

Integrated Solution for Modern Postal Needs

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Abstract

The evolution of postal services in the age of computers requires a cutting-edge solution integrating technology with established infrastructure. This current paper introduces the Modern Postal Service, a web-based end-to-end system for postal operations to make the efficiency, access, and sense of postal activities in India improved. The system offers a multi-module system having real-time monitoring, token system for services, regional language release, and citizen support through a chatbot feature, with privileged users having a push notification option.

The parcel tracking feature employs independent QR code generation and geolocation services depending on OpenStreetMap and Leaflet.js to provide real-time delivery status and route visualization. The Aadhaar token management system implements per-day token issuance limit, maintains service scalability. Chatbot module, developed on the lines of Natural Language Processing (NLP) and Retrieval-Augmented Generation (RAG), gives relevant responses to user queries about government postal schemes, from a pre-defined JSON knowledge base. Scheme recommendation engine also searches user profiles and sends

personalized scheme suggestions through SMS using the Twilio API for wider reach and engagement.

The application is built on Java Servlets and deployed on the GlassFish server with Oracle Database providing persistent storage. All this integrated well enables not just better postal logistics and citizen engagement but also global communication through local translation and web-based support services. The suggested solution has great potential for rollout in rural and semi-urban regions and is hence appropriate for India's digital empowerment and effective public service delivery.

1. Introduction

In an era of high-technology advancement and growing digital adoption, traditional post services are being pushed increasingly to become high-tech and match changing needs of the populace. Post systems, though with increased digital communication, continue to serve key roles in delivering public services that go beyond digital communication, with the majority occurring in rural and semi-urban regions where penetration of the internet and digital capability is limited. In order to close this

gap and improve the effectiveness of services, infrastructure modernization after that must incorporate technology.[1]

The Modern Postal Service project endeavours to surmount such obstacles by proposing a complete, web-based postal administration system in the Indian context. With an objective of enhancing functioning efficiency, transparency, and user experience, the system involves a multi-layered architecture and features parcel tracking provision, token management of services, regional language support, chatbot support, and scheme recommendation through automation.

Key technologies are parcel tracking through QR codes and OpenStreetMap and Leaflet.js for geolocation and real-time visualization, and Aadhaar token system enforcing a disciplined, day-to-day limit on demand control and scalability. The chatbot module, developed with state-of-the-art Natural Language Processing (NLP) and Retrieval-Augmented Generation (RAG), is an interactive map of government postal schemes. In addition, the system also has a personalized recommendation engine that examines user data and offers schema which will fit them on an individualized level through SMS through the Twilio API.

Evolved out of Java Servlets, hosted on the GlassFish server, and powered by an Oracle Database, the Modern Postal Service is efficient, scalable, and citizen-centric. Through the integration of traditional logistics with smart technologies, the system is designed to promote the accessibility and inclusivity of postal services in India, especially in areas where such upgradation can have the maximum positive effect

2. Existing System

India publish, India postal department, is the most significant and oldest publish machine in the world. although it has evolved with the development of services such as speed post, ePost, and electronic tracking over the years, the overall public of operations are still done manually and by way of earlier facilities. Parcel tracing, token system, and customer service are age-antique cumbersome processes with low mechanization and no customization.

Parcel tracking only accessible through web interface usage of monitoring numbers and real-time alone without a map view of the delivery routes. Token control for Aadhaar enrollment and other put up workplace home windows still being achieved manually or with rudimentary queuing structures without smart scheduling and in keeping with-day caps. local Accessibility is frustrated through nonexistence of multilingual guide among the majority of the individuals of postal interfaces in order that non-English dwellers may be isolated from on line services.

User aid now doesn't extend beyond FAQs or static statistics pages but falls short of an interactive tool to assist users or respond to specific questions regarding government schemes.

Levels of concern regarding schemes among rural individuals are low because of bad focused outreach, with no facility to healthy the customers with schemes based completely on their profile. Those limits diminish the productivity of provider transportation and introduce a digital divide, particularly in rural and underpenetrated regions. Inefficient smart monitoring, real-time locationing, native language support,

and intelligent user interaction reduce India's scalability and performance in its postal service within the digital technology.

With this, an AI-based, pragmatic, and elementary post control device is desired to plug those loopholes and bring the put up closer to virtual India goals.

3. Proposed System

Modern Postal Service will implement a new technology-driven, citizen-centric web application that replaces traditional postal processes with a colorful, harmonized, and dynamic web process. The system will strive to make the services more efficient, promote accessibility, and ensure digital inclusion, particularly in rural and semi-urban areas. Key requirements of the proposed system are:

Real-Time Parcel Tracking

The system offers parcel tracking via QR code, where each parcel is assigned a unique QR code that matches its delivery status. Users are able to check the live delivery routes, parcel location, and estimated delivery status using OpenStreetMap and Leaflet.js.[4]

Aadhaar Token Management System

An Aadhaar services token distribution system is also provided on a daily basis such that the efficiency of automating these kinds of services is enhanced. A token is provided to each user having a unique ID, and the system automatically issues following a 20-token quota on a daily basis such that fairness is preserved along with scalability of services. The count is reset and data cleared every 24 hours such that it remains effective.

Regional Language Implementation

The system is capable of supporting multilingual interfaces to address citizens who use various languages, thereby allowing for greater adoption and ease of access for non-native English speakers.[3]

Chatbot Support

A chatbot trained with the help of Natural Language Processing (NLP) and Retrieval-Augmented Generation (RAG) provides interactive support for users queries in the form of government-run postal schemes. The chatbot provides suitable and proper answers from a schema-based JSON knowledge base.[6]

Scheme Recommendation Engine

By processing user profiles within the system, the engine delivers customized government schemes. Users are notified directly by SMS using the Twilio API to enhance awareness and coverage for well-being schemes.[7]

Web-Based Architecture

It is deployed with Java Servlets and hosted on GlassFish server. Oracle Database is used for safe and reliable storage with outstanding performance and scaling to large populations.

By bringing together the postal infrastructure and advanced technology, the suggested system not only eliminates the vulnerability of the current infrastructure but also facilitates digital empowerment, effective delivery of services, and access to government services in a non-discriminatory way. The solution is highly appropriate for roll-out in rural and underserved geographies, bridging the digital exclusion gap and achieving Digital India goals.

4. Architecture

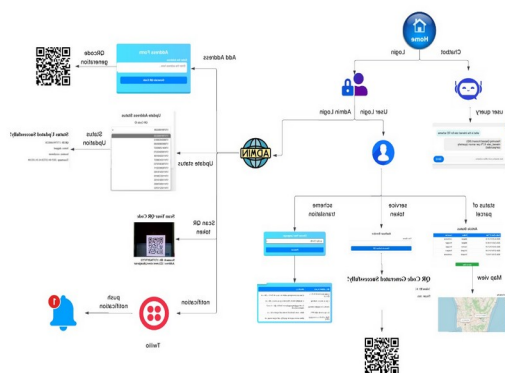


Fig. 1 Architecture

5. Workflow

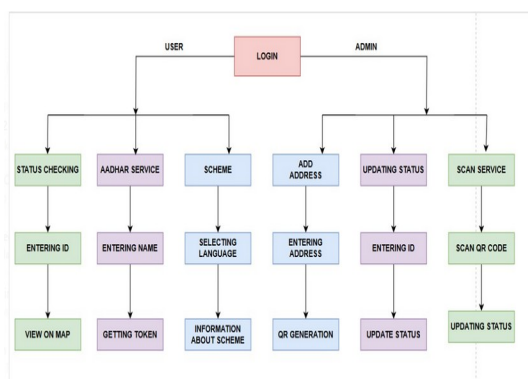


Fig. 2 Flow Diagram

5.1 User Workflow

Whenever there is a user log are presented on to the system through web interface, different functionalities based on their requirements:

- **Parcel Tracking:** Users can enter or read a QR code related to a parcel. The system extracts related delivery information from the database and displays the parcel's current location and path via OpenStreetMap and Leaflet.js. This is for openness and enhancing the degree of trust that a user has in a delivery process.

- **Aadhaar Token Generation:** One can request an Aadhaar service token by giving their name through a simple form. The system verifies the number of tokens already issued for the day (20 a day maximum), generates a new token with a unique identifier if there is an available slot, and provides a QR code. Users are alerted if the threshold is already hit, and they are asked to return the next day.

- **Chatbot Support:** There is a chatbot infused with the capability of Natural Language Processing (NLP) and Retrieval-Augmented Generation (RAG) that helps the users in querying regarding postal-government schemes. The chatbot is derived from a properly built JSON-based knowledge base that gives the precise and end-user-oriented responses.

- **Scheme Suggestion:** Once a personal profile is completed using a certain form, the system checks the information and cross-verifies it with government schemes already running. According to the eligibility criteria, customized scheme suggestions are notified to the user via SMS using the Twilio API.

5.2 Administrator Workflow

Administrators sign into the system using a secure portal to manage the backend operations of the system. Their principal work is as follows:

- **Address Entry and Parcel Registration:** New parcel address information is entered by admins. The system generates a unique QR code, saves it locally, and saves associated metadata (QR ID, address, and QR path) in the tracking_address table of the Oracle database.
- **Status Update:** Admins update the status of already opened parcels by selecting the

respective QR code ID. They input the new status and date, which are saved in the tracking_status table. It is provided to users via the parcel tracking module.

- Aadhaar Token Monitoring: Admins are able to monitor the tokens distributed each day and reset if required.

5.3 Backend Processing

The backend is achieved through Java Servlets, which perform form processing, business logic, and database manipulation. The application runs within the GlassFish server to ensure scalable and fault-tolerant processing. [5]

The Oracle Database is the central repository of data, with the following important tables defined below:

- Tracking_address — Holds QR ID, address, and QR image URL.
- Tracking_status — Holds status updates related to QR IDs.
- Aadhar — Holds Aadhaar token records and timestamps.
- User_profile — Stores user-supplied profile data to match schemes.

6.Results and Discussion

Modern Postal Service was implemented and validated in a test environment using Java Servlets, Oracle Database, and GlassFish application server. The modules were tested for usability, functionality, and performance to evaluate their ability to enhance postal services. The

implementation results reflect significant improvements over conventional systems.



Fig. 3(Generated QR)

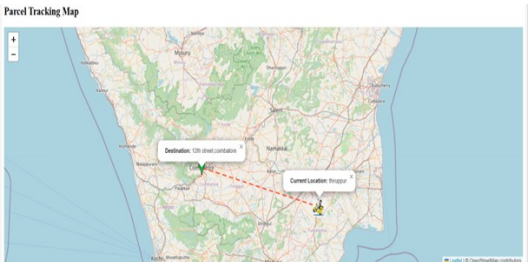


Fig. 3(Tracking)



Fig. 3(Status Updation)

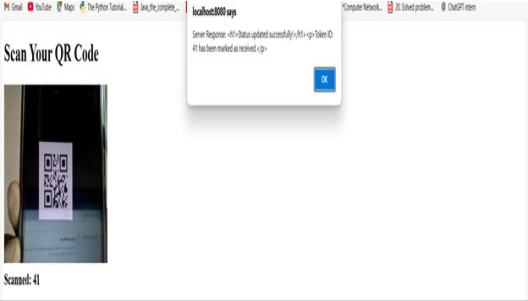


Fig. 4(Token Scanning)

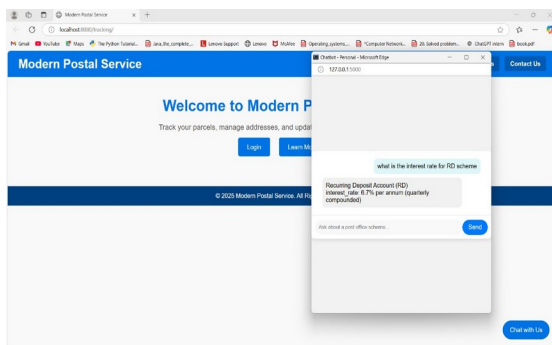


Fig. 5(Chatbot)

6. Future Enhancements

In the future, a mobile application can be developed to improve accessibility. AI and predictive analytics may optimize delivery routes and service efficiency. The chatbot can be expanded to support more regional languages and voice input. Integration with India Post and biometric authentication can further enhance system security and reach.[2]

7. Conclusion

The *Modern Postal Service* system successfully integrates digital technologies with traditional postal infrastructure to enhance efficiency, accessibility, and citizen engagement. By incorporating modules like real-time parcel tracking, Aadhaar token management, regional language support, and an intelligent chatbot, the system addresses the evolving needs of postal services in India. The use of open-source tools and scalable architecture ensures adaptability across rural and urban regions. This initiative not only modernizes postal operations but also

contributes to India's vision of digital empowerment and inclusive governance.

8. References

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