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A Project Synopsis

on

Lok-Bandhu:
AI-powered Civic Issue Reporting & Resolution Platform

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Abstract

Lok Bandhu is an AI-powered civic issue reporting and resolution platform designed to address the critical challenges faced by local governments in identifying, prioritizing, and resolving everyday civic issues such as potholes, malfunctioning streetlights, and sanitation problems. Traditional civic complaint systems suffer from low citizen awareness, high friction in reporting processes, a lack of transparency, and inadequate tracking mechanisms. This project bridges the gap between citizens and municipal authorities through a mobile-first, photo-based reporting system that leverages Convolutional Neural Networks (CNN) for automatic issue classification and intelligent departmental routing.

The platform employs a comprehensive technology stack including ReactJS and Flutter for cross-platform mobile development, Node.js with Express.js for backend services, PostgreSQL for scalable database management, and Twilio for real-time SMS notifications. The system's unique value proposition includes automatic geo-tagging, AI-driven issue categorization achieving 93%+ accuracy, hierarchy-based priority scheduling with Service Level Agreement (SLA) enforcement, and automated escalation mechanisms that ensure accountability. By implementing crowdsourced validation through citizen upvoting and duplicate complaint merging, the platform reduces redundancy while maintaining data integrity.

Lok Bandhu aligns with Sustainable Development Goals 11 (Sustainable Cities and Communities) and 16 (Peace, Justice and Strong Institutions), promoting participatory governance, transparency, and enhanced civic engagement. The expected impact includes reducing average resolution time from 30 days to 12 days, increasing citizen satisfaction from 40% to 85%, and fostering data-driven decision-making for urban infrastructure management.

Introduction

Background and Motivation

Rapid urbanization in India has created significant pressure on local governing bodies to efficiently address routine civic infrastructure issues, such as potholes, broken streetlights, and overflowing garbage bins. These problems, though common, often go unreported due to a lack of streamlined reporting mechanisms, resulting in delayed responses, inefficient prioritization, and eroded public trust in municipal governance. Citizens face high barriers in lodging complaints through traditional systems, usually involving manual paperwork, lengthy phone calls, or confusing online portals, which discourages active civic engagement. At the same time, municipalities are often overwhelmed by disorganized incoming reports, absent of robust tools to manage, categorize, and efficiently route these grievances to the right authorities.

Emergent research and practice in the field of civic technology reveal the vital role that digital transparency, mobile-first access, and participatory design play in boosting civic engagement. Notable studies examining the adoption of platforms like SeeClickFix in the United States and FixMyStreet in the United Kingdom underline how easy reporting and real-time status tracking not only increase the number of issues reported but also raise resolution rates by motivating citizens through prompt feedback. Furthermore, municipal technology pilots in India, such as Delhi's MCD 311 mobile app, have demonstrated that Service Level Agreement (SLA)-based escalation and public dashboards can sharply improve resolution times, sometimes ensuring complaint resolution within 24 hours for critical issues.

Given this context, the Government of Jharkhand's initiative calls for the development of a robust, mobile-first, AI-driven platform that facilitates the crowdsourced identification, reporting, and tracking of everyday civic issues. The core vision is to empower citizens to act as "citizen sensors" and enable municipal authorities to leverage artificial intelligence for rapid triage and efficient resource allocation, ultimately fostering more responsive, transparent, and accountable urban governance.

Gaps in Existing Systems

Despite the presence of various complaint redressal systems at the state and municipal levels, current platforms reveal significant limitations. Many rely on manual intervention to categorize and route issues, resulting in frequent misallocation of tasks and long backlog queues. User experience studies highlight complicated login processes, unintuitive forms, and the absence of instant feedback as major deterrents for public participation. Moreover, most platforms lack real-time status updates, escalation protocols, or public performance dashboards—reducing visibility into the timeline and accountability for the resolution process.

A critical gap is the lack of automated defect recognition and categorization. Although recent advances in computer vision, especially with Convolutional Neural Networks (CNNs), have achieved up to 98% accuracy in identifying defects like potholes from images, such capabilities are rarely seen in government deployments. This results in missed opportunities for reducing response delays and optimizing the assignment of municipal resources. Additionally, duplicate complaints, data

redundancy, and the absence of mechanisms for crowdsourced complaint validation (such as upvoting or merging similar reports) contribute to systemic inefficiency and wasted administrative effort.

Equity research further reveals persistent socio-demographic divides in platform usage, with marginalized groups less likely to participate due to digital literacy, language barriers, or lack of internet access. Without compensating design—such as multi-language interfaces or SMS/voice-based reporting—these platforms risk reinforcing existing gaps rather than closing them.

Contribution and Innovation

The proposed system, **Lok Bandhu**, aims to address these deficiencies through the integration of artificial intelligence, mobile-first design, and a robust, modular backend infrastructure. The platform's core contribution is an end-to-end civic issue reporting and resolution solution, where users can:

- Report issues instantly via a mobile app, uploading photographs, auto-captured location, and a brief explanation using text or speech input.
- Track the status of their submissions in real-time and receive notifications at each stage: acknowledgment, assignment, ongoing work, and resolution.
- Validate and boost visibility for severe or recurring community issues through a transparent, upvoting-enabled public dashboard.
- Provide feedback on the quality of the resolution, supporting continuous improvement.

On the administrative side, municipal departments will access a powerful, filterable dashboard that consolidates incoming reports, applies AI-driven categorization, and automates routing to relevant teams based on issue type, urgency, and location. The backend incorporates SLA-driven escalation, alerting higher authorities if issues are not resolved within timeline thresholds, and supports analytics features for monitoring key performance indicators such as mean response times and resolution rates. Public transparency is maintained through open status boards and, in severe cases, automated social media escalation.

Lok Bandhu is engineered for scalability and resilience, supporting high-volume multimedia uploads, concurrency for thousands of users, and robust API integration for future expansion. By building on best practices observed in leading global platforms and grounding new features in rigorous urban innovation literature, the project targets not only functional efficiency but also inclusivity, equity, and long-term sustainability.

Technology Stack and Field Specialization

The core technologies used are Flutter for cross-platform mobile development, React and Node.js with Express for the web interface and backend services, and PostgreSQL for robust, scalable database management. AI functionalities are enabled by custom-trained CNN models for image-based issue recognition, leveraging state-of-the-art accuracy in defect classification for civic images. Location tagging utilizes GPS and geocoding APIs, while notification and alerting are powered by Twilio's SMS gateway and standard email protocols.

The project fits squarely within the fast-growing field of Civic Technology (CivicTech) and Smart Governance, aligning closely with India's national Smart Cities Mission and the United Nations' Sustainable Development Goals (SDG) 11 and 16. It embodies the PITA framework—fostering Participation, Inclusion, Transparency, and Accountability—and leverages digital and data-driven solutions to bridge the gap between citizens and city governments.

Ultimately, Lok Bandhu aspires to set a new standard in Indian civic complaint management by uniting advanced machine learning, user-centric design, and principles of open government in one agile, forward-compatible platform.

Literature Survey

The shift towards digitized civic issue reporting has been driven by the need for faster, more transparent, and participatory governance, especially in rapidly urbanizing societies. Early international initiatives such as **SeeClickFix** (USA) and **FixMyStreet** (UK) established the model for reporting everyday civic problems—like potholes, damaged infrastructure, and waste—directly to municipal agencies via web and mobile platforms. Extensive research on these platforms has demonstrated that citizen engagement rises when tools are easy to use and provide clear status tracking and public feedback. However, studies from Brussels and Sacramento indicate that such platforms tend to be used disproportionately by digitally literate, higher-income citizens, sometimes reinforcing existing social inequalities in city services.

Indian cities are now leveraging such digital innovations through portals like the **Jharkhand Public Grievances Management System** and progressive mobile solutions like the **MCD 311 app** in Delhi. MCD 311's striking 95% complaint resolution rate for sanitation within 24 hours in 2023 showcased the efficacy of well-coordinated, tech-enabled, and SLA-driven complaint management. Despite these advances, many Indian grievance systems rely on manual complaint categorization and routing, offer limited status updates, and lack features for automated prioritization or duplicate detection. Research highlights that these limitations result in reduced public trust, low rates of repeat reporting, and challenges in tracking systemic problems or recurring service failures.

A pivotal technological development in recent years has been the integration of **artificial intelligence (AI) and deep learning** in civic tech platforms. Academic studies demonstrate that CNN-based systems can classify images of urban infrastructure—such as potholes or malfunctioning lights—with accuracy exceeding 93%. For example, YOLOv5 and MobileNetV2 architectures support real-time, automated triage and departmental routing by analyzing issue photos taken from mobile devices. Such solutions sharply reduce manual errors and accelerate response times. Further, crowdsourcing techniques like community upvoting, complaint merging, and map-based interfaces help to highlight priority issues, avoid duplication, and use public input for smarter city management.

Transparency and accountability are core themes across the literature. Studies show that platforms offering live dashboards, notification tracking, and open government analytics build higher citizen trust and foster ongoing public participation. International standards—such as the "PITA" approach (participation, inclusion, transparency, accountability)—are now widely recommended in civic engagement research, and have also influenced newer Indian initiatives like Janasunani and InfraFix.

At the same time, persistent challenges remain. Reviews across multiple cities identify that digital grievance tools can unintentionally exacerbate the digital divide, excluding elderly, low-income, and linguistically diverse populations unless inclusive design (e.g., multilingual interfaces, mobile-first UX, and offline reporting support) is deliberately implemented. Operational research in Indian municipalities also finds a need for better integration between

digital frontends and the internal workflows of government departments to realize the full benefits of automated and data-driven approaches.

In recent years, research best practices have begun to coalesce, emphasizing:

- AI-driven classification for objective and fast sorting of high-volume complaints.
- Use of **GIS visualization** for mapping hotspots and directing municipal resources efficiently.
- Integrated **service level agreements (SLAs)** and escalation chains for time-bound response and authority accountability.
- Community-based validation and feedback to close the loop with citizens.
- Systematic analysis of complaint and response data for urban policy insights and continuous improvement.

As smart city initiatives and Sustainable Development Goals (notably SDG 11 and SDG 16) push for inclusive, accountable, and responsive local government, the convergence of these innovations is recognized as crucial for future-ready civic management platforms.

Methodology/ Planning of work

The development of Lok Bandhu was systematically executed in the following phases:

Phase 1: Requirement Analysis

- Understood the problem statement and identified core features, including photo-based issue reporting, automatic location tagging, AI classification, complaint tracking, and notifications.
- Defined user roles (citizen, municipal staff, admin) and mapped their interactions and needs.

Phase 2: System Design

- Architected the application with modular layers: Flutter mobile app and React web frontend for users, Node.js/Express backend APIs, PostgreSQL database, and AI model service for image classification.
- Developed detailed database schema, API design, and system workflow diagrams to ensure clarity and maintainability.

Phase 3: Implementation

- Built the user interfaces for effortless complaint registration, incorporating features such as image upload, auto geo-tagging, and optional text/voice input.
- Integrated a CNN-based AI model to analyze images and automatically categorize complaints for proper departmental routing.
- Developed an admin dashboard offering filtering, sorting, and map-based visualization for efficient issue management.

Phase 4: Escalation and Communication

- Implemented an escalation mechanism that notifies higher-level municipal authorities and community stakeholders when issues remain unaddressed beyond predefined review periods.
- Enabled real-time notifications via SMS and email to keep citizens and officials informed about complaint statuses and updates.

Phase 5: Testing and Deployment

- Conducted unit, integration, and UI/UX testing to validate functionality and ensure accessibility across devices.
- Refined AI accuracy through testing on diverse image datasets.
- Deployed the platform on a cloud environment designed to support scalability and secure data handling.

Facilities required for proposed work

Software Requirements

- **Development Tools:** Visual Studio Code, Android Studio, Xcode for Flutter app development, and Postman for API testing.
- **Frameworks & Libraries:** Flutter SDK for mobile apps, ReactJS for web frontend, Node.js with Express for backend development, TensorFlow/PyTorch for AI model integration.
- **Database and Storage:** PostgreSQL for managing user, complaint, and department data, cloud object storage (AWS S3/Google Cloud Storage) for image and multimedia file storage.
- **APIs:** Google Maps or OpenStreetMap for location tagging and mapping; Twilio or similar service for SMS notifications.
- **Deployment & Testing:** Docker for containerization, cloud platforms like AWS/GCP/Azure for scalable hosting and deployment.

Hardware Requirements

- **Developer Machines:** Laptops/desktops with a minimum Intel i5 CPU, 8–16 GB RAM, SSD storage for efficient coding and model testing.
- **Testing Devices:** Multiple Android and iOS smartphones/tablets with diverse screen sizes and OS versions.
- **Servers:** Cloud VMs or dedicated servers with sufficient CPU and memory for backend and AI inference, GPU-enabled instances for AI model training.

Network and Security

- Secure HTTPS communication and JWT-based authentication for user and API security.
- Regular data backups and vulnerability scanning to ensure data integrity and system resilience.

Human Resources

- Skilled developers for mobile, web, backend, and AI components.
- QA testers for verification and usability testing.
- Domain experts for municipal workflows and user experience feedback.

Documentation and Support

- Comprehensive technical and user documentation.
- Training for municipal staff to ensure smooth adoption and operation.
- Mechanisms for user feedback to guide future improvements.

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