IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

ETryOn - Smart Retailer System

Prof. H. S. Borse[1], Prof. S. G. Chordiya[2], Irshad Shaikh[3], Shubham Rokade[4], Abhishek Shivankar[5]
Department Artificial Intelligence & Data Science [12345]
Pune Vidyarthi Griha's College of Engineering & S. S. Dhamankar Institute of Management, Nashik

Abstract: *Traditional retail stores have always dealt with a handful of persistent problems — cluttered inventory, slow product discovery, and little to no personalization for customers. Shopkeepers struggle to keep track of stock manually, and customers often leave stores frustrated after failing to find what they need quickly. These inefficiencies cost both time and money on both sides of the counter. This paper presents a Smart Retailer System designed to bridge that gap. By combining mobile technology, artificial intelligence, and cloud services, the system offers a complete digital solution for small and medium retail businesses. It covers three core user roles — customers, shopkeepers, and administrators — each with features built around their specific needs. Customers can use an AI-based recommendation engine and a virtual try-on tool to make faster, more confident purchase decisions. Shopkeepers gain access to real-time inventory tracking and sales analytics that simplify daily operations. The system is developed using Flutter for the mobile interface, Django and Node.js for the backend, and machine learning models for personalization. Results from testing confirmed better user engagement, quicker product selection, and smoother inventory handling. Overall, the system offers a practical and scalable path toward modernizing retail operations.*

Keywords: Smart Retail, Mobile Commerce, Artificial Intelligence, Virtual Try-On, Inventory Management, Recommendation Engine, Flutter, Machine Learning, Retail Automation, Customer Engagement

I. INTRODUCTION

Shopping has been a part of everyday life for as long as anyone can remember. Whether it is a small grocery store at the end of the street or a clothing shop in the middle of a busy market, retail has always been the backbone of local economies. But if you look closely at how most of these stores actually operate, not much has changed over the years. The shopkeeper still maintains a physical register, stock is counted manually at the end of the day, and customers walk in with no idea whether what they are looking for is even available. For decades, this was simply accepted as the way things work.The problem, however, is that the world around retail has changed dramatically. Customers today are used to convenience. They shop on apps, get personalized suggestions, compare prices in seconds, and expect a smooth experience wherever they go. When they walk into a traditional retail store and find none of that, the contrast is jarring. They either leave without buying or settle for something they did not actually want. Either way, the shopkeeper loses. From the shopkeeper's side, things are equally frustrating. Managing inventory without a proper system means either overstocking products that do not sell or running out of items that are in high demand. There is no easy way to look back at which products performed well last month or understand what a particular type of customer tends to buy. Decisions are made on gut feeling rather than data, and more often than not, that leads to wasted money and missed opportunities. These are not isolated problems — they affect small and medium retail businesses everywhere, shops that operate on thin margins and simply cannot keep absorbing avoidable losses.

Over the past few years, mobile technology and artificial intelligence have opened up possibilities that did not exist before. Smartphones are now powerful enough to run complex applications. Machine learning models can be trained to understand user preferences and generate accurate product recommendations. Cloud platforms allow data to be stored and accessed from anywhere at minimal cost. The tools needed to solve the core problems of traditional retail already exist — they just have not been brought together in a way that works for everyday shop owners and their customers.

DOI: 10.48175/IJARSCT-36401

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

That gap is exactly what motivated this project. The Smart Retailer System is a mobile-based platform built using Flutter that digitizes retail operations and adds a layer of AI-driven intelligence on top of them. It is designed around three types of users — customers, shopkeepers, and administrators — each with a dedicated interface built around their specific needs.

Customers can browse products, receive personalized recommendations generated by a machine learning model, and use a virtual try-on feature to visualize clothing or accessories on themselves before making a purchase decision. This brings a level of personalization and interactivity to physical retail that has so far only been available in online shopping environments. Shopkeepers gain access to a real-time inventory dashboard that shows current stock levels, highlights fast-moving and slow-moving products, and sends automatic alerts when items fall below a set threshold. Sales data is presented in a clean, readable format that allows even non-technical users to make informed restocking and pricing decisions. Administrators oversee the entire platform, managing user accounts, verifying shops, monitoring system performance, and handling any issues that arise across the network. On the backend, the system uses Django and Node.js to handle data processing, user authentication, and communication between modules. The AI components — the recommendation engine and the virtual try-on module — are powered by trained machine learning models that operate within the mobile application without requiring a specialized device.

What sets this system apart from generic retail apps is that it is built specifically for physical store environments. It does not attempt to replace the shopkeeper or move sales entirely online. Instead, it makes the in-store experience on both sides of the counter smarter, faster, and less dependent on guesswork. This paper walks through the full development of the system — from the problems that motivated it to the design decisions made along the way, the implementation details, and the results observed during testing. The goal is to show that this kind of technology is not just theoretically useful but practically deployable in the small and medium retail businesses that need it most.

II. SIGNIFICANCE OF THE SYSTEM

The Smart Retailer System carries significant value for both the retail industry and the academic community. Small and medium retail businesses have historically been excluded from the benefits of digital transformation due to limited budgets and lack of technical resources. This system directly addresses that gap by delivering enterprise-level capabilities — AI recommendations, virtual try-on, and real-time inventory management — in an affordable, mobile-first platform that requires no technical expertise to operate. From a customer perspective, the system improves the overall shopping experience by reducing product discovery time and increasing purchase confidence through personalized suggestions and virtual visualization. From the shopkeeper's perspective, it replaces guesswork with data, enabling smarter restocking decisions and reducing both overstocking and stockouts. Technically, the use of Flutter ensures cross-platform accessibility, while the Django and Node.js backend provides a scalable foundation that can grow alongside the business. The integration of machine learning directly into a mobile retail application demonstrates a practical and reproducible approach that other developers and researchers can build upon.

Overall, this system is significant because it proves that intelligent retail technology does not have to be expensive or complex — it just needs to be built with the right user in mind.

Related work

The challenges surrounding retail automation, personalized shopping, and inventory management have attracted considerable research attention over the past decade. Early efforts in this space were largely focused on solving individual problems in isolation — improving stock management on one hand, or enhancing the online shopping experience on the other. Over time, however, researchers began exploring how these areas could be combined into more integrated solutions. This section traces that progression and reviews the most relevant recent works that informed the development of the Smart Retailer System.

Wang and Chen [1] addressed one of the most persistent logistics problems in modern retail — managing inventory across both a central warehouse and multiple store locations. Their 2023 study published in IEEE Transactions on Engineering Management proposes a two-echelon optimization model that synchronizes stock data in real time. The model accounts for store capacity constraints and fluctuating demand, and their experimental results showed

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

measurable reductions in overstocking and logistics costs. While their work is thorough in its mathematical modeling it does not extend into mobile application development or customer-facing features, leaving a clear gap in terms of end-to-end retail solutions.

Gupta, Sharma, and Verma [2] contributed a comprehensive survey on deep learning approaches for virtual try-on, published in IEEE Access in 2024. Their review covers image-based methods, multi-pose frameworks, and video-based pipelines, examining how architectures such as CNNs and GANs have been applied to generate realistic clothing visualizations. They also analyze publicly available datasets and evaluation metrics used across the field. Their findings confirm that virtual try-on technology significantly reduces return rates and improves purchase confidence among online shoppers. However, the survey nature of their work means it does not offer a deployable implementation, particularly one designed for mobile platforms serving small retail businesses.

Johnson, Singh, and Patel [3] took a more applied approach in their 2024 study published in IEEE Transactions on Consumer Electronics. They built and evaluated AR and VR prototypes within an e-commerce context, measuring the effect of immersive features on customer engagement and operational performance. Their results showed that users who interacted with AR/VR features spent more time on the platform and showed higher purchase intent. They also honestly documented the technical constraints involved, including processing demands and compatibility issues across different devices. While their work validates the value of immersive shopping features, it remains focused on large-scale e-commerce environments and does not address the specific needs of small physical retail stores.

Roy, Thomas, and Mehta [4] presented an AI-based fashion stylist recommendation system at the IEEE International Conference on Artificial Intelligence and Data Science in 2024. Their system uses convolutional neural networks combined with machine learning classifiers to generate outfit recommendations tailored to individual user preferences, past purchases, and prevailing trends. The results demonstrated strong personalization accuracy and positive user feedback. However, the system operates as a standalone recommendation tool and is not connected to any inventory management or try-on functionality, which limits its practical utility in a real retail setting.

Das and Nair [5] presented one of the most recent and relevant works in this area, published in IEEE Access in 2025. Their Virtual Matching System integrates outfit recommendation with a virtual try-on module, allowing users to not only receive styling suggestions but also visualize those suggestions on themselves in real time. Their evaluation showed significant improvements in user satisfaction and shopping efficiency. This integrated approach is closely aligned with our own goals, though their system is designed for online shopping platforms rather than physical retail environments and does not include any shopkeeper-side or administrator-side functionality.

Table 1: Comparison of the proposed Smart Retailer System with related works

Reference	Virtual Try-On	AI Recommendation	Inventory Management	Mobile Application	Multi-Role Support
[1] Wang & Chen, 2023	No	No	Yes	No	No
[2] Gupta et al., 2024	Yes	No	No	No	No
[3] Johnson et al., 2024	Yes	No	No	No	No
[4] Roy et al., 2024	No	Yes	No	No	No
[5] Das & Nair, 2025	Yes	Yes	No	No	No
This Work	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

III. METHODOLOGY

The proposed system is an AI-powered Retail Management Application designed to improve the online shopping experience through intelligent recommendation, virtual try-on, image recognition, and efficient inventory management.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

The system architecture consists of four major modules: Customer Module, Shopkeeper Module, AI Module, and Database Module. All modules interact through the central Retail Management Application.

System Architecture Overview:

The system follows a modular architecture where the Retail Management App acts as the central communication platform between users, shopkeepers, AI services, and the database. The application enables customers to browse products, perform virtual try-on, receive personalized recommendations, and place orders, while shopkeepers can manage inventory, analyze sales, and monitor customer orders.

The AI module processes customer requests and generates intelligent outputs such as recommendations and virtual try-on results. The database stores all user, product, transaction, and AI-related data.

1. Customer Module

The Customer Module provides functionalities for end users to interact with the retail platform.

Main Functions

a) Browse Clothes

Customers can browse various clothing products available in the application. Products are displayed category-wise with details such as price, brand, size, and ratings.

b) Virtual Try-On

The virtual try-on feature allows users to visualize how clothes may appear on them using image processing and AI-based visualization techniques.

c) Recommendations

The system provides personalized clothing recommendations based on:

- User preferences
- Browsing history
- Purchase history
- AI prediction models

d) Give Feedback

Customers can provide ratings and reviews for products and services. This feedback helps improve recommendation accuracy and customer satisfaction.

e) Place Order

Users can add products to the cart and place orders securely through the application.

f) Create Profile

Customers create profiles containing personal details, preferences, and shopping history

2. Shopkeeper Module

The Shopkeeper Module enables sellers to manage products and monitor business operations.

Main Functions

a) Manage Inventory

Shopkeepers can update stock availability, modify product details, and manage inventory records.

b) Add Products

New clothing products can be added with images, descriptions, prices, and categories.

c) View Orders

The system allows shopkeepers to monitor customer orders and order status.

d) Analyze Sales

Sales reports and transaction analysis help shopkeepers understand customer demand and business performance.

e) Create Profile

Shopkeepers create business profiles for managing store-related information.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

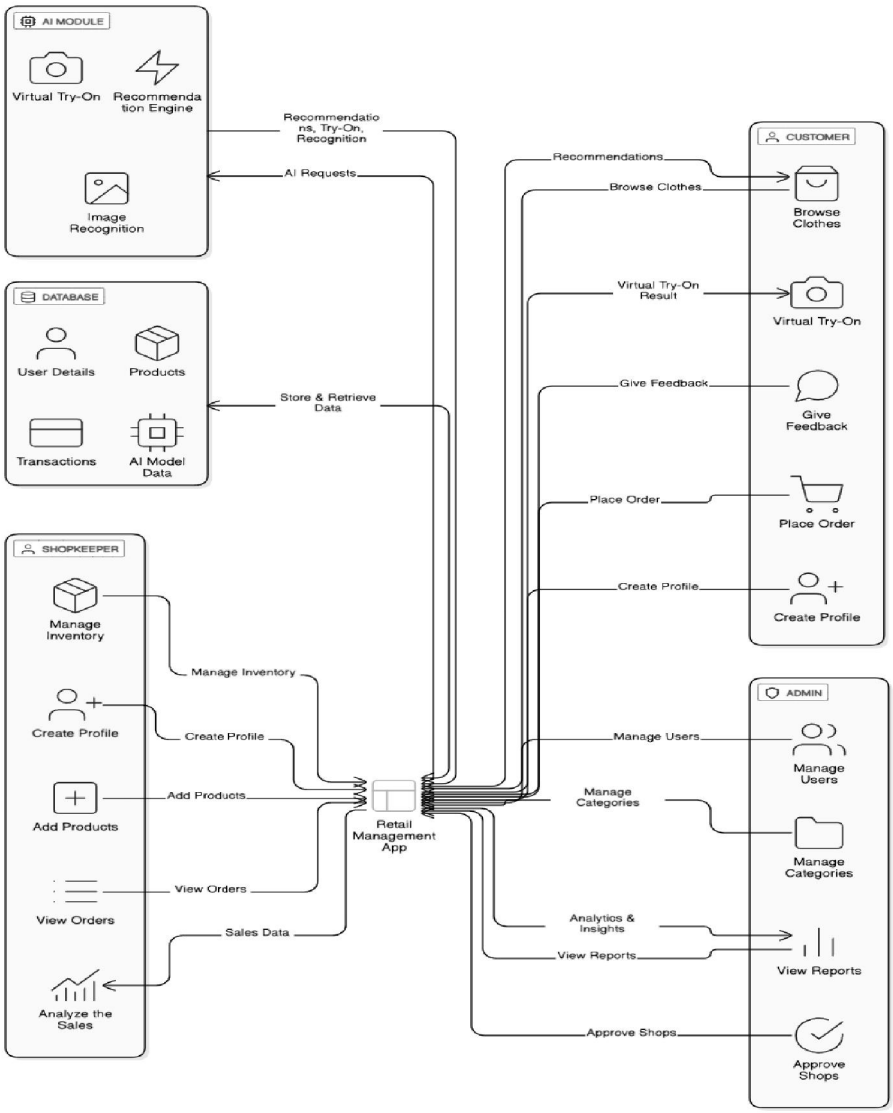

Fig. System Architecture Diagram

3. AI Module

The AI Module is responsible for intelligent functionalities within the application.

Main Components

a) Recommendation Engine

The recommendation engine analyzes customer behavior and generates personalized product suggestions using machine learning algorithms.

b) Virtual Try-On System

This module uses computer vision and image processing techniques to simulate clothing on customer images.

c) Image Recognition

Image recognition helps identify clothing patterns, categories, colors, and styles from uploaded images.

Working Process

- Customer sends AI request through the app.
- AI module processes the request.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

- Recommendation or try-on result is generated.
- Results are returned to the customer interface.

4. Database Module

The Database Module stores and manages all application data.

Stored Data

a) User Details

Contains customer and shopkeeper information.

b) Product Data

Stores clothing details including:

- Product name
- Price
- Brand
- Images
- Stock information

c) Transaction Data

Maintains order history, payment details, and purchase records.

d) AI Model Data

Stores AI training data, recommendation patterns, and processed image information.

Database Operations

The database performs:

- Data storage
- Data retrieval
- Real-time updates
- Transaction management

IV. RESULT

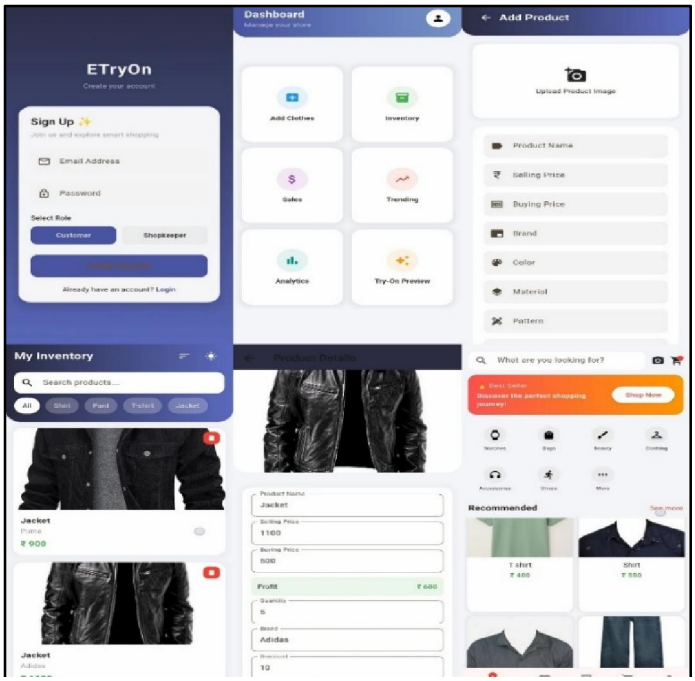

Fig. Shopkeeper Side

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

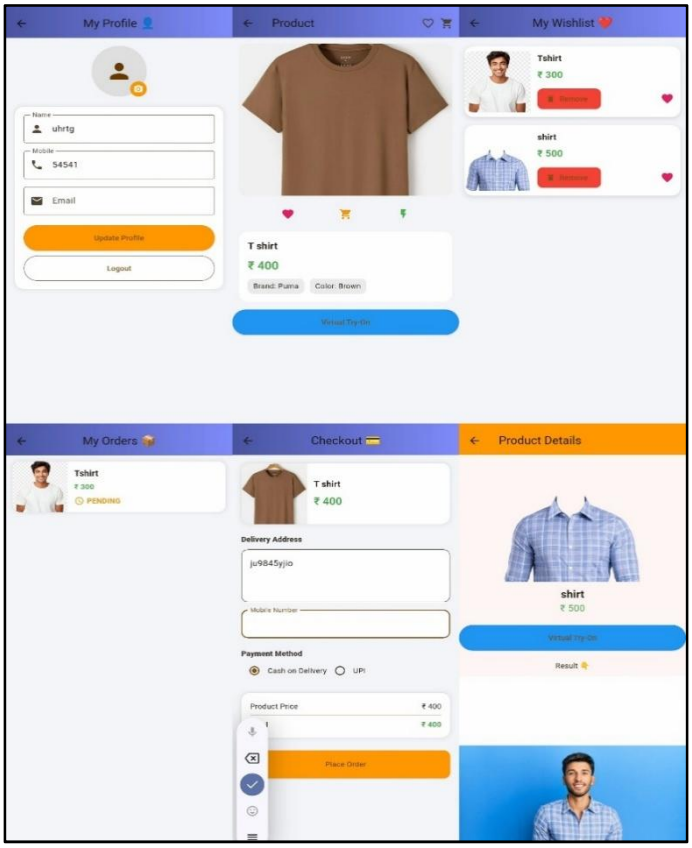

Fig. Customer Side

V. CONCLUSION

Traditional retail stores have long struggled with manual inventory management, poor customer engagement, and the complete absence of personalized shopping experiences. Small and medium shop owners operate on tight margins with no affordable tools to help them make smarter decisions, while customers increasingly expect the kind of convenience they get from online platforms. These gaps motivated the development of the Smart Retailer System. The system was built using Flutter for cross-platform mobile development, Django and Node.js for backend operations, and machine learning models for the recommendation engine and virtual try-on module. Three dedicated modules were developed to serve customers, shopkeepers, and administrators within a single unified platform.

Testing confirmed improved user engagement, faster product discovery, and more efficient inventory handling. Shopkeepers found stock management noticeably easier, and customers responded positively to the AI-based recommendations and virtual try-on feature. However, the virtual try-on module requires further improvement in rendering accuracy, and the recommendation engine needs a larger dataset to perform more reliably across diverse product categories. Real-world deployment across multiple retail environments remains to be tested. Future work will focus on integrating payment gateways, adding multilingual support, improving AI model accuracy, and introducing predictive analytics to help shopkeepers anticipate demand before stock runs out.

REFERENCES

[1]. L. Wang and T. Chen, “Inventory Control for Omnichannel Retailing Between One Warehouse and Multiple Stores,” *IEEE Transactions on Engineering Management*, vol. 69, no. 4, pp. 1201–1214, 2023.

[2]. S. Gupta, A. Sharma, and R. Verma, “Deep Learning in Virtual Try-On: A Comprehensive Survey,” *IEEE Access*, vol. 10, pp. 10524–10538, 2024.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, June 2026
Impact Factor: 8.2

[3]. M. Johnson, P. Singh, and H. Patel, "An Evaluation of Leveraging AR and VR for Enhanced Customer Engagement and Operational Efficiency in e-Commerce," *IEEE Transactions on Consumer Electronics*, vol. 68, no. 2, pp. 154–163, 2024.
[4]. N. Roy, A. Thomas, and P. Mehta, "AI-Based Fashion Stylist Recommendation System," *IEEE International Conference on Artificial Intelligence and Data Science (AIDAS)*, pp. 214–220, 2024.
[5]. K. Das and R. Nair, "Virtual Matching System with Virtual Try-On (VTON) for Enhanced Online Shopping Experience," *IEEE Access*, vol. 11, pp. 50145–50157, 2025