International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Smart Mobile Application for Water Supply Management

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Abstract: ***Water supply management has become a critical challenge in urban and rural areas due to the increasing demand for clean water and the difficulty in accessing reliable suppliers. Traditional methods of contacting water suppliers are manual, slow, and lack transparency. This project proposes a Smart Mobile Application for Water Supply Management that provides a digital platform to connect water consumers and suppliers efficiently. The system uses location-based services such as GPS to help users identify nearby suppliers, request water delivery, and track bookings in real time. It includes secure payment options, a turbidity checking device for water quality monitoring, and a feedback mechanism for better service transparency. The system also monitors daily and monthly water consumption to support responsible usage.***

Keywords: Water Supply Management, Mobile Application, GPS, Real-Time Tracking, Turbidity Monitoring, Water Consumption

1. Introduction

Access to clean and reliable water is a fundamental necessity for human health and well-being. However, water supply management has become a significant challenge in both urban and rural regions due to the growing population, rising demand for clean water, and limited availability of organized supplier networks. Many communities depend on private water suppliers and tanker services to fulfill their daily water requirements. The traditional approach of contacting suppliers manually often results in delays, miscommunication, and a lack of transparency regarding water availability, pricing, and delivery status. This creates inconvenience for consumers and reduces the overall efficiency of water supply operations.

To address these challenges, the Smart Mobile Application for Water Supply Management is proposed as a user-friendly and efficient digital platform. The system is developed as an Android-based application that integrates location-based services, specifically the Global Positioning System (GPS), to allow users to search and identify nearby water suppliers. Users can view supplier details, place delivery requests, and monitor the status of their bookings in real time. The application simplifies communication between consumers and suppliers by providing accurate information on water availability, supplier location, quantity, and pricing.

The system also includes a turbidity checking device that measures the clarity and quality of the delivered water, ensuring that consumers receive safe and clean water. In addition to delivery management, the application enables users to monitor their daily and monthly water consumption, supporting responsible usage and better planning. Secure payment options are integrated into the platform, and users can provide ratings and feedback for suppliers to maintain service quality and accountability. The application includes dedicated modules for administrators, users, and suppliers, each designed to manage their respective roles efficiently within the system.

2. Related Works

Sharma et al. (2025) proposed a mobile-based water distribution management system that uses GPS tracking to connect consumers with local water suppliers. The system improved delivery efficiency but lacked real-time booking and payment features.[1]

Kumar and Singh (2025) developed a digital platform for managing water tanker services that allows users to request deliveries through a mobile application. The system enhanced communication between consumers and suppliers but did not include water quality monitoring.[2]

Rao et al. (2024) introduced a smart water supply monitoring system using IoT sensors and cloud computing to track water levels and manage distribution in urban areas.[3]

Patel and Mehta (2024) proposed a web-based water supply management system with real-time tracking features. However, the system lacked mobile accessibility and turbidity measurement capabilities.[4]

Chen et al. (2023) explored the use of sensor-based technologies for monitoring water quality parameters including turbidity, pH, and temperature in real-time distribution systems.[5]

Singh and Verma (2023) developed a smart water management platform that integrates data analytics and geographic information systems for optimizing water supply routes and monitoring consumption.[6]

Ahmed and Khan (2022) focused on mobile application-based water service systems that use cloud platforms for connecting consumers with water providers and managing delivery requests.[7]

Gupta et al. (2025) proposed a real-time water quality monitoring system using turbidity sensors and machine

learning techniques to detect contamination and ensure safe water delivery.[8]

Nair and Joseph (2025) developed a geolocation-based water supplier search system that enables consumers to identify and contact nearby suppliers using GPS tagging, improving access to water services.[9]

Das et al. (2024) introduced an IoT-based water consumption monitoring system that tracks daily and monthly usage patterns to support efficient water resource management.[10]

Verma and Yadav (2024) proposed a smart water governance system that integrates booking management with predictive analytics to forecast demand and optimize supplier allocation.[11]

Li et al. (2023) developed a water distribution monitoring system using sensor networks and mobile applications for real-time tracking of supply and demand in residential areas.[12]

Fernandez and Lopez (2023) designed a cloud-based water supply tracking platform that enhances transparency and communication between water authorities and consumers.[13]

Reddy et al. (2023) implemented a machine learning model for predicting water demand and optimizing delivery schedules based on historical consumption data.[14]

Bansal et al. (2022) proposed a mobile application for water service management that includes booking registration, delivery tracking, and consumer feedback mechanisms.[15]

Karthik and Prasad (2022) developed an automated water quality monitoring system using IoT sensors to detect impurities and notify users about water safety levels instantly.[16]

Zhang et al. (2021) explored the application of digital technologies in water supply management, focusing on automated booking systems and resource optimization strategies.[17]
Roy and Dutta (2021) proposed a centralized digital platform for water supply services that integrates booking management, analytics, and reporting features for administrators and suppliers.[18]

3. Outlined Method

Designing a Smart Mobile Application for Water Supply Management involves a structured process aimed at improving water delivery operations and connecting consumers with suppliers efficiently. The proposed methodology integrates location-based services, database management, and sensor technologies to create a reliable and transparent water supply management platform.

3.1 Requirement Analysis

The requirement analysis phase focuses on identifying system objectives and challenges in traditional water supply management. These include manual booking processes, delayed deliveries, lack of transparency in pricing, and difficulty in monitoring water quality and consumption. Key requirements include enabling GPS-based supplier search, supporting real-time booking and tracking, integrating turbidity measurement for water quality monitoring, providing secure payment options, and maintaining a centralized database for storing supplier details, booking records, and consumption data.

a) System Design
The system design includes several interconnected modules. Users can search for nearby water suppliers through the mobile application using GPS-based location services. The application displays supplier details including availability, pricing, and location. Users can place delivery requests, make payments, and track their orders in real time. A turbidity sensor device is integrated to measure water clarity and ensure quality. An administrator dashboard allows management of user accounts, supplier verification, and monitoring of bookings and feedback. All modules interact with a centralized database that stores user profiles, supplier information, booking records, payment details, and consumption logs.

b) Development
The system is implemented using Flutter for the development of the Android-based mobile application, ensuring a responsive and user-friendly interface. The backend is developed using the Django framework to manage application logic, booking operations, and database interactions. GPS and location-based APIs are integrated for real-time supplier search and delivery tracking. A turbidity sensor module is connected to monitor and report water clarity levels. A relational database such as MySQL or SQLite is used to store user data, supplier information, booking details, payment records, and water consumption logs.

c) Integration & Testing
Integration ensures that all modules operate together as a complete and functional system. Testing procedures verify the accuracy of GPS-based supplier identification, reliability of real-time booking and tracking, performance of the payment processing module, correctness of turbidity sensor readings, and accuracy of water consumption monitoring. The system is tested under different scenarios to ensure smooth functionality, quick response time, and efficient handling of water supply operations.

4. Evaluation & Optimization

Evaluation and optimization involve analysing the performance of all modules within the Smart Mobile Application for Water Supply Management. This includes measuring the accuracy of GPS-based supplier search, evaluating booking and delivery processing efficiency, analysing notification delivery reliability, validating turbidity sensor readings, and verifying the correctness of water consumption tracking data.

Optimization techniques improve location accuracy, enhance data processing efficiency, and ensure reliable system

performance. Database query optimization, improved sensor calibration, and refined user interface design are applied to enhance the overall performance and usability of the application.

4.1 Location and Sensor-Based Approach

The Smart Mobile Application for Water Supply Management applies location-based services and sensor technologies to automate water delivery operations and improve consumer experience. One of the key components of the system is the GPS-based supplier search module, which uses real-time location data to identify and display nearby water suppliers along with their availability, pricing, and distance from the user. The system processes location data and supplier information to provide accurate and relevant search results.

In addition to location services, the turbidity checking device plays a crucial role in ensuring water quality. The sensor measures the clarity of the delivered water and provides readings that are displayed within the application. Water consumption monitoring tracks daily and monthly usage data, helping users manage their water requirements efficiently. Notification systems ensure that users receive timely updates about booking confirmations, delivery status, and water quality alerts. Analytics modules evaluate system performance and provide insights for better management decisions by administrators and suppliers.

By integrating these intelligent modules, the system provides an efficient platform for managing water supply operations transparently and reliably. The combination of GPS services, sensor technology, and mobile application features allows the system to operate effectively in both urban and rural environments.

4.2 Dataset Description

The Smart Mobile Application for Water Supply Management uses datasets consisting of supplier information, GPS location data, booking records, turbidity sensor readings, and water consumption logs. These datasets are collected from real-world user interactions through the mobile application and integrated sensor devices. The supplier data includes details such as availability, pricing, service area, and ratings, which are used to provide accurate search results for consumers.

In addition to supplier and location datasets, the system also stores booking histories, payment transaction records, consumer feedback, and turbidity measurements in the database. This data is used for tracking, performance analysis, and continuously improving the system. The availability of comprehensive datasets ensures better accuracy, reliability, and adaptability of the application in real-world water supply environments.

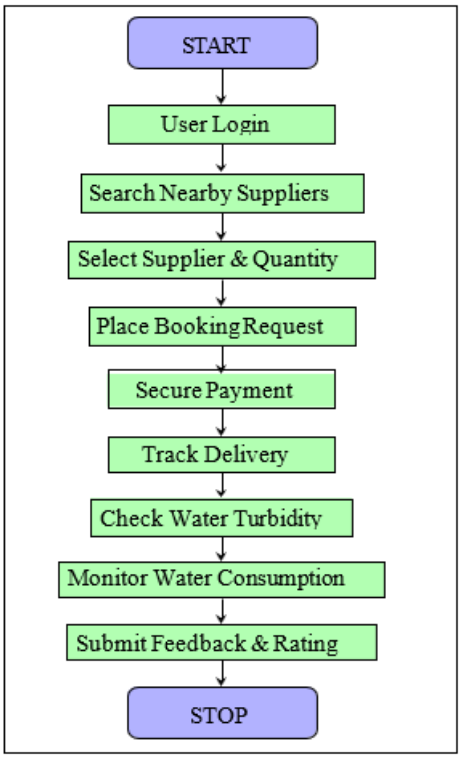

Figure 1: Flowchart of Smart Water Supply Management System

5. Result & Discussion

5.1 System Performance and Functionality

The Smart Mobile Application for Water Supply Management demonstrates effective performance in automating water delivery operations and improving communication between consumers and suppliers. The GPS-based supplier search module successfully identifies and displays nearby water suppliers with accurate location and pricing details. The system integrates multiple modules including supplier search, booking management, real-time delivery tracking, turbidity monitoring, water consumption tracking, secure payment processing, and notification services. These modules work together to reduce manual effort for both consumers and suppliers while improving transparency and delivery efficiency. The integration of Flutter, Django, GPS APIs, and sensor technologies enables the platform to operate reliably and manage water supply data in a structured and organized manner.

5.2 Test Cases and Outcomes

The system was tested under different real-world scenarios to evaluate its performance and reliability. The GPS-based supplier search module successfully identified nearby suppliers and displayed accurate information in most test cases. The booking and payment modules correctly processed delivery requests and transactions, while the turbidity sensor provided accurate water clarity measurements. The consumption tracking module accurately recorded daily and monthly usage data for users. The notification system delivered timely updates regarding booking confirmations and delivery status changes. These results demonstrate that the Smart Water

Supply Management Application can effectively support water delivery operations and improve the overall experience for consumers and suppliers.

5.3 Comparative Analysis with Existing Systems

A comparison with traditional water supply management methods shows that the proposed system significantly improves efficiency, transparency, and accessibility. Conventional approaches rely on manual phone calls and in-person communication, which can be slow and unreliable. In contrast, the proposed application automates supplier search, booking, and tracking through GPS and mobile technologies. It provides a centralized platform for managing water delivery requests, monitoring consumption, and ensuring water quality through turbidity measurement, thereby improving service reliability and consumer satisfaction.

In addition to improving delivery management, the system provides valuable insights into water consumption patterns and supplier performance. By combining real-time tracking with consumption analytics and quality monitoring, the platform creates a more organized and data-driven approach to water supply management. The collected data helps administrators identify supply shortages and allocate resources efficiently. Overall, the implementation of digital technologies in water supply management demonstrates significant potential in enhancing service delivery and improving accessibility to clean water for consumers in both urban and rural areas.

6. Conclusion

The Smart Mobile Application for Water Supply Management provides an effective solution for improving water delivery operations and enhancing accessibility to clean water through the integration of mobile technologies, GPS-based location services, and sensor-based monitoring. By incorporating real-time supplier search, booking and tracking management, turbidity checking for water quality assurance, water consumption monitoring, and secure payment processing, the system reduces manual effort and enhances the overall efficiency of water supply operations. The application creates a transparent and reliable communication channel between consumers, suppliers, and administrators.

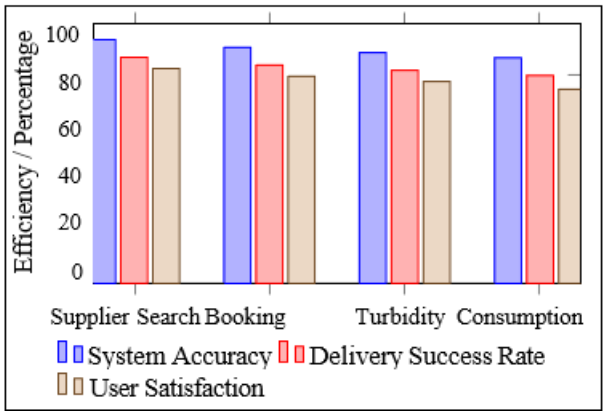

Figure 2: Performance Analysis of Smart Water Supply Management System

The system helps consumers access nearby water suppliers quickly, monitor the quality of delivered water, and track their daily and monthly consumption effectively. Suppliers benefit from streamlined booking management and efficient delivery tracking, while administrators can monitor the overall platform performance and maintain service quality. By automating these processes, the Smart Water Supply Management Application supports better decision-making and enables faster, more reliable water delivery. Overall, the proposed system demonstrates how digital and sensor technologies can transform traditional water supply management into a smart, user-friendly, and cost-effective platform that improves transparency, responsiveness, and accessibility for all stakeholders.

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