated_at)
       VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?)`,
      [expenseId, req.user.company_id, req.user.id, description, date,
category_id, paid_by || 'Cash', normalizedAmount, currency, remarks || null,
receiptUrl, 'pending', now, now]
    );

    // Create approval workflow
    const rules = await fetchCompanyApprovalRules(connection,
req.user.company_id);
    const workflow = buildApprovalWorkflow(rules);

    // Create initial approvals
    if (workflow.length > 0) {
      const firstStage = workflow[0];
      const resolvedIds = await resolveApproverIds(connection,
req.user.company_id, firstStage.approverIds, req.user.id);
```

```tsx
// src/contexts/AuthContext.tsx
import React, { createContext, useContext, useEffect, useState } from 'react';

interface User {
  id: string;
  company_id: string;
  name: string;
  email: string;
  role: 'admin' | 'manager' | 'employee';
}

interface AuthContextType {
  user: User | null;
  loading: boolean;
  configError: string | null;
  login: (email: string, password: string) => Promise<void>;
  logout: () => void;
}

const AuthContext = createContext<AuthContextType | undefined>(undefined);

export const AuthProvider: React.FC<{ children: React.ReactNode }> = ({ children
}) => {
  const [user, setUser] = useState<User | null>(null);
  const [loading, setLoading] = useState(true);
  const [configError, setConfigError] = useState<string | null>(null);

  const API_URL = import.meta.env.VITE_API_URL;

  useEffect(() => {
    if (!API_URL) {
      setConfigError('API URL not configured. Please set VITE_API_URL environment
variable.');
      setLoading(false);
      return;
    }

    const token = localStorage.getItem('token');
    if (token) {
      fetchUser(token);
    } else {
      setLoading(false);
    }
  }, [API_URL]);

  const fetchUser = async (token: string) => {
    try {
      const response = await fetch(`${API_URL}/api/auth/me`, {
        headers: { Authorization: `Bearer ${token}` },
      });

      if (response.ok) {
```

Docker Configuration

Docker Compose Setup

```yaml
# docker-compose.yml
version: '3.8'
services:
  db:
    image: mysql:8.0
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: root
      MYSQL_DATABASE: expense_db
      MYSQL_USER: expense_user
      MYSQL_PASSWORD: expense_pass
    ports:
      - "3306:3306"
    volumes:
      - db_data:/var/lib/mysql
    healthcheck:
      test: ["CMD", "mysqladmin", "ping", "-h", "localhost"]
      interval: 10s
      timeout: 5s
      retries: 5

  backend:
    build: ./hack-main/server
    depends_on:
      db:
        condition: service_healthy
    environment:
      DB_HOST: db
      DB_USER: expense_user
      DB_PASSWORD: expense_pass
      DB_NAME: expense_db
      JWT_SECRET: supersecret
```

```
      ADMIN_SIGNUP_KEY: adminkey
      EXCHANGE_RATE_API_KEY: "your_api_key_here"
    ports:
      - "4000:4000"
    volumes:
      - ./hack-main/server/uploads:/app/uploads
    restart: unless-stopped

  frontend:
    build: ./hack-main
    depends_on:
      - backend
    ports:
      - "80:80"
    restart: unless-stopped

volumes:
  db_data:
```

Backend Dockerfile

```
# hack-main/server/Dockerfile
FROM node:18-alpine

WORKDIR /app

COPY package*.json ./
RUN npm ci --only=production

COPY . .

RUN mkdir -p uploads/receipts

EXPOSE 4000

CMD ["node", "index.js"]
```

Frontend Dockerfile

```
# hack-main/Dockerfile
FROM node:18-alpine as builder

WORKDIR /app
COPY package*.json ./
RUN npm ci

COPY . .
RUN npm run build
```

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