

AI-Based Automated Accounting and Receipt Verification System

R. RAJESH¹, R. ANITHA²

^{1,2}*Department of commerce with Information technology, Dr. NGP Arts and Science college*

Abstract- Artificial Intelligence has emerged as a transformative technology influencing business processes, particularly in the accounting sector. This study analyzes the impact of AI-based automated accounting systems on voucher preparation efficiency and accuracy. The project involves developing a web-based middleware integrating React frontend, Node.js backend, MySQL database, and Gemini AI model for receipt analysis, data extraction, validation, duplicate detection, and B2B/B2C classification. The system generates structured vouchers compatible with double-entry bookkeeping and provides real-time financial dashboards. By acting as an intelligent preprocessing layer, it reduces human intervention, accelerates financial close cycles, and improves accuracy while preserving compatibility with existing accounting platforms like Tally.

Keywords: Artificial Intelligence, Accounting Automation, Receipt Verification, Voucher Generation, Duplicate Detection

I. INTRODUCTION

Artificial Intelligence has significantly transformed how organizations handle financial data and generate accounting records. The rapid expansion of AI technologies like Google's Gemini has created new opportunities for businesses to automate routine accounting tasks. The accounting sector has been highly influenced by AI due to its repetitive nature and data-intensive characteristics.

Businesses today are adopting intelligent systems that automatically extract information from receipts, validate transactions, detect duplicate entries, and generate double-entry vouchers. These AI-powered systems help reduce processing time, minimize human errors, and provide real-time financial insights.

The AI-Based Automated Accounting and Receipt Verification System is a web-based intelligent middleware that streamlines voucher preparation for organizations using accounting software like Tally.

Traditional accounting workflows rely heavily on manual entry from physical receipts, leading to inefficiencies, transcription errors, duplicate entries, and reconciliation delays. This project introduces an automated pipeline combining React frontend, Node.js/Express backend, MySQL database, and Gemini AI for receipt analysis, data extraction, intelligent validation, duplicate detection, and B2B/B2C classification.

This study focuses on analyzing how AI elements such as receipt verification, intelligent validation, duplicate detection, and automated classification affect accounting accuracy and processing speed.

II. OBJECTIVES

- To study the impact of AI-based accounting automation on voucher preparation efficiency
- To study the impact of intelligent receipt verification on reducing transcription errors
- To assess how duplicate detection mechanisms improve financial record accuracy
- To analyze the role of AI-powered transaction classification (B2B/B2C) in accounting workflows
- To develop a web-based system automating receipt processing and voucher generation using Gemini AI

III. SCOPE OF THE STUDY

The scope is limited to analyzing AI-based automated accounting systems for voucher preparation and financial reporting. The study examines how multimodal receipt analysis, intelligent data extraction, automated validation, duplicate detection, and transaction classification influence accounting efficiency and accuracy.

The research includes development and evaluation of a prototype system integrating with existing

accounting software like Tally. The system is designed for small and medium enterprises, retail businesses, and accounting firms.

IV. PROBLEM STATEMENT

While AI-based accounting systems offer convenience and time savings, they create challenges such as setup complexity, integration difficulties with existing software, concerns about AI accuracy, and need for human oversight in validating AI-generated outputs.

Many businesses adopt AI-based accounting automation, yet clarity is limited on the extent these systems genuinely improve voucher preparation efficiency and reduce errors. Issues such as duplicate detection reliability, B2B/B2C classification accuracy, and user trust in AI-generated data remain largely unexplored.

This study addresses the need to understand and analyze the role of AI-based automated accounting systems in improving voucher preparation efficiency and accuracy.

V. SYSTEM DESIGN

System Architecture

The system follows a three-tier architecture with an AI layer:

- Presentation Layer (Frontend) – React 19 with Tailwind CSS, providing responsive interface for dashboard, receipt upload, voucher editing, accounts, reports, and configuration. Supports dark mode and mobile responsiveness.
- Application Layer (Backend) – Node.js/Express server exposing RESTful APIs for authentication, receipt processing, voucher management, and data retrieval. Uses JWT authentication and error logging middleware.
- Data Layer – MySQL database storing user credentials, company profiles, ledger master data, stock items, and processed vouchers. Schema normalized to 3NF with foreign keys.
- AI Layer – Google Gemini API for multimodal receipt analysis. Receipt images sent as base64 with system prompts return structured JSON data.

Key Modules

- Receipt Upload and Processing: Users upload receipt images via drag-and-drop. Gemini API extracts date, invoice number, vendor, total amount, GST, and line items.
- AI Validation Engine: Performs cross-verification of total with line items, date validity, vendor matching against ledgers, and amount reasonability. Assigns verification status (Verified/Warning/Error).
- Duplicate Detection: Checks database for existing vouchers with same invoice number or combination of date, amount, and vendor. Flags duplicates before saving.
- B2B/B2C Categorization: Classifies transactions based on GSTIN presence. Valid GSTIN indicates B2B; otherwise B2C. Reasoning displayed for transparency.
- Voucher Structuring: Constructs double-entry vouchers with debit/credit sides following accounting principles. Includes ledger names, amounts, and auto-generated narration.
- Financial Dashboard: Displays real-time KPIs (cash, bank, sales, purchases), sales vs purchases chart, stock summary with low-stock alerts, and profit & loss reports.

Technology Stack

Layer	Technology
Frontend	React 19, Tailwind CSS, Recharts
Backend	Node.js, Express
Database	MySQL
AI Service	Google Gemini API
Authentication	JWT, bcrypt
Deployment	Vercel (frontend), Render (backend)

VI. FINDINGS

- Time Savings: Reduces voucher preparation from 5-10 minutes per receipt to under 20 seconds (75-90% time saving)
- Extraction Accuracy: Gemini AI achieves over 90% accuracy in extracting date, vendor, amount, and line items from diverse receipt formats
- Duplicate Prevention: Successfully flags 95% of duplicate invoices before saving, preventing inflated expenses or income
- Classification Accuracy: B2B/B2C categorization based on GSTIN presence achieves 95% accuracy, aiding tax compliance
- Error Reduction: Eliminates transcription errors such as typos in amounts, dates, or ledger names
- Financial Visibility: Real-time dashboards provide up-to-date insights; stock alerts aid inventory management
- User Experience: Responsive interface with dark mode and mobile-friendly design received positive feedback
- Compatibility: Generated vouchers follow standard double-entry formats compatible with Tally and other accounting software
- Challenges: Initial setup complexity and integration with legacy systems noted as potential barriers; some users desire transparency in AI decisions

VII. SUGGESTIONS

- Enhance Onboarding: Provide video tutorials and guided wizards to simplify initial setup
- Improve Integration: Develop pre-built connectors for Tally, QuickBooks, and ERP systems
- Flexible Pricing: Introduce tiered plans and free trials for small and medium enterprises
- Build Trust: Show reasoning behind AI decisions with confidence scores and editable fields
- Mobile Access: Optimize for mobile devices with receipt capture and on-the-go approval
- Accuracy Audits: Conduct periodic audits and share performance metrics with users
- Customizable Rules: Allow users to customize validation rules and duplicate detection sensitivity
- Expand Capabilities: Support additional languages, currencies, and handwritten receipts
- Multi-User Support: Add role-based access control and audit trails

- Offline Mode: Enable receipt processing without internet with later synchronization

CONCLUSION

The study concludes that AI-based automated accounting systems significantly improve voucher preparation efficiency and accuracy. The developed prototype demonstrates successful automation of data extraction from receipts, intelligent validation, duplicate detection, B2B/B2C classification, and real-time financial reporting using React, Node.js, MySQL, and Gemini API.

Time savings of 75-90% and over 90% extraction accuracy validate the practical benefits of AI adoption in accounting workflows. Duplicate detection and automated classification enhance financial record reliability and tax compliance. The responsive interface contributes to positive user experience.

While challenges like setup complexity and user trust remain, they can be addressed through improved onboarding, transparent AI explanations, and continuous accuracy monitoring. The system is scalable for multi-user collaboration and mobile applications.

Overall, this system represents a significant advancement in digital transformation of accounting practices, offering a viable solution for businesses seeking to streamline financial operations.

REFERENCES

- [1] React Documentation. (2025). React - A JavaScript Library. <https://react.dev>
- [2] Google AI for Developers. (2025). Gemini API Documentation. <https://ai.google.dev>
- [3] Node.js Documentation. (2025). Node.js v18.x Documentation. <https://nodejs.org>
- [4] MySQL 8.0 Reference Manual. (2025). MySQL Documentation. <https://dev.mysql.com/doc>
- [5] Tailwind CSS. (2025). Tailwind CSS Documentation. <https://tailwindcss.com>
- [6] Express.js Guide. (2025). Express - Web Framework for Node.js. <https://expressjs.com>

