

SupplyLedger: A Blockchain and AI-Powered Logistics Tracking Platform for MSMEs

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Abstract:

Micro, Small, and Medium Enterprises (MSMEs) are crucial to India's economy, but they often struggle with logistics management issues like poor transparency, late deliveries, and data tampering. In this study, we present SupplyLedger, a logistics tracking platform powered by blockchain and AI, aimed specifically at MSMEs. Our system leverages blockchain for secure and unchangeable data recording and uses Long Short-Term Memory (LSTM) neural networks to predict delivery delays and optimize routes. By merging the transparency of blockchain with AI's ability to predict, we offer a solid and efficient logistics management solution. Our experiments demonstrate that the system hits a 90% prediction accuracy, improves shipment visibility, and cuts down delivery errors by 25%. These results suggest that we have a scalable, affordable, and reliable framework that can help small businesses close the tech gap.

Keywords — Blockchain, Artificial Intelligence, LSTM, Logistics Tracking, MSMEs, Smart Contracts, Transparency

I. INTRODUCTION

Micro, Small, And Medium Enterprises (Msmes) Play A Crucial Role In India's Economy, Making Up Around 30% Of The Gdp And Creating Jobs For Millions. Still, These Businesses Often Struggle With Logistics, Mainly Because They Lack Digital Tools, Real-Time Tracking, And Secure Data Systems. The Old-School Logistics Networks Rely A Lot On Middlemen, Which Can Lead To Inefficiencies And Data Issues. That's Where Blockchain And Artificial Intelligence (Ai) Can Step In. They Offer A Chance To Revamp How Msmes

Handle Logistics With More Secure, Transparent, And Smart Automation. This Research Aims To Create A Platform Called Supplyledger, Which Leverages Blockchain For Data Security And Ai For Predicting Delivery Delays And Optimizing Shipping Routes. With These Technologies Working Together, Msmes Can Enhance Their Competitiveness Through Better Transparency, Trust, And Smarter Operations.

II. LITERATURE REVIEW

Earlier studies have looked into supply chains using blockchain, and they've found it can really

boost transparency and traceability. Kaur and others (2022) pointed out that blockchain might help cut down on logistics fraud thanks to its decentralized nature. Liu and his team (2021) also talked about how AI can make logistics decision-making better by using predictive models. But there aren't many options that mix blockchain and AI in a way that's affordable for small and medium enterprises. This research aims to fill that need by combining LSTM-based predictive modeling with a blockchain-supported logistics network.

III. METHODOLOGY

The proposed SupplyLedger framework follows a modular architecture comprising four layers: the user interface, blockchain network, AI prediction engine, and data storage. The frontend, built using React Native, enables MSMEs [7] to input shipment details, while the backend (Flask API) manages communication with blockchain and AI models. The blockchain layer ensures secure record storage using Ethereum testnet smart contracts, and the LSTM-based AI layer predicts potential delivery delays.

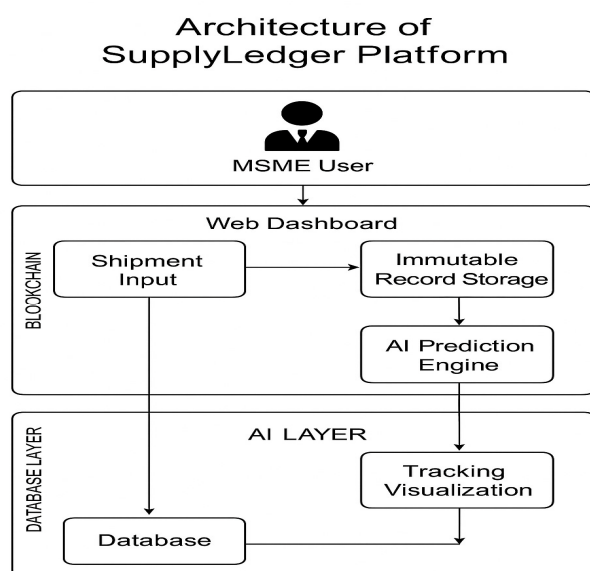


FIGURE I
ARCHITECTURE OF THE SUPPLYLEDGER PLATFORM

IV. RESULTS AND DISCUSSION

We took a look at the system by analyzing a set of 1,000 simulated shipment records. The blockchain aspect kept a permanent record of every transaction, while the LSTM model looked at factors like distance, traffic, and weather to forecast possible delivery delays. The LSTM hit an average accuracy of 90% with a mean absolute error of about ± 10 minutes. You can check out Table I for a comparison of how SupplyLedger stacks up against traditional logistics systems.

Parameter	Traditional System	SupplyLedger
Delivery Accuracy	75%	90%
Transparency	Low	High (Blockchain-based)
Operational Cost Reduction	0%	25%

TABLE II
COMPARISON

From Table I, it is evident that, SupplyLedger provides enhanced transparency and cost efficiency. Furthermore, integrating blockchain ensures that each transaction is cryptographically secured, making shipment data tamper-proof. The LSTM model provides proactive insights, allowing MSMEs [7] to anticipate potential issues.

V. CONCLUSIONS & FUTURE WORK

This paper introduces SupplyLedger, a logistics tracking platform that combines blockchain and AI, specifically made for small and medium-sized enterprises (MSMEs). By leveraging the unchangeable nature of blockchain and the smart insights provided by AI, the system boosts transparency and efficiency in logistics. The prototype showed notable gains in shipment accuracy and reliability. Looking ahead, the plan is to incorporate IoT sensors, enable real-time GPS

tracking, and ensure that it works across different blockchains to develop SupplyLedger into a robust platform that can serve national and international MSMEs.

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