WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Blockchain for Transparent Supply Chain

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ABSTRACT:

Blockchain for a Transparent Supply Chain The most important part of business today is facing challenges. Blockchain technology offers a way to solve problem s such as inefficiency, fraud, and lack of transparency. This article explores how blockchain can make the supply chain more transparent and reliable based on real-life uses over different fields, we cover the uses like reduced cost and enhanced tracing and difficulties like scalability and data privacy. We also see how both the Internet of Things and AI can increase the capability of blockchain in supply chain management time verification and information about participants.

Keywords: Blockchain, Supply Chain, Transparency, Traceability, Distributed Ledger.

Introduction

- **Supply Chains as the Backbone**: Supply chains make sure that there is a constant flow of products but have challenges like info hot spots and inefficiencies.
- **Blockchain's Role**: Blockchain was built for crypto currencies, but on a large scale it helps in enabling end-to-end product tracking and reducing fraudulent activities.
- **Focus of the Discussion**: Real-world applications, challenges, and combine blockchain with different technologies for improved potential.

History

- **Main Concept of Blockchain**: A shared, digital platform can be used many parties but resistant to tampering, ensuring trust and integrity.
- **Unique Features**: It reduces risk of corruption and provides access to trusted historical data

Why Do Supply Chains Need Blockchain?

- **Challenges in Traditional Supply Chains**:
    - Data is unevenly distributed.
    - Counterfeiting, in many industries like medicine.
- **Blockchain's Benefits**: Enhances transparency, reliability, and ensures smooth operation, which build trust among consumers.

Applications

- **Food Safety**: It helped in reducing food tracking times and improving the overall recovery and safety.
- **Pharmaceuticals**: Softwares like MediLedger ensures that the medicines are authentic and there are no fake medicines.
- **Luxury Goods**: Tracks valuable commodities like diamonds and gold to increase trust in consumers.
- **Integration with other technologies**: Use AI and IOT with blockchain for prediction of trends and real time tracking.

Methodology

- **Research**: Analyzed real-world implementations like IBM Food Trust and TradeLens to understand practical impact and limitations.
- **Simulations**: Tested blockchain's performance under scenarios involving high product volumes and connected devices, focusing on cost savings and scalability.

Results and Discussion

Advantages

- **Shared Truth**: Blockchain enables visibility of the same data for all participants, reducing conflicts and improving accountability.
- **Speed & Compliance**: Simplifies processes and accelerates tracking.

Case Study

- **IBM Food Trust**: Walmart reduced food tracking time from 7 days to 2.2 seconds which was truly amazing and it reduced their costs.

Challenges and Opportunities

- **Scalability**: Transaction volume can slow down blockchain systems. Solutions include sharding, Layer 2 protocols, and zero-proof technologies.
- **Intermediate Solutions**: Combining blockchain with other best practices enhances scalability and implementation success.

Quantitative Results

- **Simulated Outcomes**: Significant time reduction which is up to 20% after blockchain was implemented.

Conclusions and Future Work

- **Revolutionizing Supply Chains**: Blockchain resolves inefficiencies, increases transparency, and fosters trust.
- **Remaining Challenges**: Scalability and integration must be addressed for broader adoption.
- **Future Needs**: Continued development of key technologies and practices to maximize blockchain's potential.

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