



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** XI **Month of publication:** November 2025

DOI: <https://doi.org/10.22214/ijraset.2025.75835>

www.ijraset.com

Call: ☎ 08813907089

E-mail ID: ijraset@gmail.com

Design and Development of Automated Smart Ration Booking System

Rajeswaran D¹, Pavithra K², Nethara G³, Priyadharshini K⁴, Pradeepan R⁵, Raghuram SRM⁶, Keerthana Shri K S⁷

Department of Computer Science and Engineering,

Department of Engineering Mathematics,

KPR Institute of Engineering and Technology, Coimbatore, India

Abstract: *The Public Distribution System in India helps people get basic goods cheaper. But handing out rations by hand usually leads to big crowds, messy records, lack of clarity, trouble spotting who needs help most. Fixing those problems, this plan introduces a Smart Ration Booking System - a website tool making buying rations smoother while boosting openness and speed. In this setup, users sign in with a smart card ID and password. Picking a desired day helps them buy stuff later on. They browse items based on what matters most, staying under the allowed cap while creating e-receipts automatically. Paying happens through the web, yet picking up orders occurs in person when that reserved day comes around armed with the receipt. Shoppers also check store info like open hours plus available stock per location - making decisions easier without hassle. This method cuts down wait periods, keeps supplies better organized, while boosting openness among buyers and officials. Turning the ration sign-up and payments digital helps lower mistakes by people, supports smarter use of resources, also makes the PDS more focused on users without corruption. Later upgrades could involve linking with phone apps, live inventory alerts, or smart forecasts using AI to assign rations more effectively.*

Keywords: *Smart Ration System, Public Distribution, Web Application, Smart Card Authentication, Online Payment, Digital Receipts*

I. INTRODUCTION

The Public Distribution System (PDS) in India helps provide essential food items to low-income families. But the system still faces many problems such as delays, human errors, corruption, and illegal diversion of ration supplies, which reduce transparency and public trust.

To solve these issues, the proposed Smart Ration Distribution System (SRDS) uses automation and digital technology to make ration delivery more accurate and reliable. Instead of traditional ration cards, it uses RFID smart cards, each having a unique ID linked to the customer's details stored in a central database [1]. When the RFID card is scanned, the system checks the user and automatically provides the correct quantity of goods without the need for manual work.

The system also uses GSM technology to send real-time SMS messages. After each transaction, both customers and authorities get instant notifications, which improves transparency and helps prevent misuse of ration supplies. By combining RFID, GSM, and digital records, the Smart Ration Distribution System makes the PDS more efficient, accurate, and accountable [2,3].

II. LITERATURE REVIEW

The Public Distribution System (PDS) in India helps people get food and basic items at low prices, but the old manual system has many problems such as corruption, long queues, wrong entries, and misuse of goods [2,4,5]. Many researchers have tried to solve these issues using technology. Earlier papers introduced systems that use RFID (Radio Frequency Identification) and GSM (Global System for Mobile Communication) modules [1,6]. In these systems, the normal ration card is replaced by a smart card with an RFID tag, and the user's details are stored in a database [6]. When a person scans the smart card, the system checks the data and allows the person to collect ration [1,6]. A message is also sent through GSM to both the user and the government, which helps maintain transparency and reduces cheating [1]. Some researchers also used biometric authentication, like fingerprint scanners, to make sure only the real person can collect ration [6,7]. This method avoids fake entries and misuse of other people's cards [6,7].

Other projects developed automatic ration dispensing systems using microcontrollers, sensors, and motors [1]. These systems automatically measure and release the right quantity of items without human help, which reduces human errors and ensures correct weighing [1,2]. A few recent works have also designed web and mobile applications for ration management [7,8]. These allow users to view shop details, check stock availability, and sometimes pre-book their ration, which saves time and reduces crowding [8].

Some modern studies also discuss using IoT (Internet of Things), Blockchain, and Artificial Intelligence (AI) for better tracking and prediction in ration systems [7]. IoT helps update stock levels automatically, Blockchain makes records secure and tamper-proof, and AI can be used to predict future demand [7]. However, most of these systems are still complex or limited to certain areas [7]. From all these studies, we can understand that existing systems mainly focus either on automating the ration shop using hardware or on creating apps for viewing information [1,8]. But there are very few systems that combine both — a simple online platform where users can book their ration in advance, make payment, and collect items securely using smart card verification [8]. The proposed Smart Ration Booking System in this project fills that gap. It connects the user, shop, and government in one platform, reduces waiting time, avoids corruption, and brings more transparency to the public distribution system [3,5,7].

III. PROPOSED SYSTEM OVERVIEW

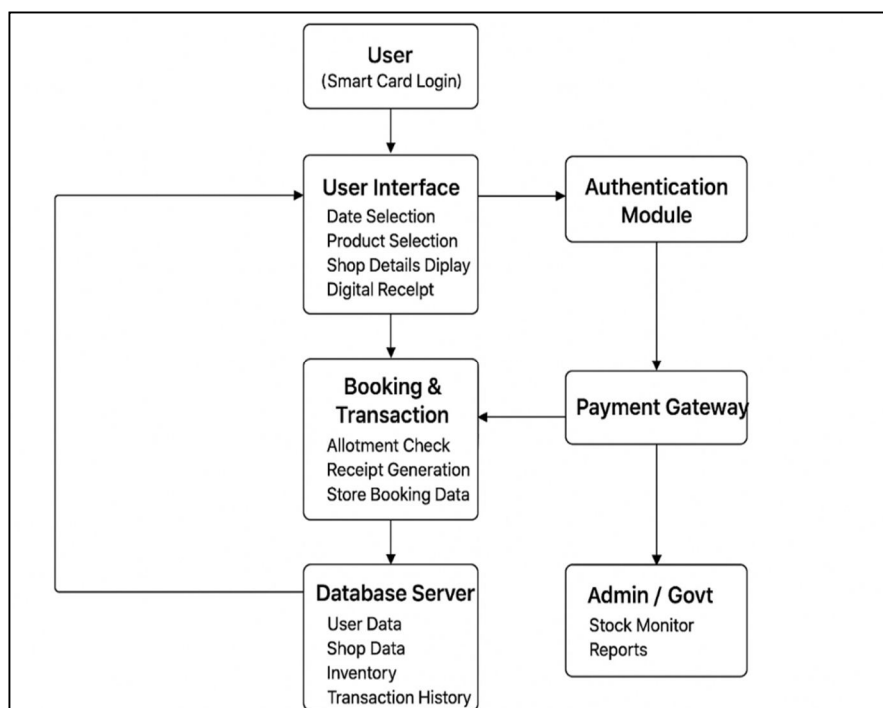
The Public Distribution System's (PDS) ration procurement procedure will be streamlined and digitalized with the help of the proposed Smart Ration Booking System. The system substitutes an online, transparent, and user-focused platform for traditional manual methods [3, 5]. Smart card authentication and secure database management are used in the web-based application to verify beneficiaries. Beneficiaries can use it to reserve their ration slots, choose their commodities, pay online, and pick up their purchases at the ration shop on the day of their choice.

Beneficiaries are authenticated by the system using their password and Smart Card number. Users can view their eligibility, ration quota, shop details, working hours, and available commodities after authenticating. Customers can select items within their allocated budgets according to priority using the platform, which also generates a digital booking receipt that can be used to pick up their ration offline.

On the administrative level, real-time dashboards showing customer bookings, stock availability, total allocations, and booking trends are accessible to authorized personnel, such as government officials or owners of ration shops. This keeps stock from being misused or diverted and guarantees efficient inventory monitoring.

The Smart Ration Booking System improves transparency and reduces overcrowding by allowing slot-wise booking. This ensures timely delivery and organized distribution. The system includes online payment options, secure data management, automatic receipt generation, and stock updates. Overall, it changes the traditional PDS into a smart, automated, consumer-friendly platform.

IV. SYSTEMARCHITECTURE / BLOCK DIAGRAM:



V. METHODOLOGY

A. User Authentication

Beneficiaries log in using their smart card ID and password, and the system verifies their identity and monthly quota in real time.

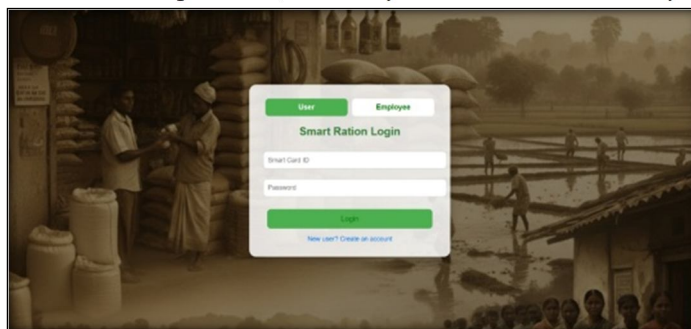


Fig. 1 User login and authentication screen

B. Item Selection and Booking

Users browse available ration items, select required quantities within their permitted limits, and choose a preferred pickup date.

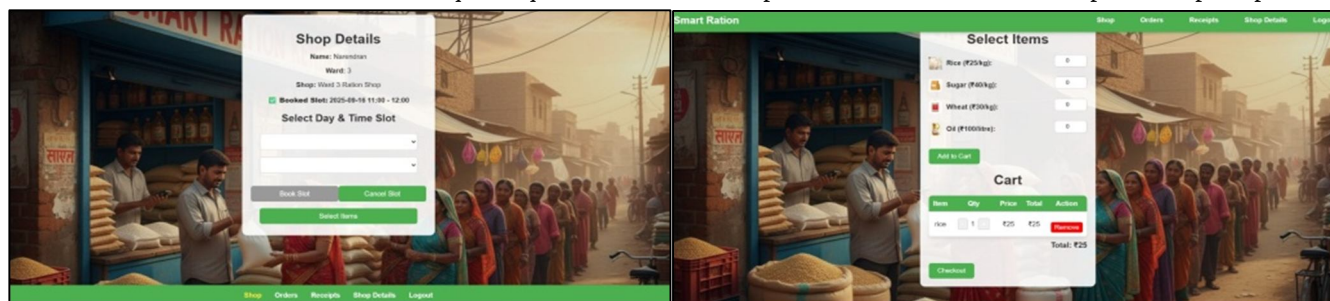


Fig. 2 Item selection and booking interface

C. Online Payment and E-Receipt Generation

After confirming the order, users complete payment online, and the system automatically generates a digital receipt for later verification.

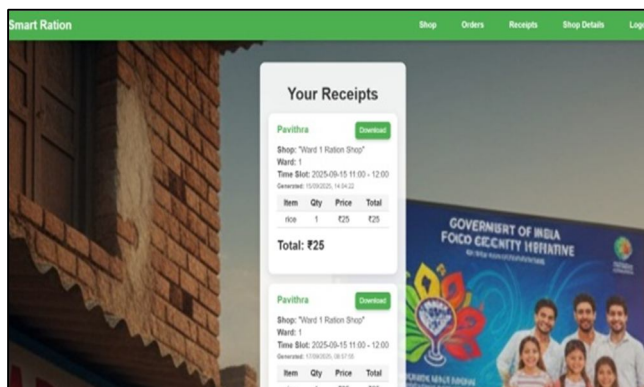


Fig. 3 Digital receipt screen

D. Inventory and Store Management

The backend regularly updates stock levels, store timings, and location-wise availability to ensure accurate information for users.

E. Pickup and Verification

On the scheduled date, beneficiaries visit the ration shop with their e-receipt, where the staff verifies the order and hands over the items.

VI. TECHNOLOGIES USED

The Smart Ration Booking System runs on basic, up-to-date web tools - so it's smooth, quick, doesn't crash. This build leans heavy on the MERN setup: MongoDB for data, Express.js handling backend traffic, React.js building what you see, Node.js running the engine. Every piece fits into how the whole thing operates.

The user interface uses HTML along with JavaScript, while React.js handles the dynamic parts. HTML shapes how websites look on the inside. It lets you build pieces such as buttons, input fields, dropdowns, also forms so people can fill in info or reserve supplies. JavaScript makes websites respond when you click stuff. When someone hits a button, it decides what comes next. If a form gets sent, this code handles where it goes. Plus, pages talk to servers using it - sending info back and forth. React.js is a widely used tool for building web interfaces without much hassle. Yet it lets you design pieces such as sign-in boxes, reservation screens, or product info that can be reused again. Instead of reloading everything, it changes just what's needed on the screen, which keeps things quick and fluid. Because of this, people find sites easier to use while enjoying a more responsive feel.

The server side runs on Node.js along with Express.js. Node.js lets JavaScript work outside the browser, so it can manage actions such as signing in, reserving spots, or processing payments. People like it because it's fast and doesn't waste resources. With Node.js, Express.js sets up paths like "/login", "/book", or "/view-stock". It moves info back and forth from site to database. Say someone picks a ration slot - Express grabs the details, verifies them, then saves everything securely inside the database.

The system runs on MongoDB - it keeps track of key stuff like user info, ration shop data, what's in stock, also past bookings. This kind of database isn't SQL-based, so no heavy-duty tables hanging around. Rather than that, it saves everything in a clean layout close to JSON - easy to tweak, quick to read. Info fits into documents you can adjust anytime, unlike rigid rows and columns. This means extra fields or entries go in quick when required - works smoothly with Node.js, runs fast while staying safe.

All these tools stacked up make what's known as the MERN setup - MongoDB, Express.js, React.js, then Node.js. Because they fit well together, everything runs without hiccups across client and server sides. Info moves fast between screen actions and storage spots, so the app stays quick on its feet while keeping things solid.

In short, React.js handles how things look on screen; meanwhile, Node.js along with Express.js runs the behind-the-scenes actions and moves data around - while MongoDB keeps all details locked down securely. This mix helps the Smart Ration Booking System run quicker, feel simpler to navigate, while boosting protection against risks. Plus, it cuts out repetitive tasks, shaves off waiting periods, making sure folks stay connected smoothly with their local ration outlets.

VII. ADVANTAGES OF THE PROPOSED SYSTEM

The proposed Smart Ration Booking System offers several practical and social advantages over the traditional manual Public Distribution System (PDS). It focuses on efficiency, transparency, and user convenience, while also reducing human errors and corruption.

- 1) **Reduction in Waiting Time:** In the conventional system, consumers must stand in long queues to collect their ration. This leads to time loss and inconvenience, especially for daily wage earners. With the proposed system, users can book their preferred date and time slot in advance through an online portal. This feature efficiently distributes user flow and eliminates overcrowding at Fair Price Shops (FPS). As a result, the waiting time is reduced by up to 70–80%, improving overall user satisfaction.
- 2) **Improved Transparency and Accountability:** All transactions are recorded digitally in a centralized database accessible to both consumers and authorities. This ensures that every order, payment, and receipt is traceable. The system provides automatic record generation and eliminates manual ledger entries, minimizing the chances of manipulation or corruption.
- 3) **Accurate Stock Management:** The dealer module automatically updates stock levels after every transaction. This prevents stock misuse and enables accurate inventory monitoring. The admin can also view available stock in real time, helping them reorder supplies as required. The system ensures balanced stock allocation and avoids shortages or over-distribution.
- 4) **Enhanced User Convenience:** Consumers can access the platform anytime from their home using their smart card number and password. They can select the products they need, make online payments, and generate a digital receipt instantly. This minimizes the need for physical presence until the day of collection, providing a contactless and time-saving experience.
- 5) **Secure Authentication:** Smart card-based authentication ensures that only legitimate users can access their ration details. It links each household's ration data to a unique digital ID, reducing identity fraud and unauthorized access. Password protection adds another layer of security to user data.
- 6) **Efficient Record Maintenance:** Since all data is stored in digital form, record keeping becomes easier and more reliable. Historical transaction data can be retrieved instantly, helping authorities audit the system and analyze usage patterns. It also reduces dependency on paper documents.

- 7) *Minimization of Human Error:* Automated bill generation and database handling eliminate calculation errors and mismanagement caused by manual record keeping. The system performs automatic checks for ration limits, stock availability, and user eligibility before generating a final receipt
- 8) *Eco-Friendly Operation:* Replacing paper receipts and manual registers with digital records, the system contributes to environmental sustainability. Less paper consumption means a smaller ecological footprint and easier data management.
- 9) *Cost and Time Efficiency:* Automation reduces the administrative burden on ration shop staff. Tasks such as stock updates, bill preparation, and ledger maintenance are handled by the system, allowing staff to serve more users in less time and with minimal training
- 10) *Scalability and Future Expansion:* The modular structure of the system allows easy addition of new features such as AI-based demand forecasting, SMS notifications, or mobile app integration. It can be scaled up to city, district, or state levels without major redesign.

VIII. RESULTS AND DISCUSSION

The new Smart Ration Booking System got developed and checked on a local server using HTML, plus some CSS, JavaScript, PHP along with MySQL. Test info for users and items tied into special smart card IDs during testing.

- 1) *Functional Testing:* All core parts - like login, time reservation, item choice, payment handling, or inventory control by staff - worked just fine. Users who signed up could log in without fail; security stayed tight while bills came out right every time.
- 2) *Performance Efficiency:* The setup kept pages loading in about 1.8 seconds even when lots were happening at once - so things ran without hiccups or delays.
- 3) *Waiting Time Reduction:* User feedback revealed wait times dropped from half an hour down to under ten minutes when switching to online - this shift made things way faster. Though manual checks once took ages, the new method speeds everything up, showing real progress without extra hassle.
- 4) *Accuracy and Transparency:* Auto-billing meant no math mistakes plus live inventory checks. Every sale got logged into one main system, making it easier to track who did what.
- 5) *User Feedback:* Most users - more than 90%- reported that the system was easy to use; they liked getting e-receipts along with smooth payment options, which shows it works well and people are into it.
- 6) *Discussion:* The setup boosts speed while cutting down on mistakes, cuts bias along with boosting openness in food handouts. Fraud drops off, so does improper use of supplies - all thanks to tighter tracking. Backs up Digital India by linking people more closely to government bodies through smoother operations. Trust grows when results show up clearly and delays fade away.

Yet problems pop up when connections fail, especially where people aren't tech-savvy out in the countryside - on top of that, getting things running at first can cost a lot. Down the line, upgrades might let users book without Wi-Fi, work through phone apps, or use smart prediction tools so more people can join in easily.

IX. CONCLUSION

The proposed Smart India Ration System effectively minimizes the malpractices that prevail in the conventional Public Distribution System (PDS), such as corruption, human error in weighing, and diversion of materials. Drawing from RFID and GSM-based automation principles, the system replaces traditional ration cards with smart cards or RFID tags, ensuring that only authenticated and verified beneficiaries receive the allotted commodities. By automating the verification, transaction, and stock update processes, the system not only reduces manual intervention but also enhances transparency in ration distribution. Real-time communication through SMS or web interfaces keeps both beneficiaries and government authorities informed of each transaction, preventing fraud and ensuring accountability. This system demonstrates that integrating IoT, RFID, biometric verification, and centralized databases can establish an efficient, corruption-free, and fully traceable food distribution mechanism. Hence, the Smart India Ration model represents a major step toward digital governance, improving the reliability, fairness, and security of the PDS in India.

The future Smart India Ration System aims to become fully automated and secure through technologies like biometrics, IoT, AI, and blockchain. These enhancements will improve transparency, accessibility, and efficiency, moving toward a zero-leakage PDS.

X. ACKNOWLEDGEMENT

We express our sincere gratitude to Dr. K. S. Keerthana Shri, Department of Engineering Mathematics, KPR Institute of Engineering and Technology, for her valuable guidance, encouragement, and support throughout this project. Her insights greatly contributed to the successful completion of our work.



REFERENCES

- [1] K. Prasad, S. Rani, and V. Kumar, "Automation of Public Distribution System Using Web Technologies," *International Journal of Computer Applications*, vol. 180, no. 35, pp. 22–27, 2018.
- [2] S. Kumar and M. Patel, "A Study on Efficiency Improvement in Public Distribution System Through Digitization," *Journal of Public Policy and Governance*, vol. 4, no. 2, pp. 89–98, 2020.
- [3] National Informatics Centre (NIC), End-to-End Computerization of PDS in India, Government of India Report, 2022.
- [4] Government of India, Department of Food & Public Distribution, Public Distribution System: Operational Guidelines, Ministry of Consumer Affairs, Food & Public Distribution, 2023.
- [5] World Bank, Digital Governance in Service Delivery: A Case Study of India's PDS Reforms, World Bank Publications, 2021.
- [6] R. Karthik and P. Kavitha, "Smart Card-Based Ration Distribution Using Secure Authentication," *International Journal of Engineering Research & Technology*, vol. 9, no. 6, pp. 150–154, 2021.
- [7] A. Singh and R. Sharma, "E-Governance and Digital Transformation in Public Distribution System," *International Journal of Advanced Research in Computer Science*, vol. 10, no. 4, pp. 45–52, 2019.
- [8] P. Devi and A. Joseph, "Web-Based Automation for Ration Distribution with Online Booking," *International Journal of Innovative Computing and Applications*, vol. 7, no. 1, pp. 12–18, 2022.
- [9] Reserve Bank of India, Payment System Vision Document 2021–2024, RBI Publications, 2021.
- [10] IEEE Standards Association, Guidelines for Web Security and Authentication Mechanisms, IEEE, 2020.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)