International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 10 | Oct - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

BlockShop: Towards a Decentralized and Intelligent Online Marketplace

Surya Pratap[1], Suraj Yadav[2], Nitesh Nisad[3], Ankit Singh[4]

Department of Computer Science and Engineering, Prasad Institute of Technology, Jaunpur, Uttar Pradesh, India

-Guided By: Ayush Yadav

Abstract - Traditional automated interview systems often rely on static question banks, resulting in a generic and impersonal candidate experience. Such systems frequently fail to accurately assess an applicant's unique skill set. VeriHire addresses these challenges by introducing an adaptive, AI-powered interview platform designed to conduct dynamic and personalized interviews.

The system begins by analysing a candidate's professional profile — including resumes, portfolios, and repositories — to understand their expertise. Using Natural Language Processing (NLP) and a Large Language Model (LLM), VeriHire generates tailored, real-time questionnaires and adapts subsequent questions based on the candidate's live responses. This approach enables deeper exploration of technical knowledge, problem-solving skills, and project experience, closely simulating the process of a human interviewer.

MCP (Model Context Protocol) is a new standard that allows language models to securely communicate with external tools, databases, and APIs, making AI systems more extensible and capable. *RAG (Retrieval-Augmented Generation)* is a powerful technique that improves model accuracy by fetching relevant information from a knowledge source before generating a response. *LangChain* is a popular open-source framework that helps developers build applications using language models by chaining prompts, tools, and memory into a structured workflow

The system begins by analysing a candidate's professional profile — including resumes, portfolios, and repositories — to understand their expertise. Using **Natural Language Processing (NLP)** and a **Large Language Model (LLM)**, VeriHire generates tailored, real-time questionnaires and adapts subsequent questions based on the candidate's live responses.

Key Words: MCP, RAG, LANG-CHAIN

1. INTRODUCTION

E-commerce has transformed the way we shop, with platforms like Flipkart and Amazon setting the gold standard for digital retail. However, even these giants rely heavily on manual browsing, traditional payment systems, and customer service models that can feel outdated in the age of intelligent tech. Enter BlockShop—a new kind of e-commerce platform that aims to combine the ease and familiarity of traditional online shopping with the cutting-edge capabilities of **AI chatbots** and **blockchain-based payments**. This paper introduces BlockShop as a forward-thinking solution designed to streamline the shopping experience, enhance customer engagement through real-time assistance, and ensure secure, transparent transactions using blockchain.

2. RECENT WORKS

Recent advancements in artificial intelligence and blockchain technology have significantly influenced the e-commerce landscape. A growing body of research has focused on integrating **AI chatbots** into online retail platforms to enhance user experience and reduce dependency on human customer service agents. For instance, platforms like **Amazon** and **Shopify** have integrated intelligent recommendation engines and AI-driven chat support to streamline the shopping journey. These systems utilize **natural language processing (NLP)** to understand user queries and provide personalized responses, helping users navigate product catalogs, track orders, and receive tailored suggestions based on browsing and purchase history.

At the forefront of chatbot research, the **Retail-GPT** project demonstrated the effectiveness of using Retrieval-Augmented Generation (RAG) techniques in e-commerce chat assistants. This system connects real-time product data with a conversational model to generate grounded, accurate responses. It effectively reduces the issue of AI hallucinations—when chatbots generate incorrect or fabricated information—which is critical in a commerce setting where trust and clarity are essential.

On the blockchain side, several recent works have proposed the use of **decentralized payment systems** for se-

cure and transparent financial transactions. The **Epass** protocol, for example, introduced a privacy-preserving asynchronous payment method using smart contracts, allowing users to engage in deferred payments without exposing sensitive transaction data. Similarly, research into smart contracts for **cross-border payments** has highlighted how blockchain can be used to streamline global e-commerce by eliminating intermediaries, reducing fees, and providing automated compliance tracking. These insights are particularly relevant to BlockShop, which envisions a seamless integration of crypto wallets and blockchain-based transaction recording.

Real-world implementations are also catching up. Large companies are experimenting with **AI-assisted conversational commerce**. Notably, **Walmart** recently integrated with **OpenAI's ChatGPT**, allowing users to shop directly through chat by browsing and placing orders within the conversation interface. In India, **BigBasket** has announced a pilot where customers can purchase groceries through ChatGPT using UPI payments, reflecting a trend towards frictionless, AI-driven shopping experiences combined with local payment rails. These industry applications validate the feasibility and growing demand for AI-first e-commerce platforms.

Furthermore, emerging hybrid platforms like **ChainGPT** and **Girolamo** show early-stage experiments in combining blockchain and AI chat interfaces. ChainGPT, for example, integrates real-time social sentiment data into its chatbot for crypto-related queries, while Girolamo operates as a generative AI model hosted directly on the **Cardano blockchain**, representing a fusion of decentralized infrastructure and conversational intelligence. These systems illustrate the potential for creating more autonomous, trustworthy digital agents that operate within secure, decentralized ecosystems.

Despite these advancements, key challenges remain. Studies continue to raise concerns around **AI accuracy**, especially in product recommendations and dynamic question answering, as errors in chatbot logic can lead to poor customer experiences. Similarly, **blockchain-based systems** face issues such as **transaction latency**, **gas fees**, and **privacy risks** when operating on public chains. While platforms like OpenBazaar experimented with fully decentralized e-commerce using cryptocurrency, they struggled with adoption due to UX and operational complexity.

3. BLOCKSHOP ARCHITECTURE

BlockShop's system is designed to be familiar in appearance but radically different under the hood. The user interface closely resembles platforms like Flipkart for a smooth shopping experience. But what sets it apart is its intelligent backend. The **AI chatbot** handles everything from product searches and order updates to personalized recommendations using natural language understanding. Meanwhile, the **blockchain payment system** supports digital wallets, smart contracts, and crypto payments—allowing users to transact in a secure, traceable, and decentralized manner. Together, these technologies form a powerful architecture that combines usability, intelligence, and security.

4. WORKFLOW OF BLOCKSHOP

The customer journey on BlockShop begins like any other—browsing for products. But instead of navigating endless categories, users can ask the AI chatbot for exactly what they need, getting instant help and suggestions. Once ready to purchase, the system shifts into blockchain mode, where smart contracts ensure transparent pricing, no hidden fees, and secure payments. Whether it's paying in stablecoins or checking delivery status, the entire experience is smooth and tech-driven. From browsing to chatbot interaction to crypto payment and delivery, every step is intelligently automated and securely logged.

5. SECURITY AND PRIVACY

Security is one of BlockShop's biggest strengths. Blockchain naturally offers tamper-proof transaction records, which makes fraud nearly impossible. At the same time, AI ensures that customer data is used ethically and smartly—tailoring the experience without compromising privacy. Unlike traditional e-commerce sites that store vast amounts of user data on centralized servers, BlockShop minimizes risk by decentralizing sensitive information and relying on encryption and anonymization. This layered approach significantly reduces vulnerabilities, from identity theft to payment fraud.

6. METHODOLOGY AND SYSTEM ARCHITECTURE

6.1 SYSTEM ARCHITECTURE

• Frontend:

- Built using modern JavaScript frameworks like **React.js** or **Next.js** to ensure a fast, responsive, and intuitive user interface.
- Designed to resemble familiar e-commerce platforms (e.g., Flipkart) to ensure ease of use for all customers.
- Integrates a conversational **AI chatbot interface**, allowing users to search for products, get recommendations, and complete purchases through natural dialogue.

- Supports secure user login, shopping cart functionality, product browsing, and order tracking.

• **Backend:**
- Developed using **Python-based frameworks** such as **Django** or **Flask**.
- Handles all core business logic, including user authentication, order management, product catalog services, and chatbot integration.
- Exposes secure RESTful APIs to connect the frontend, AI core, and blockchain modules.
- Ensures scalability, data validation, and secure user session management.

• **AI/ML Core:**
- **Chatbot Engine**: Powered by a fine-tuned **Large Language Model (LLM)**, designed to assist users in real-time with product queries, support, and personalized shopping suggestions.
- **Recommendation Module**: Uses historical purchase data and user preferences to deliver smart product suggestions.
- **Intent Recognition & Response Handling**: Natural language understanding (NLU) components allow the system to comprehend user queries accurately and generate meaningful responses.

• **Blockchain Payment System:**
- Integrates with public blockchain networks (e.g., **Ethereum** or **Polygon**) to support **crypto-based payments** and **smart contract transactions**.
- Includes a **wallet integration module** where users can link or create blockchain wallets.
- Smart contracts ensure **secure, transparent, and irreversible transactions**, reducing the need for third-party payment processors.
- All transactions are recorded on-chain for traceability and fraud prevention.

• **Database:**
- Uses **PostgreSQL** (for structured transactional data) or **MongoDB** (for flexible document storage).
- Stores user profiles, product information, order history, chatbot interaction logs, and blockchain transaction metadata.
- Ensures high availability and quick retrieval of data through indexing and query optimization.

6.2 DEVELOPMENT METHODOLOGY

To ensure a scalable, adaptable, and user-centered development process, the **Agile** methodology will be followed. The project is divided into multiple iterative **phases**, enabling continuous feedback, testing, and improvement throughout the lifecycle.

Phase 1 – Platform Design & Requirement Analysis
- Focuses on defining key user stories, platform goals, and technology stack.
- Includes prototyping the user interface and designing system architecture components (frontend, backend, AI, and blockchain layers).
- This phase lays the foundation for aligning business logic with user experience and system performance expectations.

Phase 2 – AI Chatbot & Recommendation Engine Development
- Involves training and fine-tuning an **LLM** to serve as the AI shopping assistant.
- The model will be customized for e-commerce interactions — handling queries like “Find me the best laptop under ₹50,000” or “Track my last order.”
- Integration of recommendation algorithms to suggest relevant products based on browsing history, past purchases, and trending items.
- Real-time context awareness and multi-turn dialogue handling will be emphasized for a smooth conversational experience.

Phase 3 – Blockchain Payment System Implementation
- Development of smart contracts to automate order validation, payments, and refunds.
- Integration with popular crypto wallets like **MetaMask** or **Trust Wallet** for user authentication and transaction signing.
- Backend APIs will securely bridge the e-commerce engine with the blockchain layer to handle order confirmations and fund transfers.
- Special attention will be given to gas optimization, wallet onboarding UX, and handling transaction failures gracefully.

Phase 4 – Backend Integration & API Development
- Backend systems (using Django/Flask) will be built to connect the AI engine, database, frontend, and blockchain module.
- Includes development of secure APIs for:
  - User authentication
  - Product catalog management
  - Cart and order processing
  - Chatbot session handling
- The backend will also include caching, logging, and middleware to ensure reliability and performance at scale.

Phase 5 – Frontend Development & User Experience Design

- The frontend will be developed using **React.js** or **Next.js** to deliver a fast and mobile-friendly UI.
- Includes chatbot interface, dynamic product browsing, and seamless checkout experience.
- Integration with crypto wallets for payment authorization.
- Emphasis will be placed on accessibility, responsiveness, and ease of use across devices.

Phase 6 – Testing, Deployment & Optimization

- Comprehensive **unit testing**, **integration testing**, and **user acceptance testing (UAT)** will be carried out to ensure robustness.
- Load testing will be done for blockchain transactions and AI response times.
- The platform will be deployed on a cloud provider (e.g., AWS, GCP, or Azure), ensuring auto-scaling, CDN integration, and security best practices.
- Continuous monitoring tools (e.g., Prometheus, Grafana) will be used to track performance and usage analytics.

7. TECHNOLOGY STACK

Table -1: Technologies Used

Layer	Technologies Used
Frontend	HTML, CSS, JavaScript
Backend	Python, FastAPI
AI/ML Chatbot	FastAPI (for API), OpenAI API / Custom LLM
Blockchain	Solidity (Smart Contracts), Remix IDE (for compilation and deployment)
Database	Local Storage (Browser-based)
Authentication	JWT (JSON Web Tokens)
Deployment	Render (Cloud Hosting Platform)

8. EXPECTED OUTCOMES AND APPLICATIONS

8.1 Expected Outcomes (Expanded)

1. Fully Functional Prototype of BlockShop

- The project will deliver a complete, working prototype of **BlockShop**, demonstrating its ability to combine AI-powered product discovery with secure, blockchain-based payments. The prototype will showcase the entire shopping experience — from interacting with the AI chatbot for product assistance to completing transactions using smart contracts — all within a seamless web interface.

2. Intelligent AI Chatbot for Shopping Assistance

- BlockShop will feature a real-time **AI chatbot** capable of understanding natural language queries, assisting users in finding products, answering questions, and recommending personalized items. This chatbot will simulate human-like conversations, improving user engagement and offering an intuitive alternative to traditional browsing.

3. Blockchain-Enabled Payment System

- The platform will include a **smart contract-based payment system** that supports cryptocurrency transactions. The prototype will demonstrate secure and transparent payments through wallet integrations (e.g., MetaMask), ensuring end-to-end visibility of the transaction on the blockchain.

4. Secure and Decentralized Order Management

- By leveraging blockchain, BlockShop will showcase how order data and payment logs can be stored and verified in a decentralized manner, minimizing fraud risks and ensuring trust between buyers and sellers.

5. Smooth Frontend-Backend Integration

- The system will highlight seamless communication between the static frontend (HTML, CSS, JavaScript), the FastAPI-powered backend, and external modules like AI APIs and blockchain smart contracts. This will serve as a practical proof of how lightweight tech stacks can support modern, intelligent commerce experiences.

8.2 Applications & Future Scope

1. Smart E-Commerce Platforms for Retailers

- BlockShop can be integrated into **retail websites and online stores** to enhance the shopping experience through AI-driven recommendations and natural language search, while also offering blockchain payment as a secure alternative to traditional gateways like UPI or credit cards.

2. AI-Driven Product Discovery Assistants

- The platform can serve as a blueprint for creating **chatbot-based shopping assistants** for marketplaces, especially in regions or platforms where users prefer voice/text interactions over manual

browsing. This is particularly useful for accessibility-focused e-commerce.

3. Decentralized Payment Gateways for Web3 Commerce

- The smart contract system can be extended to support **decentralized checkout systems**, enabling marketplaces and NFT platforms to conduct secure and transparent transactions using crypto. This opens doors to Web3-native shopping experiences and tokenized loyalty systems.

4. Educational Tool for Blockchain + AI Integration

- BlockShop can be used in **academic and developer training environments** to demonstrate real-world applications of AI and blockchain. It can help students and professionals understand how to integrate conversational AI with decentralized systems through a hands-on, functional project.

5. Foundation for Conversational Commerce Startups

- Startups aiming to enter the **conversational commerce** or **Web3 retail** space can use BlockShop's architecture and prototype as a base to build more advanced platforms with additional features like voice interfaces, decentralized identity (DID), and crypto-based rewards.

CONCLUSIONS

The rapid evolution of technology continues to reshape the digital commerce landscape, and platforms like BlockShop stand at the intersection of some of the most transformative innovations of our time—artificial intelligence and blockchain technology. Traditional e-commerce platforms, while effective, often lack the personalized user experience and financial transparency that modern consumers increasingly demand. BlockShop addresses these gaps by introducing an intelligent, conversational shopping assistant powered by AI and secured by blockchain-based payments. This fusion not only elevates the user experience but also enhances trust, reduces operational costs, and ensures transaction integrity in a decentralized manner.

The integration of a real-time AI chatbot provides users with an intuitive, human-like interface for product discovery, decision support, and customer service. Unlike conventional search-and-click interfaces, the conversational approach caters to users of varying digital literacy levels, thus making the platform more inclusive. The use of a lightweight stack—HTML, CSS, JavaScript on the frontend, and Python with FastAPI on the backend—demonstrates how even minimalistic technologies can power highly responsive, intelligent systems when coupled with powerful APIs and external services.

Simultaneously, blockchain introduces a layer of trust, immutability, and decentralization that traditional financial systems often fail to provide. With smart contracts written in Solidity and deployed via Remix IDE, BlockShop ensures that every transaction is secure, transparent, and tamper-proof. By using local storage and JWT-based authentication, the platform maintains a balance between simplicity and security, making it suitable for prototyping and educational use while remaining extensible for future development.

The prototype of BlockShop not only validates the feasibility of combining AI and blockchain in e-commerce but also lays the groundwork for further innovations in conversational commerce, decentralized identity, token-based loyalty systems, and Web3-native marketplaces. In addition to its practical applications, this project also serves as a learning framework for students, developers, and researchers exploring the convergence of AI and decentralized technologies.

While challenges such as scalability, regulatory constraints, AI hallucinations, and crypto adoption remain, BlockShop provides a strong proof-of-concept that these technologies, when thoughtfully combined, can significantly enhance digital commerce. As consumer expectations shift toward more secure, personalized, and intelligent interactions, platforms like BlockShop may become the blueprint for the next generation of e-commerce solutions.

ACKNOWLEDGEMENT

We would like to express our deepest gratitude to our esteemed guide, **Professor Ayush Yadav**, whose exceptional guidance, insightful advice, and unwavering support have been instrumental in the successful completion of our project, **BlockShop: The Future of AI-Powered E-Commerce**. His profound knowledge and thoughtful feedback challenged us to think critically and explore innovative solutions, helping us navigate both technical complexities and conceptual hurdles throughout the research and development phases. Professor Anwar's patience and encouragement not only strengthened this work but also significantly enriched our personal and academic growth, inspiring us to strive for excellence.

We are equally thankful to the Department of Computer Science and Engineering at Prasad Institute of Technology, Jaunpur, for fostering a stimulating academic environment that nurtures creativity and innovation. The department's commitment to providing excellent infrastructure, access to modern resources, and a culture of inquiry greatly facilitated our ability to undertake this ambitious project. The encouragement to apply theoretical

knowledge to practical challenges was invaluable in shaping our approach and refining the final output.

Our heartfelt appreciation goes to the global open-source communities and developers who have contributed to the development of indispensable technologies that made this project feasible. Tools and frameworks such as **FastAPI**, **Remix IDE**, **Solidity**, and various AI libraries provided a robust foundation for our system's architecture and functionality. The spirit of collaboration and generosity that drives these communities has been a source of inspiration and has allowed us to build a platform that integrates cutting-edge AI and blockchain technologies effectively. Without their continuous efforts to innovate and share knowledge openly, the realization of BlockShop would not have been possible.

We also wish to acknowledge the support of our peers and colleagues who offered valuable insights, shared feedback, and motivated us during moments of challenge and uncertainty. Their willingness to collaborate and exchange ideas contributed positively to the iterative refinement of this project.

Finally, and most importantly, we extend our sincere gratitude to our families and friends for their unconditional love, patience, and encouragement throughout this journey. Their constant belief in our abilities and their support during difficult times provided us with the strength and resilience needed to stay focused and motivated. Their sacrifices and understanding have been an essential pillar that upheld us throughout the research and development of BlockShop.

This project is a testament to the collective efforts, encouragement, and inspiration we received from many individuals and institutions. We are deeply grateful for every contribution, big or small, that helped turn our vision into reality.

REFERENCES

1. React Documentation – A JavaScript library for building user interfaces. https://reactjs.org/docs/getting-started.html
2. Sebastián Ramírez. (2019). FastAPI: Modern, fast (high-performance), web framework for building APIs with Python 3.6+. https://fastapi.tiangolo.com/tutorial/
3. Solidity Documentation – Official documentation for the Solidity programming language. https://docs.soliditylang.org/en/v0.8.19/
4. Remix IDE – Ethereum Remix Online Solidity IDE for smart contract development. https://remix.ethereum.org/
5. Mozilla Contributors. (2023). JavaScript Guide. MDN Web docs. https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide
6. Python Software Foundation. (2023). Python 3 Documentation. https://docs.python.org/3/
7. MongoDB Manual – Official documentation for MongoDB NoSQL database. https://docs.mongodb.com/manual/
8. jsonwebtoken.io. (2023). Introduction to JSON Web Tokens (JWT). https://jwt.io/introduction/
9. Render Documentation – Guide to deploying applications on Render cloud platform. https://render.com/docs/deploy-node-express-app
10. Hugging Face. (2023). Transformers: State-of-the-Art Natural Language Processing. https://huggingface.co/transformers/
11. Explosion AI. (2023). spaCy: Industrial-Strength Natural Language Processing in Python. https://spacy.io/usage
12. Ethereum Foundation. (2023). Smart Contracts – Ethereum Developer Documentation. https://ethereum.org/en/developers/docs/smart-contracts/
13. Blockchain.com. (2023). What is Blockchain? https://www.blockchain.com/learning-portal/what-is-blockchain
14. OpenAI. (2022). Introducing ChatGPT: Optimizing Language Models for Dialogue. https://openai.com/blog/chatgpt/
15. Tailwind Labs. (2023). Tailwind CSS Documentation – Utility-First CSS Framework. https://tailwindcss.com/docs/installation