**AUTOMATION FOR LATECOMER MONITORING SYSTEM**

***Submitted by***

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**(AUTONOMOUS)**



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**BONAFIDE CERTIFICATE**

Certified that this project report “**LATE COMER MONITORING SYSTEM**

**”** is the bonafide work of KESAVAN.T**(912221104026).** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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# ABSTRACT

The Automation Latecomer Management System is designed to automate and streamline punctuality tracking across diverse organizations including corporate offices, educational institutions, government agencies, healthcare facilities, and retail establishments. Addressing the universal challenge of time discipline in workforce management, this digital solution replaces error-prone manual processes with an efficient technological approach. The system employs modern web technologies featuring React (Vite) for a high-performance frontend, Tailwind CSS for responsive cross-device compatibility, and a secure backend built on Node.js, Express.js with PostgreSQL (Supabase) for reliable data management. By standardizing late arrival tracking through a unified platform, the solution caters to the specific operational requirements of various sectors while maintaining consistent core functionality for attendance monitoring and reporting.

The system introduces two main interfaces—a scanner page for marking attendance and an admin panel for managing data. The scanner supports barcode scanning (using the ZXing decoding library) or manual input of member details while displaying real-time date and time. Each barcode contains a 16-digit numeric code, validated using the Luhn algorithm (checksum verification) to ensure accurate identification. The admin panel offers CRUD operations, including adding, editing, deleting, bulk importing via CSV, and exporting member and attendance data in PDF and Excel formats, categorized department-wise. Additional features like dashboards, authentication, and automated email reports (sent to officials such as HODs and principals) enhance security and usability.

By digitizing the process, organizations can reduce manual errors, improve transparency, and efficiently manage latecomer records. The system provides detailed analytics and downloadable reports (individual student/department reports and general batch/department summaries) for better decision-making. Future enhancements could include facial recognition for scanning and integration with SMS alerts for parents. This project ensures better monitoring and discipline, contributing to a more productive organizational environment.

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**ABBREVIATIONS**

|  |  |
| --- | --- |
| HTML | Hyper Text Markup Language |
| CSS | Cascading Styling Sheet |
| JS | JavaScript |
| API | Application Programming Interface |
| JSON | JavaScript Object Notation |
| DOM | Document Object Model |
| HTTP | Hypertext Transfer Project |
| SPA | Single Page Application |
| CRUD | Create, Read, Update, Delete |
| NPM | Node Package Manager |
| JSX | JavaScript XML |
| CDN | Content Delivery Network |
| ES | ECMA Script |
| VDOM | Virtual Document Object Model |
| JWT | JavaScript Web Token |
| PSQL | PostgreSQL |
|  |  |

# CHAPTER 1 INTRODUCTION

## SYSTEM OVERVIEW

In modern organizations across education, corporate, and institutional sectors, maintaining punctuality and tracking attendance has become a critical operational challenge. Traditional manual methods using registers or spreadsheets prove time-consuming, error-prone, and inefficient, lacking real-time monitoring capabilities and centralized data access. These limitations create significant gaps in workforce management and disciplinary oversight.

The Late Comer Management System provides a universal solution through an efficient web-based platform for tracking late arrivals. The system enables security personnel or administrators to record entries either via barcode scanning of organizational ID cards or manual data input. Upon processing, it automatically captures member details (name, rollno, department) with precise timestamps, storing all records in a secure cloud database for real-time tracking and comprehensive reporting.

Built with modern web technologies, the system features a React.js (Vite) frontend for optimal performance and Tailwind CSS for responsive design across all devices. The Node.js/Express.js backend handles robust API management and data processing, while PostgreSQL on Supabase ensures reliable relational data storage. JWT authentication implements role-based access control, restricting administrative functions like data modification and export to authorized personnel while adhering to security best practices.

This system empowers organizations to analyse attendance trends, identify punctuality patterns across departments/teams, and monitor individual compliance. By eliminating manual processes, it reduces administrative overhead, minimizes errors, and enhances operational transparency.

Over time, this system can help college administrations gain deeper insights into attendance patterns, department-wise punctuality, and individual student behavior. It reduces manual paperwork, eliminates duplication errors, and brings transparency to the student monitoring process.

In this project, we explore the architecture, design, and implementation of the Late Comer Monitoring System and demonstrate how modern full-stack web technologies can be effectively utilized to solve a real-world problem in the education sector. The proposed system not only ensures operational efficiency but also promotes digital transformation within campus environments, setting a precedent for future enhancements like facial recognition, SMS alerts to parents, and mobile app integration.

## OBJECTIVE OF THE PROJECT

* To develop a real-time web application for recording late entries via both manual input and barcode scanning.
* To enable gatekeepers, administrators and faculty to efficiently track punctuality across organizations.
* To reduce administrative workload through automated filtered reporting including:
* Department/team-wise latecomer analysis
* Daily attendance logs with timestamps
* To implement secure JWT authentication for role-based access control ensuring:
* Authorized record modifications
* Protected system configurations
* To design an intuitive interface using React.js and Tailwind CSS featuring:
* Visual clarity
* Cross-device responsiveness
* To establish reliable data management using:
* PostgreSQL on Supabase
* Structured storage architecture
* Guaranteed data integrity

### Existing system

The Current System Architecture in a generalized manner, as shown in Fig. 1.1

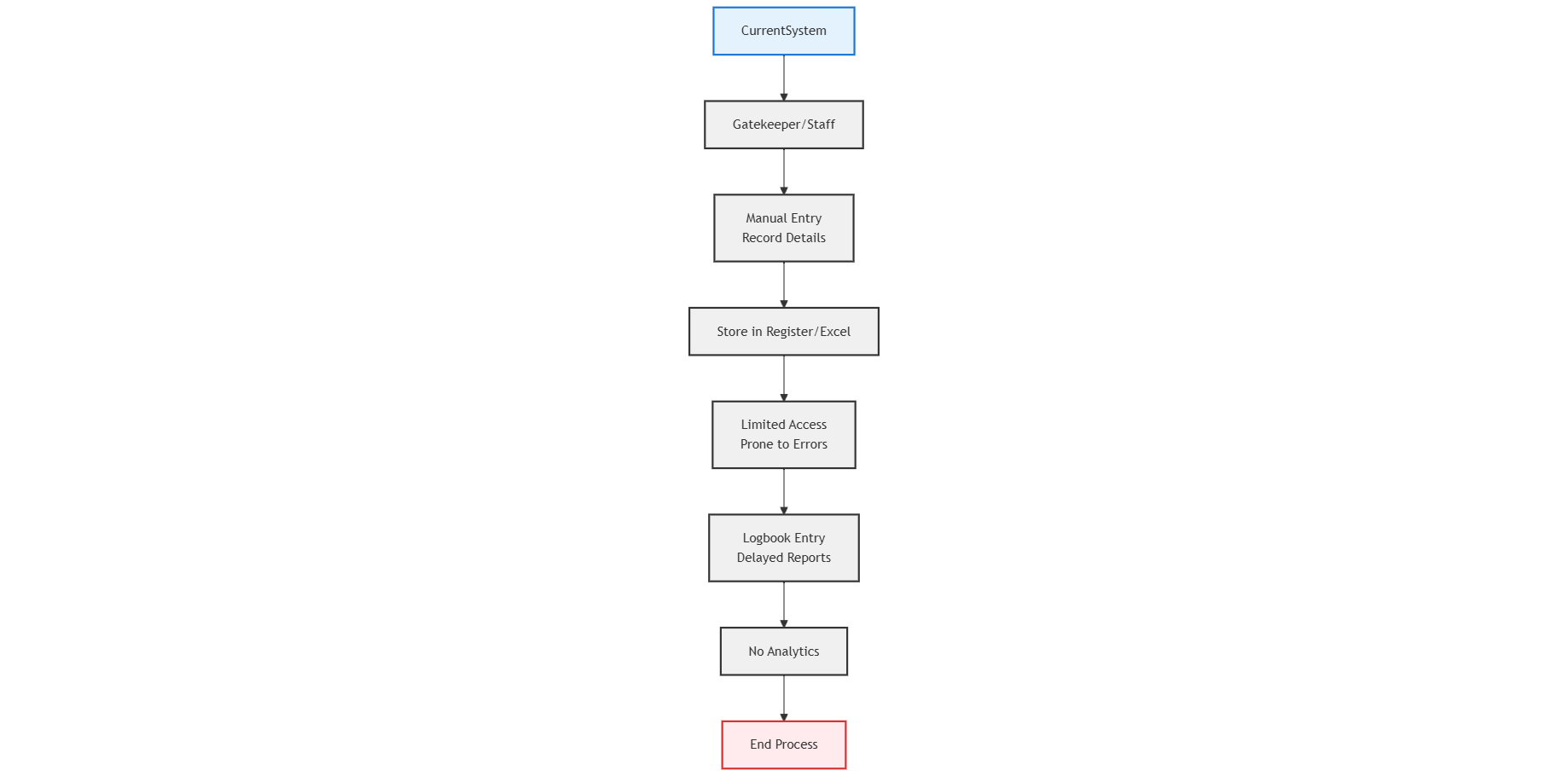


Fig. 1.1 Current System Architecture

* User: The primary actor in the current system is the gatekeeper or security staff, who is responsible for manually recording the details of students who arrive late. This usually involves writing down the student's name, roll number, and department in a register or logbook.
* Prone to error : A physical register or Excel sheet is used to record and store latecomer details. This method is prone to human error, lacks accuracy, and is difficult to manage or refer back to when needed.
* Logbook Entry: The current setup does not allow real-time access for department staff or administrators. Reports and student records must be collected manually, leading to delayed communication and action.
* No Automation: Since everything is manually handled, functionalities like automated report generation, filtering by date or department, and analytics are completely absent. Additionally, there is no role-based security or login authentication.

Now the current system works but it lacks efficiency and digital optimization. All entries are done manually, which increases the chances of human error and data loss. It is also time-consuming for both students and staff. Moreover, there is no proper analytics or tracking method to evaluate frequent latecomers. Since the system is paper-based, retrieving past data becomes difficult and cannot be accessed remotely or in real-time.

## 1.3 SCOPE OF THE PROJECT

The project aims to develop a web-based Late Comer Monitoring System to replace manual tracking methods with a digital, automated solution. The system will:

Streamline Data Entry: Allow staff to record late entries manually or via barcode scanning for faster, error-free input. Automatically capture student details (name, ID, department) and timestamp for accuracy.

Admin Control & Reporting: Provide an admin dashboard for managing records, generating reports, and filtering data by date, department, or student. Enable real-time monitoring of latecomer trends for better decision-making.

Database & Security: Store all records in a secure cloud database (Supabase/PostgreSQL) for easy access and backup. Implement role-based access (JWT authentication) to restrict unauthorized changes.

Institutional Benefits: Reduce manual paperwork and human errors in attendance tracking. Improve discipline management through automated analytics (e.g., frequent latecomers, department-wise trends).

### 1.3.2. Proposed system

The previous section discussed the limitations of the existing manual and semi-automated attendance systems. To improve efficiency, the proposed system includes all existing features along with the following enhancements –

* Barcode Scanner: This allows staff to scan student ID cards for quick and accurate late entry recording, minimizing human error and saving time.
* Real-Time Database Integration: All data collected through manual entry or barcode scanning is instantly stored in a centralized online database for easy access and updates.
* Filter and Report Module: Admin can filter records by department, date, or time, and generate reports for analysis or sharing with faculty and higher authorities.
* User Authentication: Admin access is secured with login credentials to prevent unauthorized data manipulation.
  + Flow of The System: In the proposed system Once the staff logs into the system, they can either manually enter student details or scan the barcode using the scanner interface. Upon submission, the data is processed and stored in the database. Admins can later retrieve and analyze these records using built-in filter and reporting options. This system ensures faster, secure, and more efficient handling of late comer information.

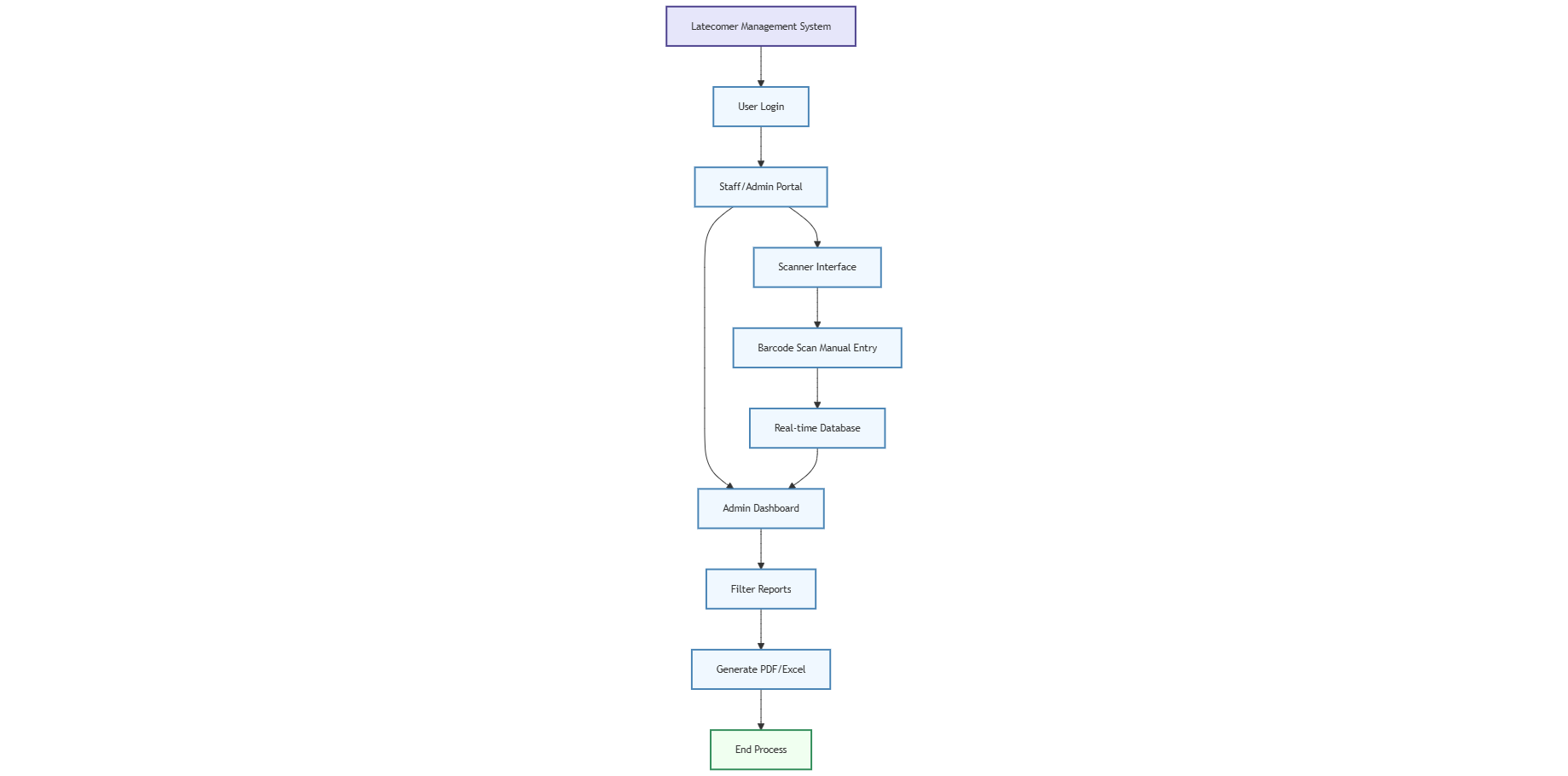


Fig 1.3.2 Proposed System Architecture

## 1.4 LITERATURE SURVEY

1. Smart Attendance System Using Barcode Scanner: This paper explores the implementation of barcode scanners for student attendance, significantly reducing time consumption compared to manual methods. It discusses how barcode technology can be effectively used in educational institutions to ensure accurate recording and real-time monitoring.

2. Automation in Educational Administration Using Web Applications: This research highlights the advantages of integrating web-based applications into educational workflows, such as student record maintenance and attendance tracking. The paper shows how web systems improve efficiency, transparency, and accountability.

1. Design and Implementation of a Real-Time Database for Academic Systems: This paper presents the need for and benefits of real-time databases in academic management. It explains how syncing data to an online cloud-based platform allows multiple users to access, analyze, and report data without delay.
2. User Authentication and Data Security in Admin Portals: The paper reviews various authentication methods used in admin-based portals. It emphasizes the importance of user login features and data protection mechanisms to safeguard sensitive student and institutional data from unauthorized access.

# CHAPTER 2

# SYSTEM SPECFICATION

## SYSTEM INTERFACE

**React.js with Vite** is used as the frontend framework in this project. React allows for the creation of dynamic, component-based user interfaces, and Vite enhances the development experience by providing fast server start and hot module replacement. This results in a highly responsive single-page application ideal for real-time interaction like scanning and viewing attendance data.

**Tailwind CSS** is a utility-first CSS framework that helps in rapidly designing modern and responsive web interfaces. It enables developers to style elements directly in the HTML structure using predefined classes, making the UI consistent, customizable, and mobile-friendly without writing custom CSS from scratch.

**Node.js with Express** serves as the backend environment for the system. Node.js allows asynchronous, event-driven handling of requests, while Express simplifies routing and middleware integration. This setup handles data processing, student record management, and API interaction between the frontend and the database.

**PostgreSQL** is used as the database system for storing and retrieving structured data such as student details, attendance logs, and admin credentials. It supports relational queries and ensures reliable, scalable data storage with ACID compliance.

## SYSTEM SPECIFICATION

### External Interface Requirements

* **Software Interface**

**Frontend Interface:** The frontend of the application is built using React.js and styled with Tailwind CSS to ensure a smooth, interactive, and accessible user experience. Vite is used as the build tool to provide fast development and optimized production builds. The interface includes a scanner dashboard and an admin panel for managing student attendance and user data efficiently.

**Backend Connectivity:** The frontend is connected to a Node.js and Express backend through RESTful APIs. All interactions such as student data submission, retrieval, and attendance tracking are handled through these APIs in a secure and efficient manner.

**Database Interface:** PostgreSQL is used as the database, connected to the backend via direct query layer. It stores structured data including student information, attendance logs, department-wise analytics, and admin credentials.

## Functional Requirements

### Latecomer Management Functions:

Implements core functionalities such as student record entry, attendance tracking, department-wise data segmentation, and data filtering based on date and time. These operations are handled using dynamic React.js components integrated with PostgreSQL for real-time data storage and retrieval.

### Admin Dashboard:

Provides an intuitive dashboard for administrators to view total student entries, manage records, perform CRUD operations (Create, Read, Update, Delete), and export data reports. The dashboard is developed using responsive UI components in React and styled with Tailwind CSS for a clean and organized layout.

### Accessibility:

Ensures inclusive design through semantic HTML markup and Tailwind’s utility-first styling for better readability and navigability. The system supports keyboard shortcuts, high-contrast visual elements, and responsive layouts for a smooth experience across all devices and for users with visual impairments.

### Security:

Implements backend-level security using Node.js and Express middleware. Includes input validation, role-based access control for admin features, and secure communication between client and server using RESTful APIs. Sensitive data is handled securely and stored in the PostgreSQL database.

### 2.3. Other Non-Functional Requirements:

* **Usability:**

The system is designed to offer a user-friendly experience for both admin and college staff by providing a clean, minimalistic interface using Tailwind CSS. Navigation is simplified with a well-structured layout, clearly labeled sections, and responsive components that guide the user throughout the application. Regular usability testing and feedback collection help identify areas for further improvement.

### Performance Requirements:

Optimizations such as component-level rendering, lazy loading for charts and admin panels, and efficient data fetching from PostgreSQL ensure a smooth and fast user experience. React with Vite enables a highly responsive frontend, reducing load time and enhancing system interactivity during peak data usage.

### Compatibility Requirements:

The application is tested for cross-browser compatibility to function consistently across popular web browsers like Chrome, Firefox, Edge, and Safari. It is also designed to be desktops, tablets, and smartphones used by staff admins.

# CHAPTER 3

# SYSTEM DESIGN

## SYSTEM DESIGN

## System Design Overview

The Latecomer Management System represents a modern web-based solution developed to automate and optimize late-entry tracking processes across multiple organizational sectors including educational institutions, corporate environments, and government facilities. The platform incorporates dual data entry methods, featuring both barcode scanning technology utilizing the ZXing library with Luhn algorithm validation for ID verification, and conventional manual input options, ensuring precise and instantaneous data recording.

The technical architecture employs React with Vite for high-performance frontend operations, complemented by Tailwind CSS to deliver a fully responsive user interface accessible across various devices. Backend functionality is supported by Node.js and Express.js, providing efficient API management and data processing capabilities, while PostgreSQL database hosted on Supabase guarantees secure and scalable data storage for comprehensive attendance record-keeping.

The system architecture comprises two principal operational interfaces. The Scanner Interface facilitates rapid late-entry logging by security personnel through either barcode scanning or manual data entry, with integrated automatic timestamp generation. The Admin Dashboard equips authorized personnel with comprehensive data management tools, including advanced filtering options, analytical reporting features with PDF/Excel export capabilities, and complete CRUD functionality for record maintenance.

Security implementation centers on JWT authentication protocols to enforce strict role-based access control, safeguarding sensitive system functions against unauthorized use. The solution effectively eliminates traditional manual recording errors while enhancing operational transparency through real-time monitoring features, demonstrating adaptability to diverse organizational requirements. Planned future enhancements incorporate automated notification systems via email/SMS and sophisticated analytical tools for behavioral pattern recognition.

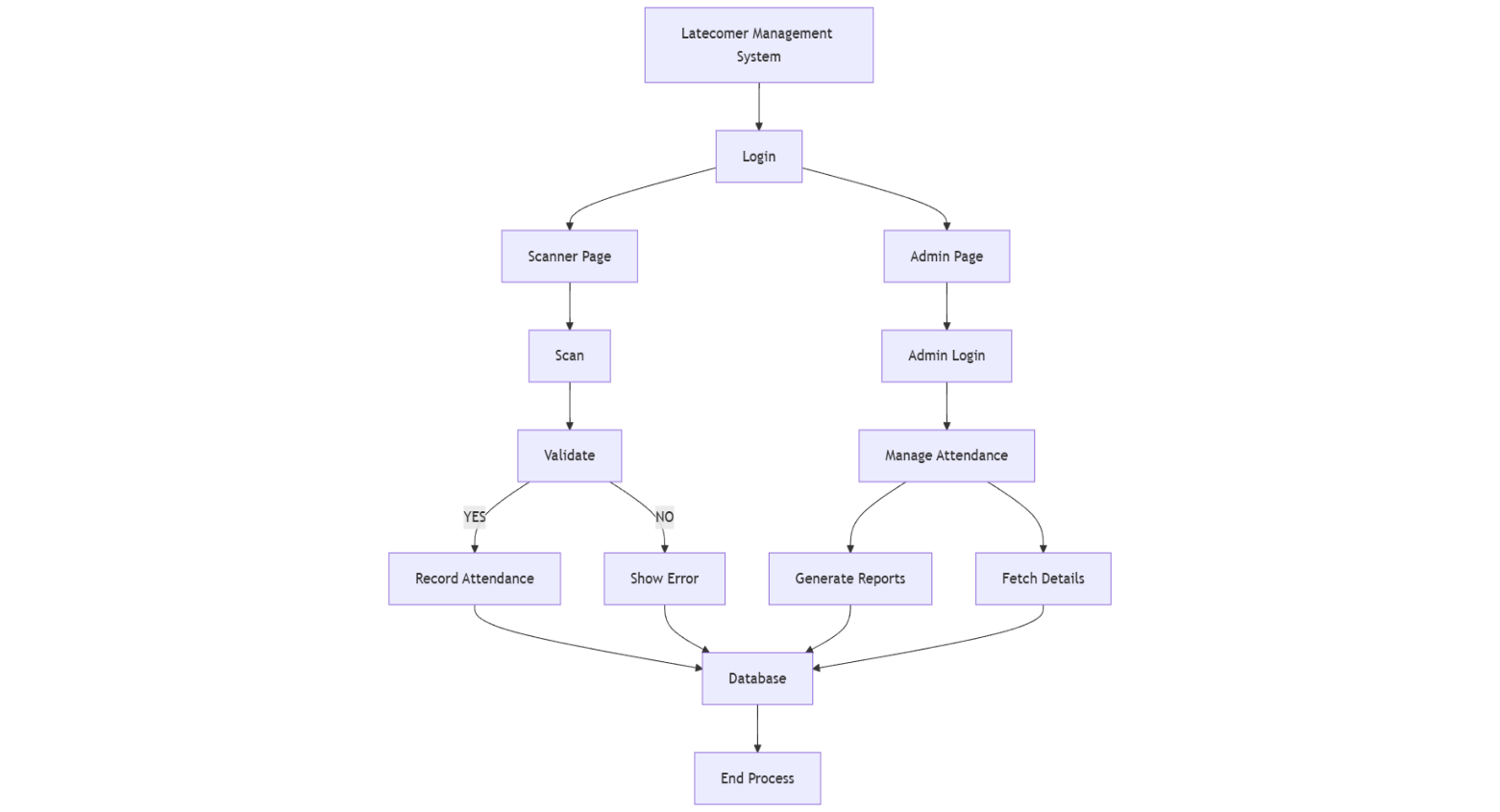


Fig 3.1: System architecture Diagram

## SYSTEM ARCHITECTURE

### Frontend Components:

* React Components: The frontend is built using modular React components. Each page is divided into reusable components such as Header, Navbar, ScannerForm, AdminDashboard, DataTable, FilterControls, and Footer. This modularization helps in better readability and faster updates.
* Form & Table Handling: The Scanner page includes a form for entering latecomer details, while the admin page contains a sortable and filterable table for reviewing entries, exporting data, and managing records.
* Axios Integration: The frontend uses Axios to send asynchronous API requests to the backend for data fetch, update, and delete operations.

### Backend Components

* Express Server: A Node.js + Express backend handles HTTP requests from the frontend, routes them appropriately, and responds with the requested data. It supports CRUD operations and logical functions such as time-stamping and validation.
* API Endpoints: Routes are created for key actions like POST /late-entry, GET /entries, PUT /edit-entry, and DELETE /remove-entry. These endpoints are protected with validation logic and are extendable for future enhancements like login/auth.
* Middleware & Error Handling: Middleware is used for request parsing (e.g., express.json()), CORS handling, and error logging. A custom error-handling module ensures smoother debugging and server resilience.

### Database Design:

* PostgreSQL Integration: The backend connects to a PostgreSQL database using libraries like pg or sequelize. The schema is designed to store structured data like:
* Register Number
* Student Name
* Department
* Batch
* Date & Time
* Status
* Table Structure: An attendance, students table holds the proper data types, primary key constraints, and indexing for fast querying and filtering.

### UI/UX Structure:

* Tailwind CSS Framework: The user interface is styled using Tailwind CSS, allowing fast and consistent layout design. Utility-first classes help in creating responsive designs across both Scanner and Admin views.
* Responsive and Minimalist Design: The user interface is designed with a responsive layout that adapts seamlessly to both desktop and mobile viewports. Emphasizing a minimalist approach, the application maintains a clean and distraction-free environment, enabling users to focus on their primary tasks efficiently. Key UX elements such as visual alerts for successful or failed operations, confirmation modals, and pagination for managing large datasets enhance the overall usability and user experience.

### Routing and Navigation:

* React Router DOM: Client-side routing is managed using react-router-dom. There are primarily two routes:
* /scanner: Page for staff to enter latecomer details
* /admin: Page for viewing reports, editing, filtering, and exporting data
* Navigation Controls: Navigation elements include a persistent header with navigation links and a footer for quick access to core functionalities.

### Admin Module Design:

* Data Management Tools: Admins can view, filter, edit, and delete entries through a structured dashboard. Data filtering can be done by rollno (unique\_id constrains).
* Export Functionality: The admin page supports Pdf/Excel export functionality using third-party libraries like react-pdf or xlsx for record-keeping and report generation.

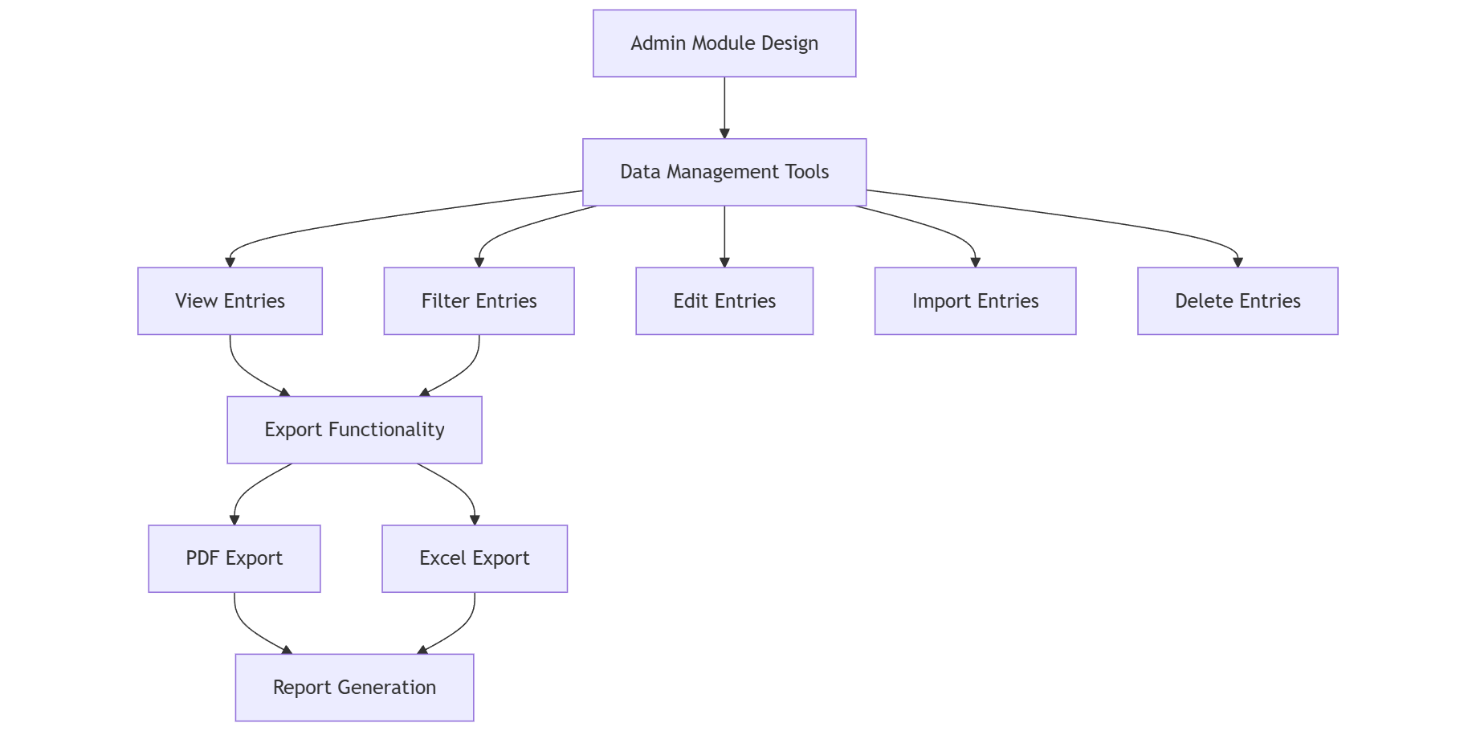


Fig 3.2.6 Admin Dashboard Architecture

## CODE DESIGN

### server.js

import express from 'express';

import dotenv from 'dotenv';

import cors from 'cors';

import authRoutes from './routes/authRoutes.js';

import attendanceRoutes from "./routes/attendanceRoutes.js";

import studentRoutes from './routes/studentRoutes.js'; //Import student routes

dotenv.config();

const app = express();

// Middleware

app.use(express.urlencoded({ extended: true })); // Parse URL-encoded bodies

app.use(

  cors({

    origin: "\*",

    credentials: true,

  })

);

app.use(express.json());

// Routes

app.use('/api/auth', authRoutes);

app.use("/api/attendance", attendanceRoutes);

app.use("/api/students", studentRoutes);

app.get("/", (req, res) => {

    res.send("Backend is working!");

});

// Start the server

const PORT = process.env.PORT || 5000;

app.listen(PORT, () => console.log(`Server running on port ${PORT}`));

### App.jsx

import { Routes, Route } from "react-router-dom";

import Login from "./Login";

import Dashboard from "./Dashboard";

import Report from "./Report";

import StudentReport from "./StudentReport";

import StudentReportDetails from "./StudentReportDetails";

import DepartmentReport from "./DepartmenReport";

import ViewData from "./ViewData";

import ViewDataReport from "./ViewDataReport";

import ImportIndividual from './ImportIndividual';

import ImportBatch from './ImportBatch';

import EditStudents from './EditStudents';

import DeleteIndividual from './DeleteIndividual';

import DeleteBatch from "./DeleteBatch";

import ScannerPage from "./ScannerPage";

function App() {

return (

<Routes>

<Route path="/" element={<Login />} />

<Route path="\*" element={<Dashboard />} />

<Route path="/dashboard" element={<Dashboard />} />

<Route path="/reports" element={<Report />} />

<Route path="/reports/student" element={<StudentReport />} />

<Route path="/reports/student/details" element={<StudentReportDetails />} />

<Route path="/reports/department" element={<DepartmentReport />} />

<Route path="/reports/department/details" element={<DepartmentReport />} />

<Route path="/view-data" element={<ViewData />} />

<Route path="/view-data/results" element={<ViewDataReport />} />

<Route path="/data-tools/import/individual" element={<ImportIndividual />} />

<Route path="/data-tools/import/batch" element={<ImportBatch />} />

<Route path="/data-tools/edit" element={<EditStudents />} />

<Route path="/data-tools/delete/individual" element={<DeleteIndividual />} />

<Route path="/data-tools/delete/batch" element={<DeleteBatch />} />

<Route path="/scanner" element={<ScannerPage />} />

</Routes>

);

}

export default App;

### main.jsx

import { StrictMode } from 'react'

import ReactDOM from 'react-dom/client'

import './index.css'

import { BrowserRouter } from "react-router-dom";

import App from './App.jsx'

ReactDOM.createRoot(document.getElementById('root')).render(

<StrictMode>

<BrowserRouter>

<App />

</BrowserRouter>

</StrictMode>,

)

**3.3.4 sidebar.jsx:**

import { useState } from "react";

import { Link, useNavigate } from "react-router-dom";

import icon from "/img/image.png";

const Sidebar = () => {

  const navigate = useNavigate();

  const [activeMenu, setActiveMenu] = useState(null);

  const [showImportSubmenu, setShowImportSubmenu] = useState(false);

  const handleLogout = () => {

    localStorage.removeItem("token");

    navigate("/");

  };

  const toggleMenu = (menu) => {

    setActiveMenu(activeMenu === menu ? null : menu);

  };

  return (

    <div className="w-[240px] h-auto border border-solid border-black rounded-lg bg-gradient-to-b from-[#6B69CC] to-white p-5 mt-1 ml-1 flex flex-col justify-between">

      <div>

        <div className="text-center mb-6">

          <img src={icon} alt="Logo" className="h-20 w-20 mx-auto rounded-lg" />

          <h2 className="text-[22px] text-white mt-3">MANAGE</h2>

        </div>

        <nav className="space-y-2">

          <Link

            to="/dashboard"

            className="block bg-gradient-to-r from-[#BF8DFF] to-[#1482B9] py-2 px-4 rounded-full text-[#4d4747] font-bold border border-[#6F00FF]"

          >

            Dashboard

          </Link>

          <div>

            <button

              onClick={() => toggleMenu("report")}

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            >

              Report <span>{activeMenu === "report" ? "▼" : "⮞"}</span>

            </button>

            {activeMenu === "report" && (

              <div className="ml-4 mt-1 space-y-1">

                <Link

                  to="/reports/student"

                  className="block py-2 px-4 rounded-full bg-gradient-to-r from-[#BF8DFF] to-[#1482B9] text-[#4d4747] font-bold border border-[#6F00FF]"

                >

                  Student

                </Link>

                <Link

                  to="/reports/department"

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                >

                  Department

                </Link>

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          <Link

            to="/view-data"

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          >

            View Data

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          <div>

            <button

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            >

              Data Tools <span>{activeMenu === "data-tools" ? "▼" : "⮞"}</span>

            </button>

            {activeMenu === "data-tools" && (

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                {/\* Import with hover submenu \*/}

                <div

                  className="relative"

                  onMouseEnter={() => setShowImportSubmenu(true)}

                  onMouseLeave={() => setShowImportSubmenu(false)}

                >

                  <button className="w-full bg-gradient-to-r from-[#BF8DFF] to-[#1482B9] py-2 px-4 rounded-full text-[#4d4747] font-bold border border-[#6F00FF] flex justify-between items-center">

                    Import <span>⮞</span>

                  </button>

                  {showImportSubmenu && (

                    <div className="absolute left-full top-0 ml-2 space-y-1 bg-none space-1 rounded-lg shadow-lg z-20 w-[180px] p-2 duration-500">

                      <Link

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                      >

                        Individual

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                      <Link

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                      >

                        Batch

                      </Link>

                    </div>

                  )}

                </div>

                {/\* Edit \*/}

                <Link

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                  Edit

                </Link>

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                    Delete <span>⮞</span>

                  </button>

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                    >

                    Individual

                    </Link>

                    <Link

                      to="/data-tools/delete/batch"

                      className="block py-2 px-4 bg-gradient-to-r from-[#BF8DFF] to-[#1482B9] rounded-full text-[#4d4747] font-bold border border-[#6F00FF] hover:opacity-90"

                    >

                      Batch

                    </Link>

                  </div>

                </div>

              </div>

            )}

          </div>

        </nav>

      </div>

      {/\* Admin Profile \*/}

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          <div className="bg-[#6c5ce7] w-8 h-8 rounded-full flex items-center justify-center text-white">

            S

          </div>

          <span className="text-white font-bold">SCE ADMIN</span>

        </div>

        <button

          onClick={handleLogout}

          className="w-full bg-white text-black py-1 px-4 rounded-full hover:bg-red-500 hover:text-white transition-colors duration-200"

        >

          Logout

        </button>

      </div>

    </div>

  );

};

export default Sidebar;

# CHAPTER 4 IMPLEMENTATION

## MODULE-WISE IMPLEMENTATION

## Scanner Page:

The Scanner Page is the entry point used by staff members to record latecomers. It is designed for quick and manual data input, either by typing or using barcode scanning

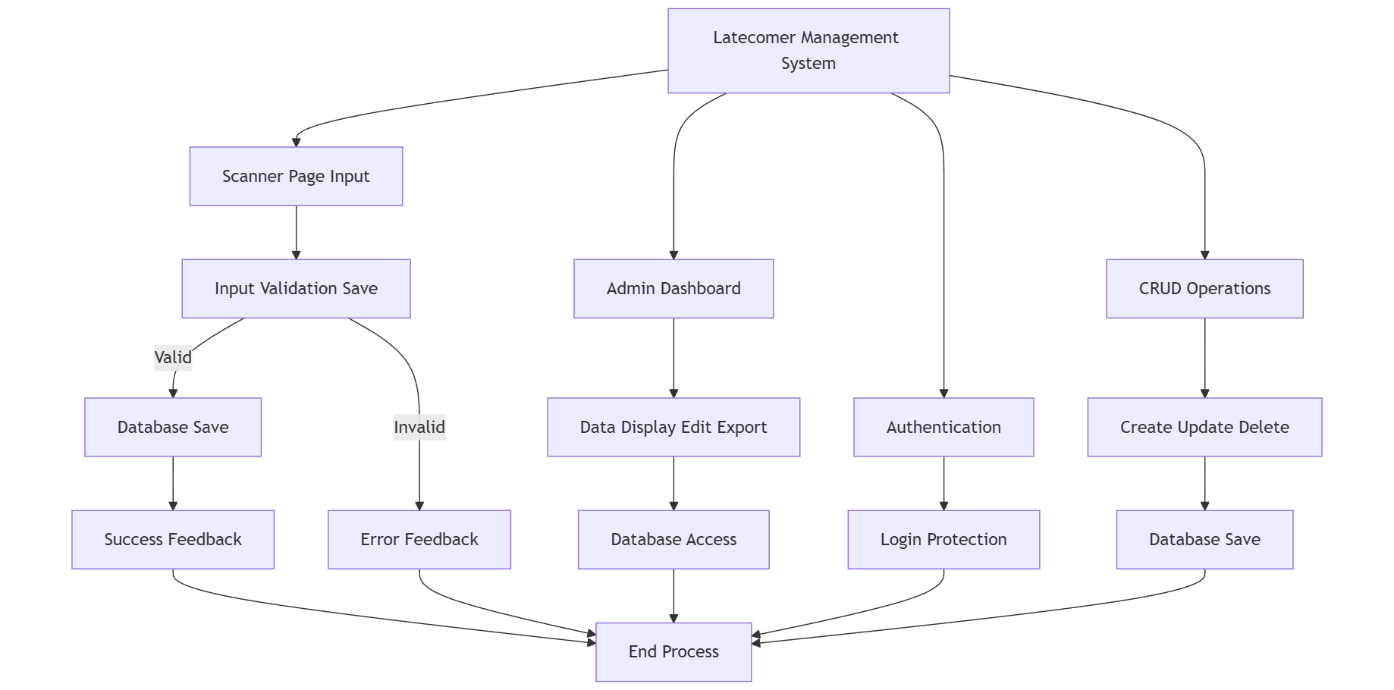


Fig 4.1.1: Implementation Module

Form Elements: Includes input fields such as Student Name, Register Number, Department, Date, Time, and Reason for being late. These inputs are validated on the frontend to avoid incorrect or incomplete entries.

Live Clock & Date Display: Real-time system time and date are automatically filled in or displayed to reduce human error during manual entries.

Post Request to Backend: Once the data is submitted, it triggers a POST request to the backend API endpoint (/api/attendance) where the data is saved to the PostgreSQL database.

Feedback Mechanism: Upon submission, success or error messages are displayed using toasts or alerts to notify the user.

* + 1. **Admin Dashboard**

The Admin Dashboard is the control panel of the system, where admin users can view, manage, filter, edit, and export latecomer data.

Data Table Display: All records from the database are fetched via a GET request and displayed in a paginated and sortable table layout.

Filtering & Search: Admins can filter data based on Date, Department, or Student Name. The filtering is done client-side for quick access, or server-side for large data sets.

Edit/Delete Actions: Each row includes buttons for editing or deleting records. These actions trigger PUT and DELETE API calls respectively.

Export Features: Export to Excel or pdf is enabled for administrative purposes using tools like react-pdf or xlsx

* + 1. **Authentication System**

Although not mandatory for smaller use cases, an optional Authentication Module is implemented to restrict access to the Admin Dashboard

Login Page: Admin users log in using a username and password. On successful authentication, a session or token is generated and stored locally.

Route Protection: React Router is used to protect the /admin route, redirecting unauthorized users to the login page if they are not authenticated.

Future Integration: JWT-based authentication or Supabase Auth integration can be added for enhanced security

* + 1. **CRUD Functionality**

The entire system is built around essential CRUD (Create, Read, Update, Delete) operations, supported through RESTful APIs.

Create: Data is added via the Scanner Page using a POST request to the backend.

Read: Admin Dashboard uses GET requests to read and display all student late entry data.

Update: Individual records can be edited through a modal or inline editing, triggering PUT requests to update database records.

Delete: Records can be deleted permanently via a DELETE request sent from the Admin Dashboard.

All operations are validated both client-side and server-side to maintain data integrity and accuracy

### Implementation Plan:

* **UI/UX Design with Figma:**
* Wireframing: Created initial low-fidelity wireframes for key pages such as the Scanner Page, Admin Dashboard, and Login Screen.
* High-Fidelity Prototypes: Designed interactive high-fidelity prototypes showcasing the full flow and design system.
* Design Handoff: Exported assets and layout details for frontend implementation, ensuring consistency in fonts, colors, spacing, and component reuse.
* **Setup and Configuration:**
* Frontend Initialization: Initialized the project using Vite + React for faster development setup.
* Backend Setup: Created a Node.js + Express.js server to handle all API requests and middleware.
* Install Dependencies: Installed essential libraries:
* Frontend: Axios, React Router DOM, Tailwind CSS, SweetAlert.
* Backend: Express, CORS, dotenv, jsonwebtoken, pg, bcrypt.

### User Interface Development:

* Scanner Page: Built to record and scan student details using manual input or barcode-based scanner.
* Admin Dashboard: Displays a data table view with filtering, searching, and analytics widgets.
* Reusable Components: Header, Sidebar, Form Inputs, and Data Table with responsive design using TailwindCSS.

### Routing and Navigation:

* React Router DOM: Used for navigating between routes like /scanner, /admin, /login.
* Protected Routes: Implemented route protection using JWT token validation to prevent unauthorized access.

### Authentication System:

* JWT Tokens: Used for user login sessions, stored securely using HttpOnly cookies.
* Login System: Developed a secure admin login page with error handling and input validations.

### CRUD Functionalities:

* Student Records: Admin can Create, Read, Update, and Delete late-comer entries from the database.
* Real-Time Feedback: Used SweetAlert for success/error modals after operations.
* Bulk Import: Added functionality to import student data from Excel/CSV files.

### Database Integration (Supabase with PostgreSQL):

* Supabase: Used as the cloud-hosted backend service with PostgreSQL database.
* Table Structure: Created tables for students, admins, and attendance.
* API Integration: Backend connects securely with Supabase using credentials stored in .env file.

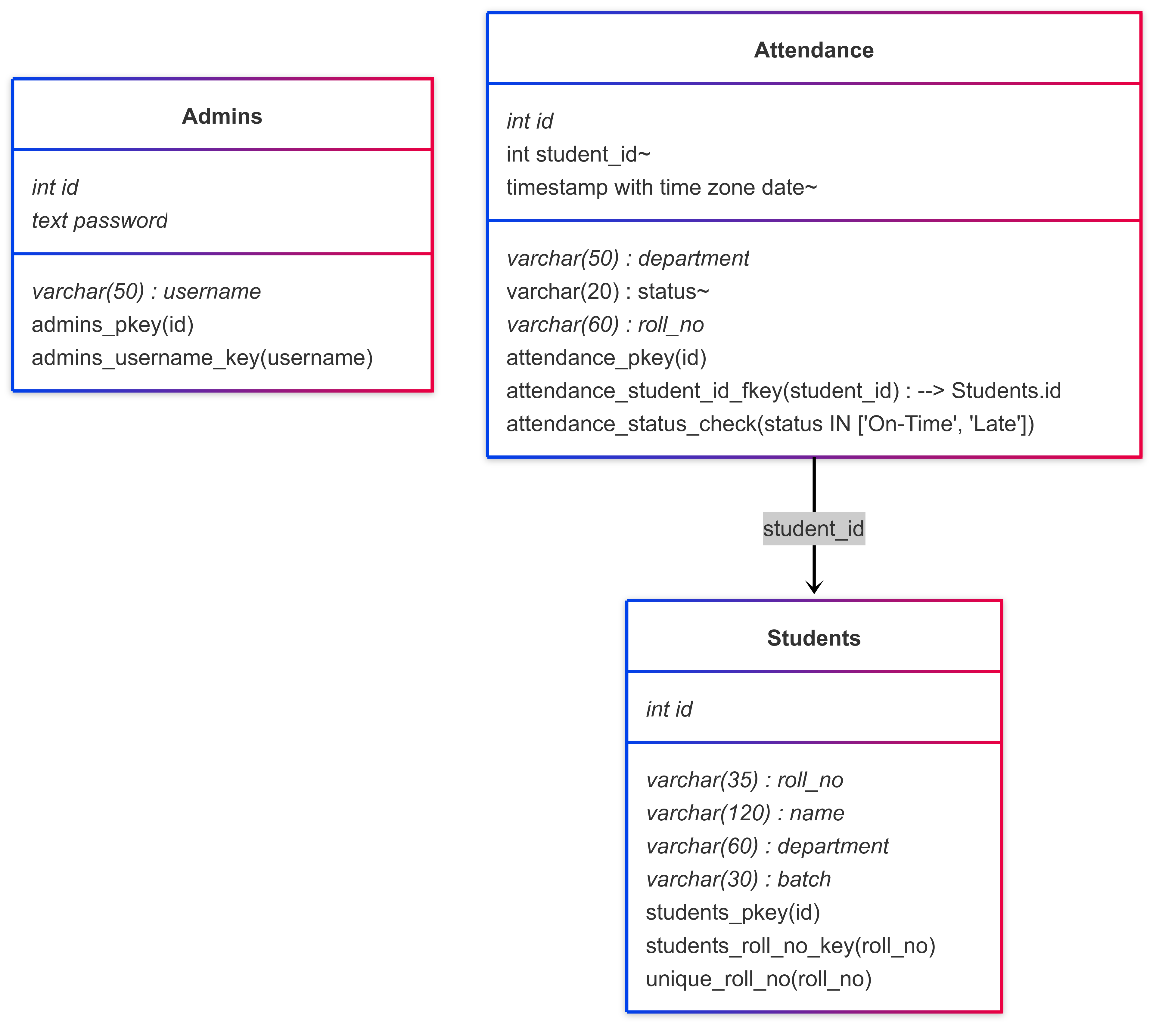


Fig 4.2: Supabase Database Tables

### API Integration:

* Backend API (Node.js): Developed RESTful API endpoints for scanning, authentication, and dashboard operations.
* Axios in Frontend: Used Axios for making HTTP requests and handling async data fetches from the backend.

### Testing and Debugging:

* Manual Testing: Validated form inputs, login flow, and record operations.
* Browser Debug Tools: Utilized Chrome DevTools for testing layout, console logs, and network responses.
* Postman: Used for testing backend API endpoints individually.

### Optimization and Performance:

* Form Validations: Included both client-side and server-side validation to reduce errors.
* Minification: Final build is optimized using Vite’s production mode before deployment.

### Accessibility:

* Semantic HTML: Used accessible tags like <label>, <input>, and <button> with appropriate aria-\* attributes.
* Keyboard Navigation: Ensured all form fields and buttons are accessible via keyboard inputs.

### Deployment:

* Frontend Hosting: Deployed frontend on Vercel using GitHub integration.
* Backend Hosting: Backend hosted on Render or Vercel Functions depending on resource optimization.
* Supabase: Hosted database with secure access through API keys and role-based permissions.

# CHAPTER 5 TESTING

## TESTING FOR LATECOMER MANAGEMENT SYSTEM

### Scanner Input Testing:

* Scanner Accuracy: Verify the scanner accurately reads and inputs student details such as Name, Register Number, and Department.
* Real-Time Detection: Check the system's ability to detect and display real-time input as the scanner is triggered.
* Invalid Input Handling: Test how the system handles partial or corrupted scans (e.g., missing student ID) and provides fallback messages or manual override options.

### Functional Testing:

* Input Pre-Processing: Ensure the system extracts correct values from the scanned input (name, ID, department, time).
* Late Status Determination: Verify that the system correctly flags entries as late or on-time based on the threshold time (e.g., 8:45 AM).
* Role Validation: Test different user roles (Admin vs Scanner User) and ensure correct access level and permissions are enforced.
* Toast Alerts: Confirm that success and error messages are triggered appropriately during actions like scan, submit, or delete.

### Database & Storage Testing:

* Database Insertion: Verify student data is stored accurately in the PostgreSQL database via Supabase after submission.
* Data Integrity: Test for prevention of duplicate entries, empty fields, and invalid timestamps.
* Real-Time Updates: Ensure the table on the admin page updates immediately after a successful submission.
* Date-Based Filtering: Check if filtering entries by date, department, or student name works correctly.

### Accessibility Testing:

* Keyboard Navigation: Confirm all actions like scanning, submitting, and filtering can be done via keyboard alone.
* Color Contrast: Validate that UI elements like buttons, alerts, and table texts have appropriate color contrast for readability.
* Responsive UI: Test the app’s appearance and usability on various screen sizes and resolutions.
* Validate webpage behavior across different browsers and devices.

### End-to-End (E2E) Testing:

* Objective: To validate the entire flow from data scanning to submission, storage, and admin visualization to ensure the application meets functional goals.
* Tools Used: Postman.
* Test Scenarios:
* Simulate user input via scanner and test the resulting data entry.
* Check redirection and access restriction for unauthorized users.
* Verify table sorting, search, and filter functionality.
* Ensure database reflects correct entries post submission.
* Test across different browsers like Chrome, Edge, and Firefox.

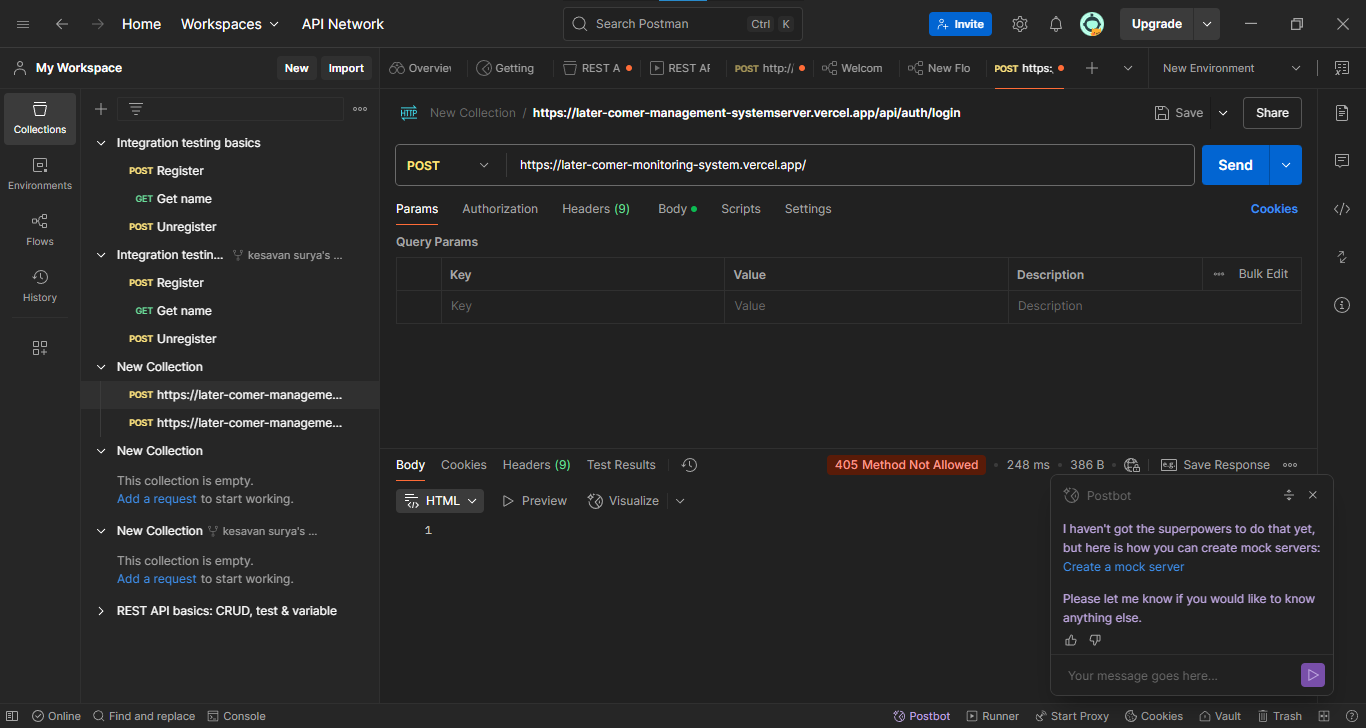


Fig 5.1: Testing Module 1

## TESTING MODULE

### Cross-Browser Testing:

* Browser Compatibility: Test the application across different web browsers (e.g., Chrome, Edge, Firefox, Safari) to ensure consistent functionality and appearance.
* Responsive Design: Verify the responsiveness of the application on various devices and screen sizes, including desktops, tablets.

### Performance Testing:

* Load Testing: Simulated multiple users accessing the Scanner Page and Admin Dashboard concurrently to assess the backends’ ability to handle database queries and API requests without delay.
* Response Time: Measured API response times for operations such as login, record creation, and fetching student entries to ensure smooth and efficient performance, especially under moderate data load.

### Security Testing:

* Data Privacy: Focused on securing user sessions through the use of JWT tokens stored in HttpOnly cookies and validated access for admin users only. Verified that all sensitive data (e.g., login credentials) are securely transmitted over HTTPS.
* Input Validation: Implemented strong form validations both on client and server sides to prevent SQL injection, XSS, and other common vulnerabilities. Used middleware for input sanitization and authentication checks.

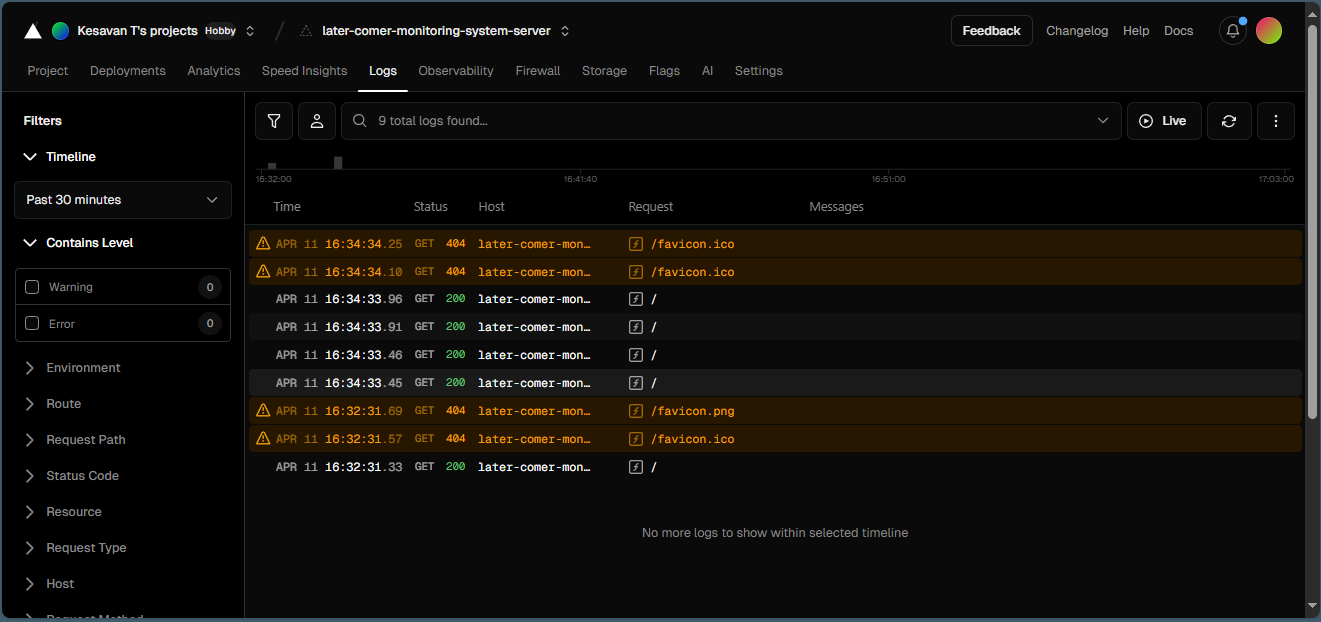


Fig 5.2: Testing Module 2

### Usability Testing:

* User Feedback: Conducted internal testing with sample users (students and faculty) to gather feedback on the usability of the Scanner and Admin Dashboard interfaces. Minor layout and workflow improvements were made based on this input.
* Navigation Flow: Evaluated the clarity of the route navigation between /login, /scanner, and /admin, ensuring users could intuitively understand the process without confusion. Used visual cues and alerts to guide user actions.

# CHAPTER 6 RESULT

The Student Late-Comer Entry Management System has been successfully developed and deployed. The implementation meets the expected project requirements with efficient system performance, security, and user experience outcomes:

### Functionality:

* Every essential feature, including CRUD operations, real-time data presentation in the admin dashboard, login system, and student record entry via scanner or manual input, is completely integrated and operational.
* To improve data handling efficiency, administrators can safely log in, examine, edit, and remove entries, as well as import student data in bulk from Excel or CSV files.

### Performance:

* The application delivers fast load times and efficient data processing using Vite for frontend and Node.js for backend.
* Performance remains stable under concurrent operations such as simultaneous data entry and admin dashboard access, confirming the reliability of the backend API and PostgreSQL queries.

### Accessibility:

* The interface is built using semantic HTML and TailwindCSS with proper ARIA attributes for screen readers.
* All functionalities are keyboard-accessible, making the application inclusive and usable for individuals with accessibility needs.

### Security:

* Security is reinforced using JWT-based authentication stored in HttpOnly cookies, preventing token tampering and session hijacking.
* All user inputs are validated on both client and server sides to avoid common threats like SQL injection and XSS attacks.

### Usability:

* Positive feedback was received during user testing sessions with faculty and sample admin users. The system’s simplicity, clean UI, and responsiveness were highly appreciated.
* Users found it easy to navigate between the scanner, login, and admin pages, with prompt visual feedback (SweetAlert) confirming successful actions.

### Cross-Browser Compatibility:

* Verified consistent application behavior across multiple web browsers, including Chrome, Firefox, Edge, and Safari.

# APPENDIX

**APPENDIX 1**

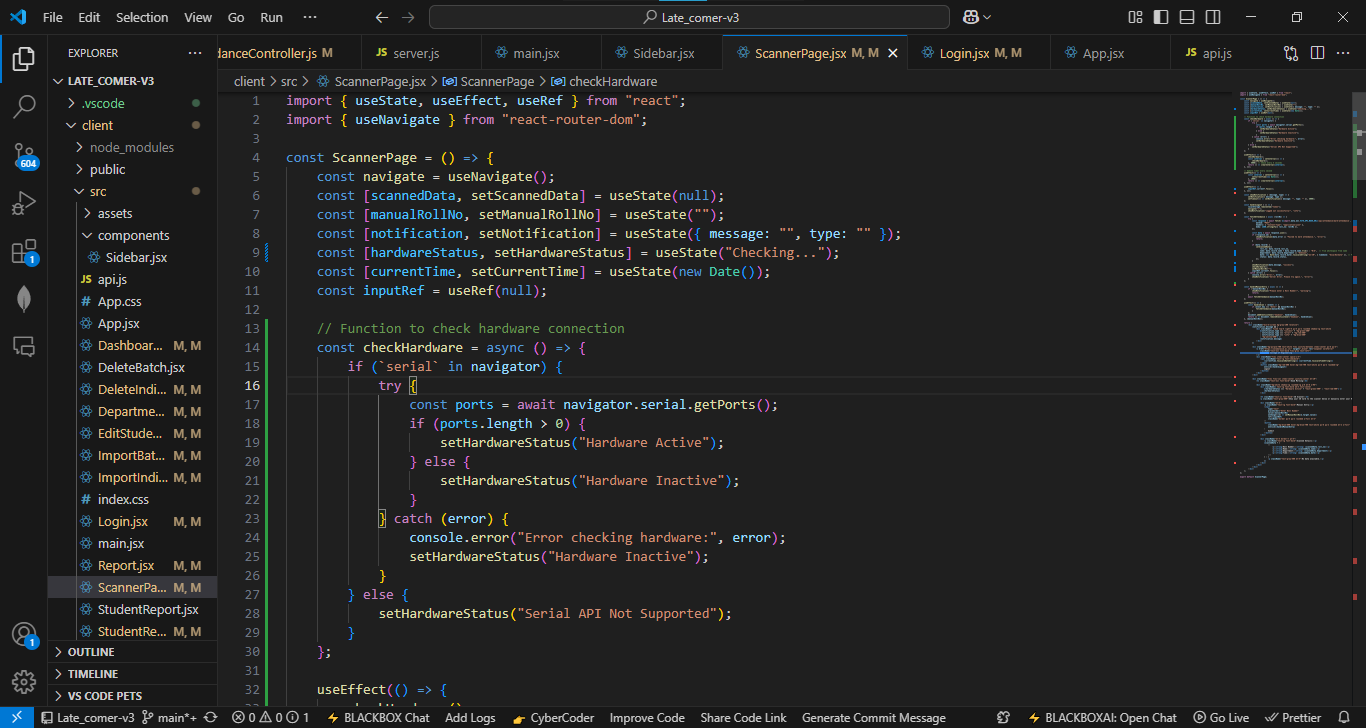


Fig A1: Coding Page

**APPENDIX 2**

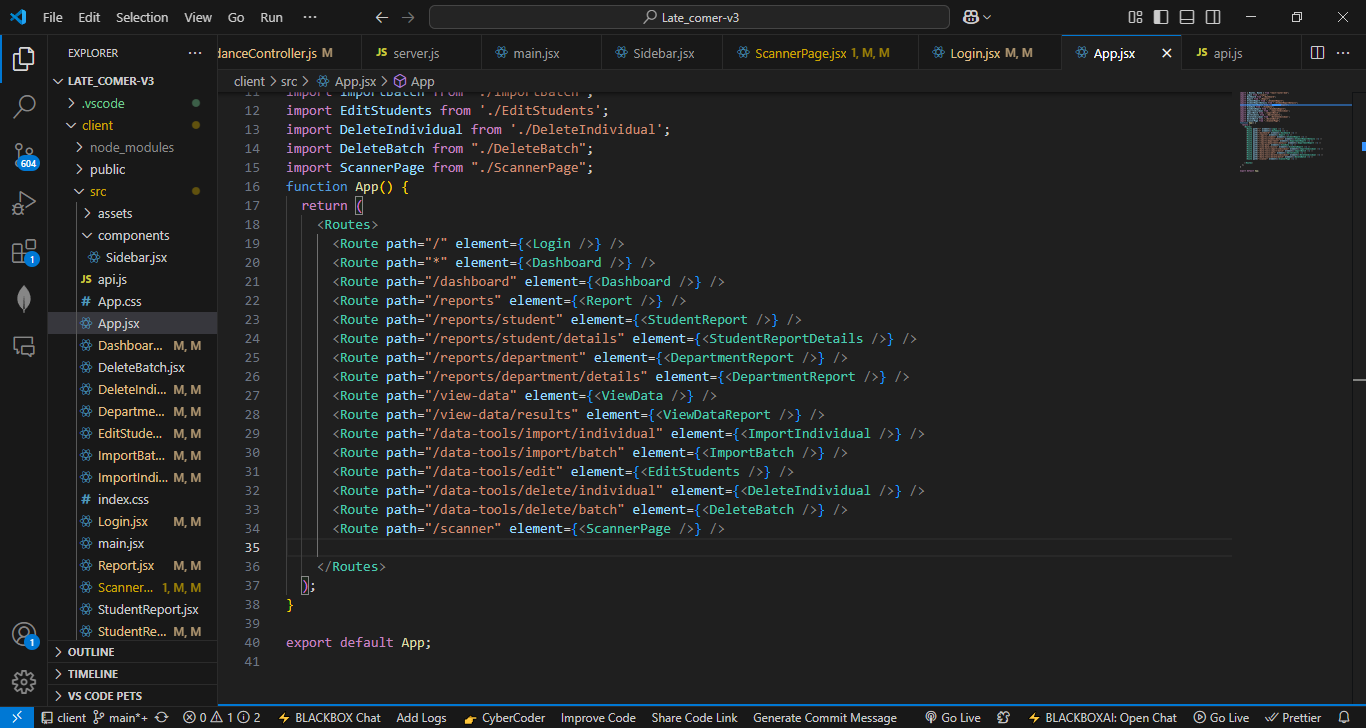


Fig A2: App.jsx coding Page

**APPENDIX 3**

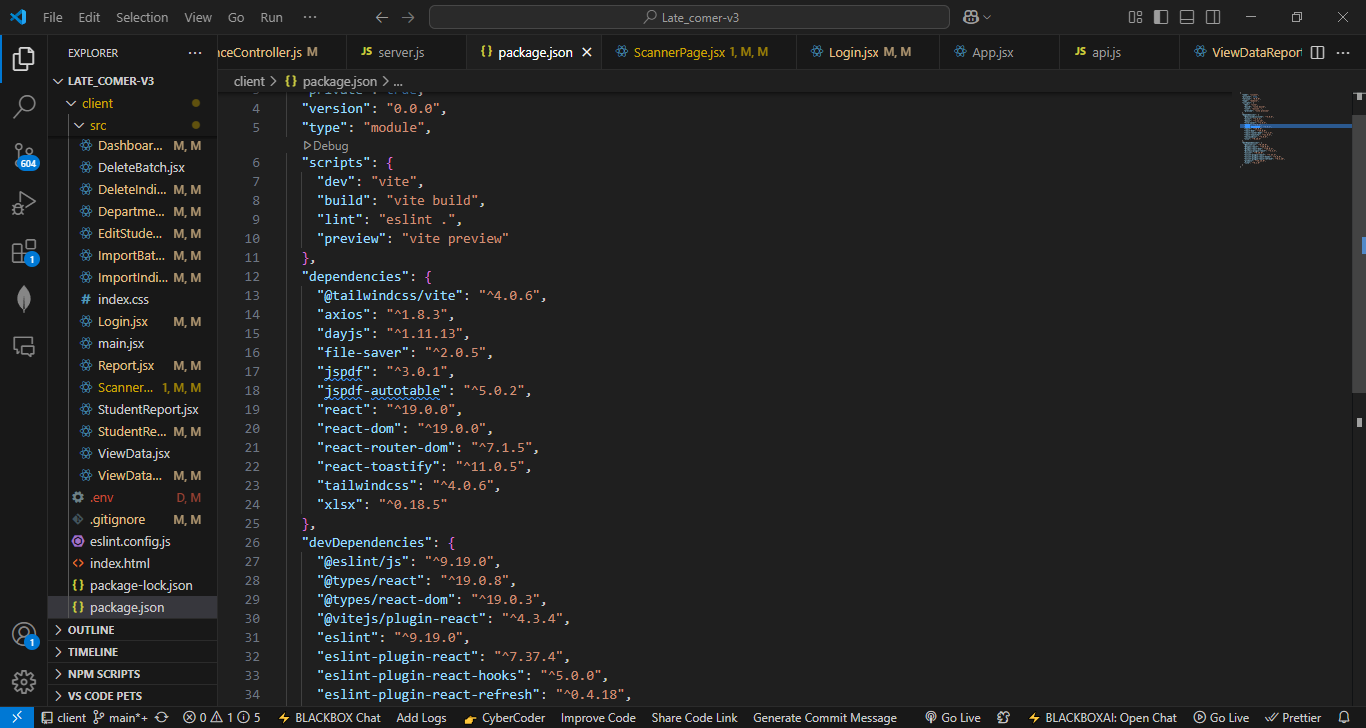


Fig A3: Package.json Page

**APPENDIX 4**

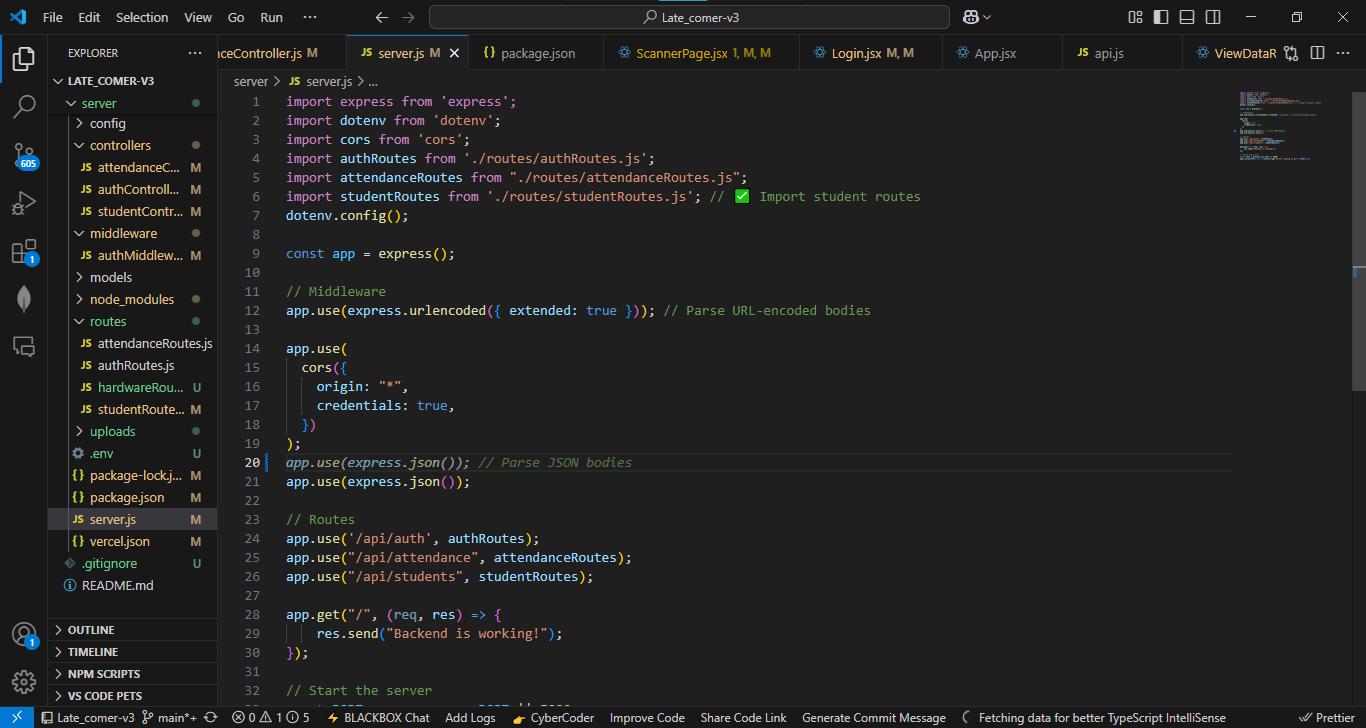


Fig A4: server.js Coding Page

**APPENDIX 5**

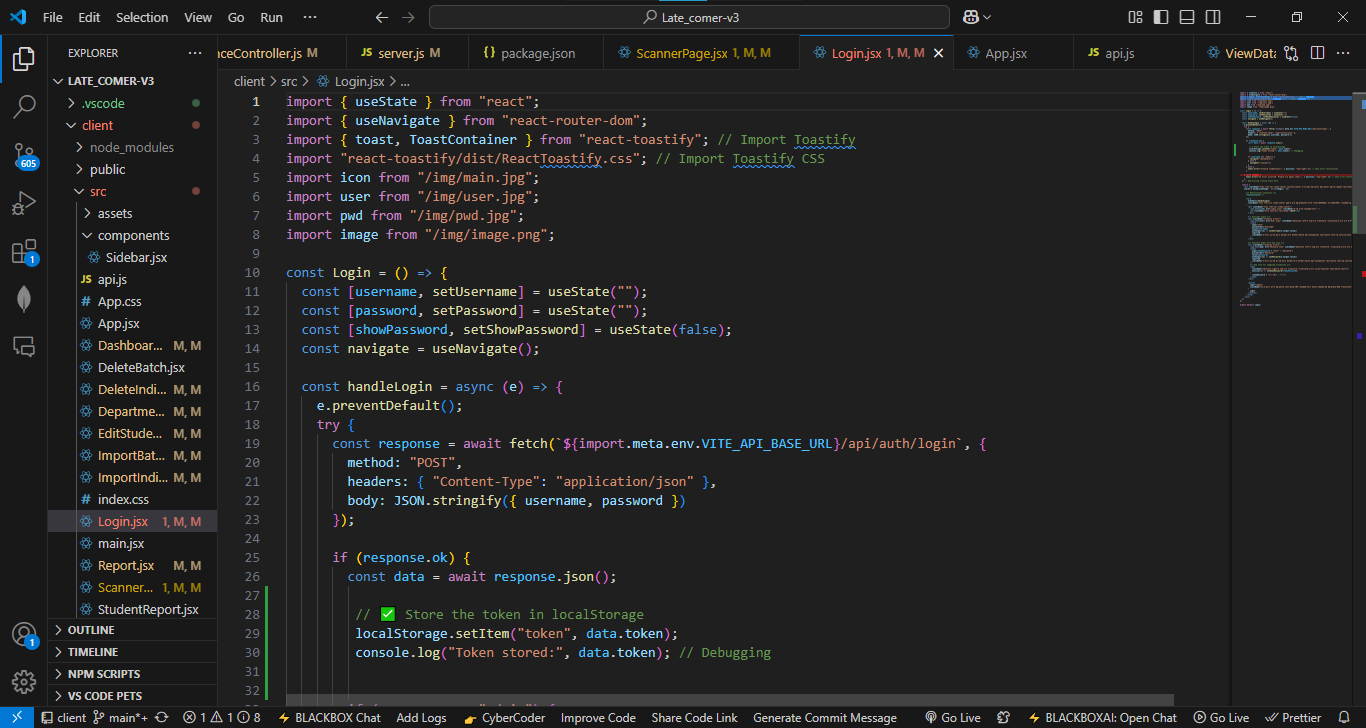


Fig A5: Login Page

**APPENDIX 6**

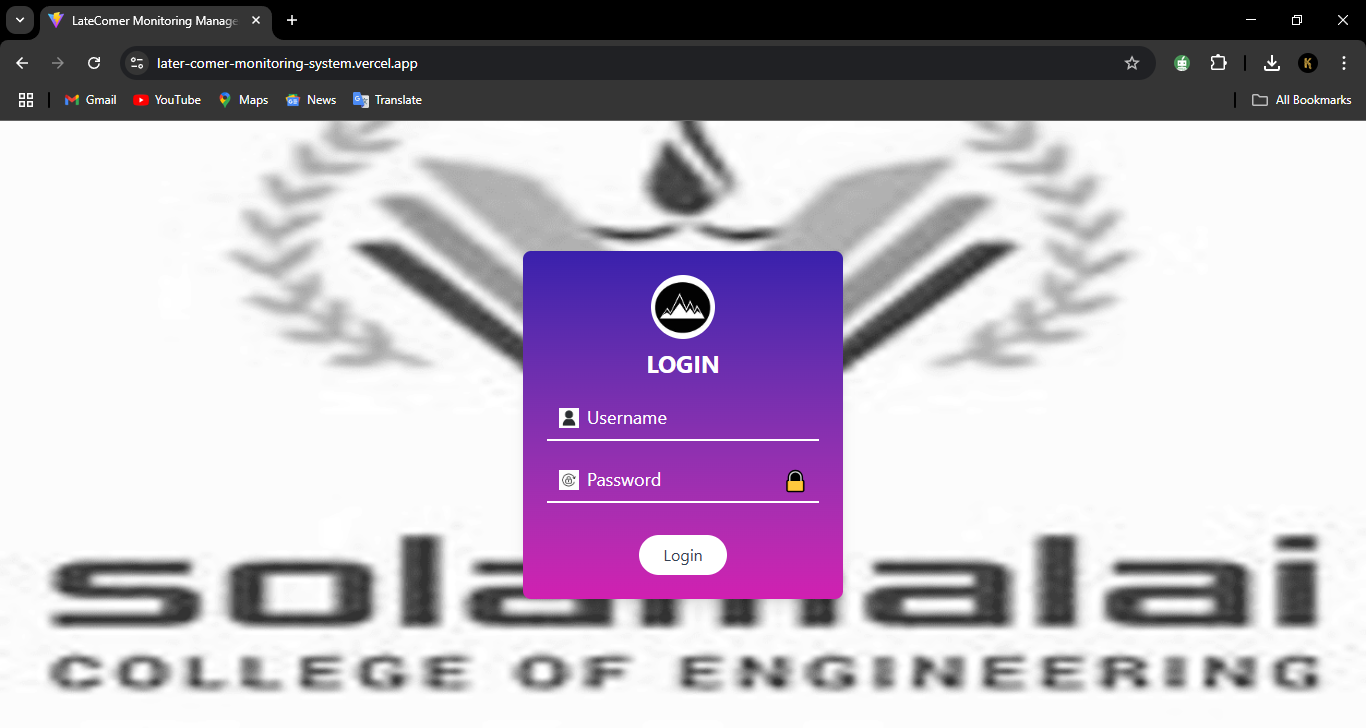


Fig A6: Front Page

**APPENDIX 7**

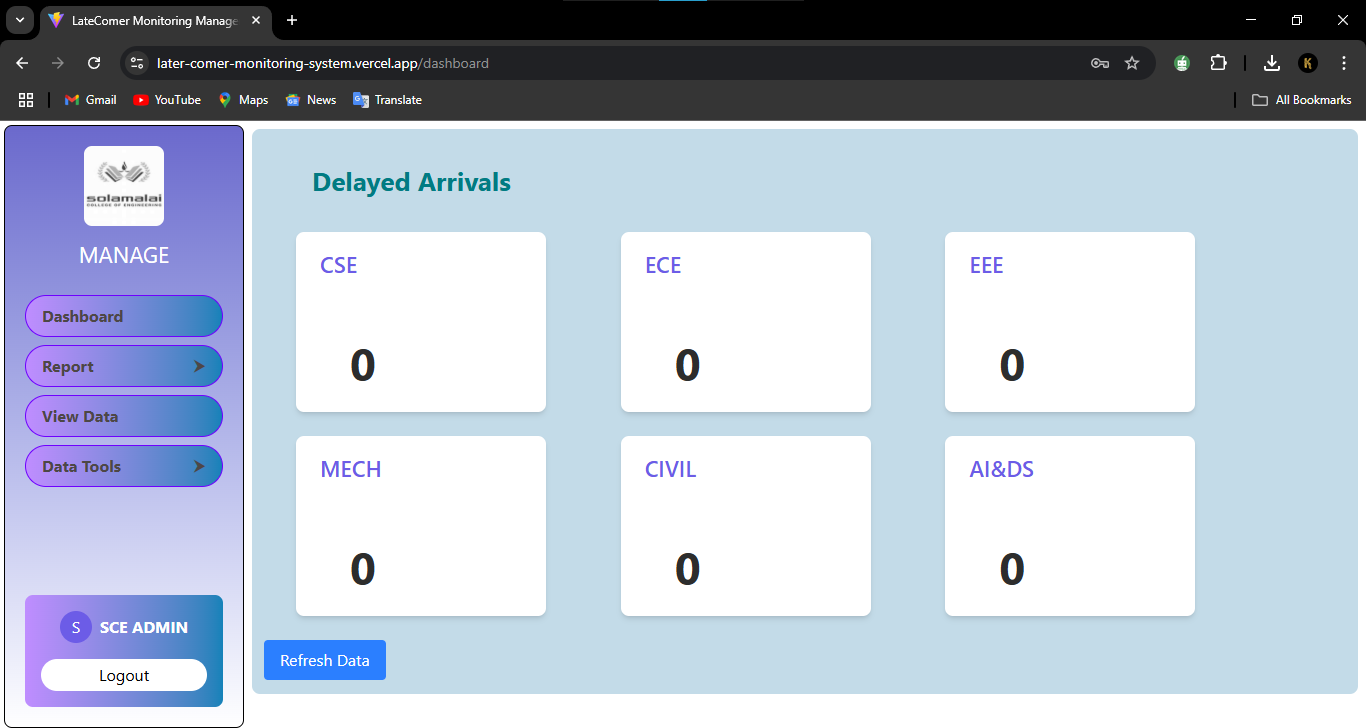


Fig A7: Admin Page

**APPENDIX 8**

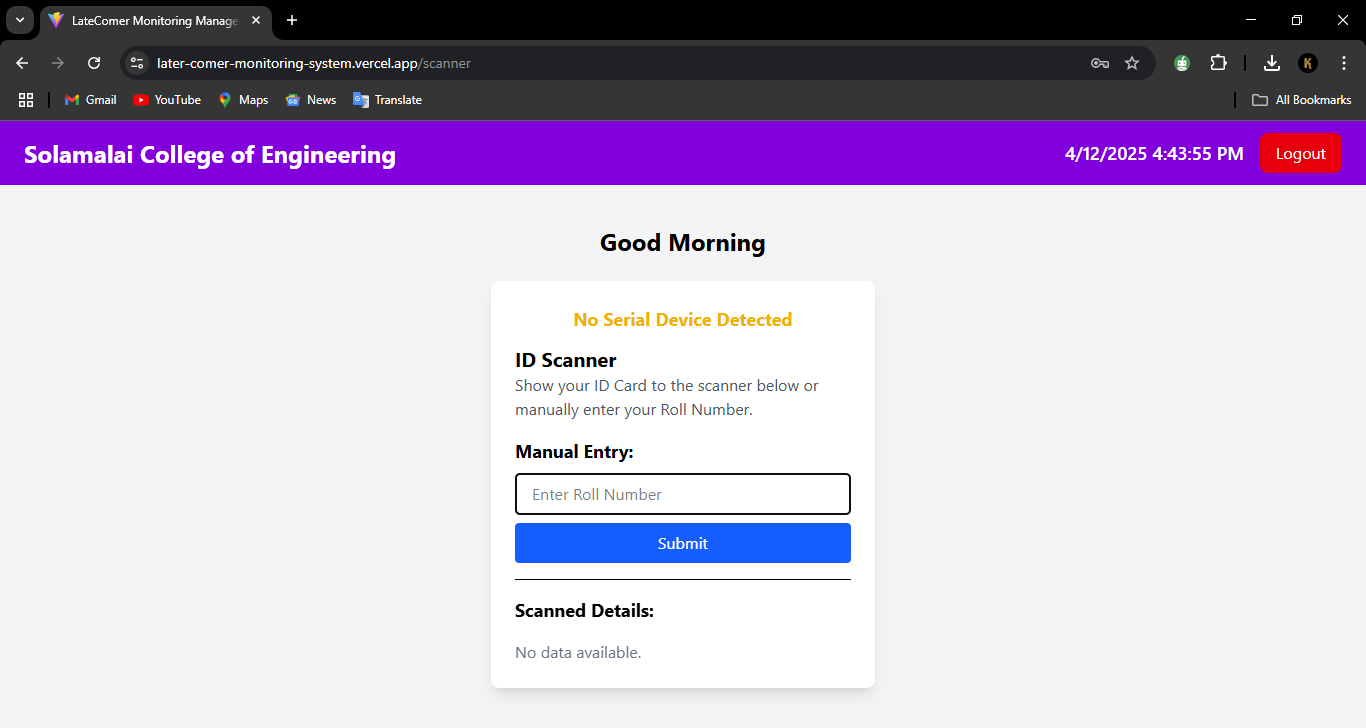


Fig A8: Scanner Page

# CHAPTER 7 CONCLUSION

## CONCLUSION

The Late Comer Monitoring and Management System has been successfully designed, implemented, and tested. This system addresses the key challenges in manually tracking late attendance and brings automation, accuracy, and real-time monitoring into institutional record-keeping:

1. Automation of Late Entry Tracking:

The system streamlines the traditional method by enabling latecomer data entry through both manual and barcode-based input. This reduces human error and provides efficiency and reliability in managing student attendance records.

1. Efficient Admin Dashboard with CRUD Functionality:

The admin dashboard is made with React.js and styled with Tailwind CSS, making it easy to use and responsive. It has a secure login to keep data safe. Users can add, view, change, and remove data. Changes show up right away thanks to real-time updates. You can filter data to find what you need quickly. The dashboard also lets you edit and delete entries. It can create reports about late entries, helping track and understand data better.

1. Robust Backend with Real-Time Cloud Integration:

By leveraging Node.js and Supabase (PostgreSQL), the system ensures reliable data storage, role-based access, and secure communication between frontend and backend using JWT-based authentication.

1. Accessibility and Usability:

The application supports keyboard accessibility and provides intuitive UI components, making it usable by administrative staff with minimal training.

1. Cross-Platform Compatibility:

The system has been tested across major modern browsers and is deployed on Vercel, ensuring smooth access on desktops, laptops, and tablets without installation.

1. Security and Data Integrity:

Implementation of token-based authentication, environment-configured API keys, and secure role-based views ensures that sensitive student data is protected from unauthorized access.

7. Positive Feedback & Institutional Readiness:

Early testing within the institution environment demonstrated that the solution significantly reduces administrative overhead and enhances accountability for students.

In conclusion, the Late Comer Monitoring and Management System is a user-friendly and efficient solution for tracking student late entries in colleges. It automates the logging process using both manual input and barcode scanning, helping staff record data accurately and quickly. The system features a clean UI built with React and Tailwind CSS, and ensures data security with JWT-based login and Supabase PostgreSQL integration. Admins can filter, search, and export records easily through the dashboard.

This project proves that modern web technologies, when used correctly, can solve real-world problems effectively. It offers a faster, more reliable, and digital way to handle latecomer data in educational institutions.

## FUTURE SCOPE

The future scope of the Late Comer Monitoring and Management System opens new possibilities through the integration of advanced technologies such as artificial intelligence and biometrics. Upcoming versions of the system can incorporate face recognition to enable contactless and seamless attendance logging, enhancing both efficiency and security. Additionally, predictive analytics can be employed to identify recurring latecomer patterns across departments or individuals, enabling proactive interventions by administrators. To improve communication, features such as automated SMS or email alerts to parents and students can be integrated, especially in cases of frequent late entries. The development of a mobile scanner app using smartphone cameras for barcode scanning can increase accessibility and flexibility for on-the-go usage.

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# LATECOMER MONITORING

# MANANGEMENT SYSTEM

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### Abstract

Managing student attendance, particularly tracking latecomers, is a persistent challenge in educational institutions. Traditional manual methods are often time-consuming, error-prone, and lack real-time accessibility. This project presents an automated and streamlined approach to monitoring latecomers using modern web technologies and cloud-based services. The system is designed to allow staff to record student entries via barcode scanning or manual input using a secure scanner interface, with all data stored in a centralized PostgreSQL database managed via Supabase. The admin panel provides functionalities for filtering, searching, editing, and exporting reports in Excel/PDF formats. Authentication is enforced using JWT tokens to ensure data privacy and role-based access. The solution is deployed on Vercel, offering fast, scalable access via any browser. The proposed system significantly reduces the burden on faculty by automating the tracking process and providing accurate, real-time records. It also enables transparent communication by allowing administrators to generate and share reports efficiently. Future enhancements include facial recognition integration and predictive analytics to identify patterns in late entries. This project emphasizes digitization in academic workflows, contributing to the larger vision of smart and efficient campus management systems.