Integrated Order and Transaction Management System Using Hybrid Algorithm

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Abstract- ***Order Management System (OMS) that efficiently tracks and manages both individual and bulk customer orders, ensuring smooth and accurate processing throughout the order Lifecycle. Designed with scalability in mind, the system provides a user-friendly interface for placing orders, offering real-time updates on order status, inventory levels, and delivery tracking. The OMS is tailored to handle bulk orders efficiently, optimizing inventory management and logistics to ensure timely and organized deliveries. It includes features such as automated tracking, bulk order processing, and status notifications, allowing businesses to manage larger volumes with ease. By minimizing manual interventions, the system reduces errors, improves transparency, and enhances operational efficiency. Additionally, the OMS supports sustainability by optimizing resource usage and minimizing waste in the supply chain. Whether handling individual customer purchases or managing high-volume bulk orders, the system provides a seamless and reliable experience, ensuring customer satisfaction and supporting business growth.***

Indexed Terms- ***Order management, Web based application, Order tracking, Delivery tracking.***

I. INTRODUCTION

The Order Management System (OMS) serves as a comprehensive solution designed to streamline and enhance the order processing workflow for businesses. In today's fast-paced market, effective order management is critical to maintaining customer satisfaction and operational efficiency [1].

This system provides an intuitive interface for managing various aspects of order processing, from tracking order status to overseeing inventory levels. With features such as a dashboard overview of total, pending, and completed orders, as well as a detailed view of recent transactions, the OMS empowers users to make informed decisions quickly. The navigation menu allows for easy access to various functionalities, including order tracking, inventory management, reporting, and system settings [2].

Whether you are a small business looking to improve your order processing or a larger enterprise aiming to enhance your existing systems, the Order Management System is designed to simplify operations, reduce errors, and ultimately deliver a better experience for both the business and its customers. This front page serves as the gateway to these capabilities, setting the stage for efficient order management and seamless customer interactions [3].

1.1. Key Features and Scope

The proposed blockchain-based supply chain system offers significant advancements compared to traditional Order Management Systems (OMS). Unlike existing OMS platforms that rely on centralized databases and manual reconciliation, this system ensures end-to-end traceability through an immutable blockchain ledger, enhancing transparency and trust [4]. It replaces conventional payment gateways with decentralized transactions via MetaMask, offering secure, tamper-proof, and faster settlements. By leveraging smart contract automation, processes like order verification, payments, and compliance tracking are streamlined, eliminating delays and reducing errors inherent in manual systems [5]. Additionally, real-time IoT integration for monitoring storage conditions such as temperature and humidity ensures product quality, a feature not typically present in standard OMS. Regulatory compliance is simplified by securely storing

certifications and safety data directly on the blockchain, whereas traditional systems often struggle with fragmented and inaccessible compliance data. The scalability and adaptability of the blockchain system further allow it to accommodate predictive analytics, sustainability tracking, and global trade transparency, offering a modern, efficient alternative to outdated OMS solutions [6].

1.2. Benefits

The proposed blockchain-based system offers significant advantages over traditional Order Management Systems (OMS). Unlike centralized OMS, which are prone to errors, data manipulation, and limited transparency, this system ensures tamper-proof, end-to-end traceability through a decentralized ledger. It automates critical processes like order verification, payments, and compliance tracking using smart contracts, reducing manual effort and errors, while enabling secure, instant decentralized payments via MetaMask, eliminating intermediaries and lowering transaction costs [7]. Real-time IoT integration monitors environmental conditions like temperature and humidity, ensuring product quality—a feature often missing in conventional OMS [8]. Additionally, it simplifies regulatory compliance by securely storing certifications and safety data, provides dynamic and accurate inventory updates, and enhances fraud prevention with blockchain's immutable nature. Supporting global scalability, multilingual, and multi-currency operations, it also enables sustainability tracking, empowering companies to adopt eco-friendly practices, making it a future-ready and efficient alternative to outdated OMS platforms [9].

1.3. Properties

The blockchain-based Order Management System (OMS) is characterized by several innovative properties that redefine efficiency and transparency in supply chain management. It operates on a decentralized network, eliminating reliance on a central authority and fostering trust among participants [10]. Its immutability ensures that once recorded, transactions and data cannot be altered, providing a secure and tamper-proof ledger. Smart contracts automate critical processes such as payments, order approvals, and compliance checks, significantly reducing manual intervention and errors [11]. The system enhances traceability by offering real-time tracking of products from origin to delivery, while its interoperability allows seamless integration with IoT devices, MetaMask wallets, and existing ERP systems. Scalability ensures it can support global operations with multilingual, multi-currency, and regulatory compliance capabilities. Real-time data updates improve decision-making and operational efficiency, while fraud prevention is bolstered through blockchain's cryptographic properties. Additionally, sustainability tracking promotes eco-friendly practices, and user empowerment provides stakeholders with transparent access to data, fostering greater trust and engagement. These properties make the blockchain-based OMS a robust, future-ready solution for modern supply chain challenges[12].

II. RELATED WORK

The blockchain-based Order Management System (OMS) shares similarities with other projects like Clinical Trial Management Systems (CTMS), Online Booking Management, and Payment Management Systems, but it also exhibits distinct advantages tailored to supply chain processes. Like CTMS, it ensures end-to-end traceability and data integrity; however, while CTMS focuses on tracking patient data and clinical procedures, the OMS emphasizes product movement, quality assurance, and regulatory compliance [13-15]. Compared to Online Booking Management, which uses centralized databases to manage reservations, the OMS leverages blockchain's decentralized nature to enhance transparency, prevent double bookings, and maintain tamper-proof records of transactions. In Payment Management Systems, blockchain facilitates secure and instant payments, comparable to the OMS's use of smart contracts and cryptocurrency wallets like MetaMask for decentralized transactions [16-18]. However, the OMS goes further by integrating IoT data for environmental monitoring and automating supply chain workflows, providing a more comprehensive and versatile solution. This comparison highlights how the OMS adapts blockchain's strengths to address the specific challenges and requirements of supply chain management [19-20].

III. PROPOSED WORK

The blockchain-based order management website uses a decentralized ledger for immutable, transparent transactions and smart contracts for automation, while the normal website relies on a centralized database and traditional payment gateways, lacking inherent transparency and immutability, making blockchain more secure but potentially slower and costlier compared to the simpler, faster centralized system.

3.1. Reasons for including Blockchain in OMS

- Security

Blockchain uses advanced cryptography to secure transactions, making them resistant to hacking and fraud. Decentralization ensures no single point of failure, providing a highly secure environment for order and payment processing.

- Transparency

All transactions are recorded on a shared, immutable ledger visible to authorized parties. This transparency ensures accountability and builds trust among customers and vendors, as everyone can verify transaction details independently.

- Decentralization

Transactions are verified by a distributed network of nodes, removing reliance on a central authority. This eliminates single points of failure, increases system resilience, and ensures uninterrupted operations.

- Automation

Smart contracts automatically execute transactions when predefined conditions are met, eliminating manual intervention. This reduces errors, speeds up processes, and ensures accurate order fulfillment and payment processing.

- Reduced Intermediaries

Blockchain enables direct peer-to-peer transactions, cutting out middlemen. This reduces transaction costs, speeds up processes, and simplifies the order management workflow.

- Fraud Prevention
- The immutable and transparent nature of blockchain makes fraudulent activities easily detectable. This minimizes risks like double-spending, fake orders, or payment disputes, ensuring a secure transaction environment.

3.2. Technology Stack

- HTML5, CSS3, JavaScript for frontend [21].
- Sqlite for efficient data management of database [22].
- Python flask framework used for connecting templates and web-based APIs [23]

3.3. Algorithm

Initialize blockchain network
Initialize inventory database
Initialize order ledger on blockchain
Deploy smart contracts for order handling

Function add_chemical(chemical_name, quantity):
  If chemical_name in inventory database:
    inventory database[chemical_name] += quantity
  Else:
    inventory database[chemical_name] = quantity
  Create blockchain transaction to log chemical addition

Function place_order(customer_name, chemical_name, quantity):
  If chemical_name not in inventory database or insufficient quantity:
Print "Insufficient inventory"
  Else:
    Create order with customer_name, chemical_name, quantity, status "Pending"
    Add order to blockchain order ledger
    inventory database[chemical_name] -= quantity
    Confirm order placement
    Execute smart contract for order handling

Function fulfill_order(order_id):
  Execute smart contract to validate and fulfill order
  Update order status to "Fulfilled" on blockchain order ledger
  Print "Order fulfilled"

Function show_inventory():

Retrieve and display inventory from inventory database

Function show_orders():
Retrieve and display orders from blockchain order ledger

While True:
Prompt user for action
If action is "add chemical":
Call add_chemical
Else if action is "place order":
Call place_order
Else if action is "fulfill order":
Call fulfill_order
Else if action is "show inventory":
Call show_inventory
Else if action is "show orders":
Call show_orders
Else if action is "exit":
Break loop

This algorithm describes a blockchain-based inventory and order management system that ensures transparency and security in chemical supply chains. It initializes a blockchain network, an inventory database, and an order ledger on the blockchain, deploying smart contracts for automated order handling. The add chemicals function updates inventory and logs the addition as a blockchain transaction. The place_order function verifies stock availability, creates an order with a "Pending" status, updates inventory, and executes a smart contract to process the order. If stock is insufficient, it notifies the user. The fulfill_order function validates and completes an order via a smart contract, updating its status to "Fulfilled" on the blockchain. The show_inventory and show orders functions retrieve and display the inventory and order details from the database and blockchain ledger, respectively. The system operates in a continuous loop, prompting users to perform actions such as adding chemicals, placing orders, fulfilling orders, or viewing records. Blockchain ensures immutability, reducing fraud, while smart contracts automate order processing, minimizing manual intervention. This hybrid approach leverages both a centralized database for inventory and a decentralized ledger for order tracking, enhancing efficiency, reliability, and security in supply chain management.

3.4. Architecture

The order management system features a frontend built with HTML for structuring content, CSS for styling and layout, and JavaScript for interactivity and dynamic behavior. The frontend provides a user-friendly interface for order creation, tracking, and management. The backend utilizes SQLite, a lightweight relational database, to store and manage order data, customer information, and inventory details. JavaScript facilitates communication between the frontend and backend via APIs or AJAX requests, enabling seamless data retrieval and updates. This architecture ensures efficient order processing, real-time updates, and a responsive design, making the system scalable and easy to maintain for small to medium-sized businesses.

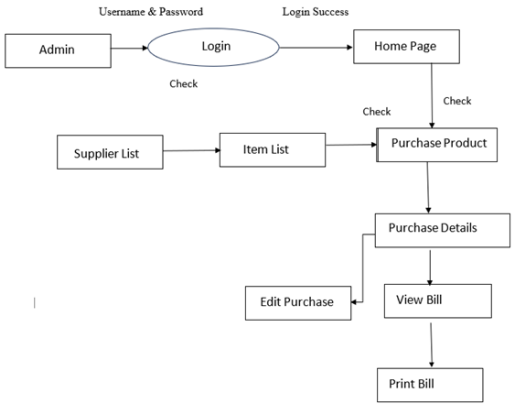

Fig1. DataFlow Diagram

The above flow diagram depicts how the order management system works. In the order management system software, we will have a login page which will be handled by the admins and purchasing the item will be made and the database will be connected with the Sqlite database. The orders purchased will be stored in the database so that the order can be tracked to check the status of the purchased product or item.

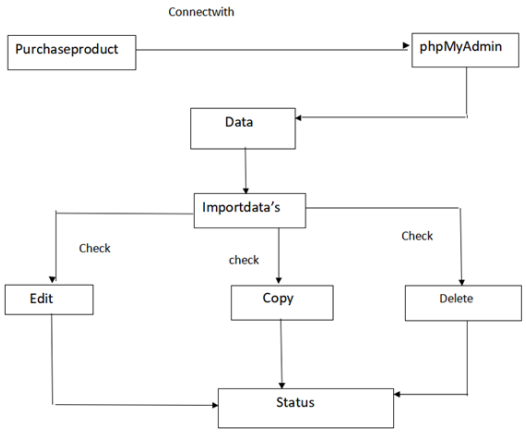

Fig2. Data flow Diagram of Database

The above diagram which is a flow diagram depicts how the database in the order management system works. It is connected with the MyAdminPhp where the data will be imported to the Sqlite so that the status of the products and other details of the products will be updated.

IV. RESULT AND DISCUSSION

LOGIN PAGE

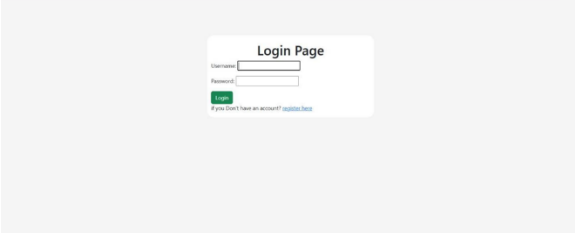

Fig .1 Login Page

This page is a login page where the authenticated users will login by using username and password then it will direct the users to the website's homepage.

REGISTRATION PAGE

Fig .2 Registration Page

This page is a registration page where the users can create an account to go in and access the webpage. Here , details like name and phone number must be given.

HOME PAGE

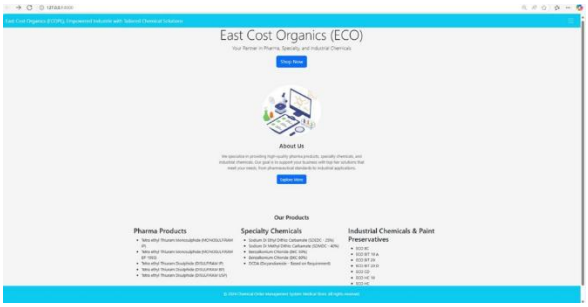

Fig 3. Home page

This screenshot captures the Home Page of our Order Management System, serving as the central hub for users. It features a clean, intuitive design with easy navigation to key sections like product browsing, cart management, and order tracking. The home page reflects the system's core functionality, offering quick access to essential features while showcasing its modern, user-centric design.

ABOUT PAGE

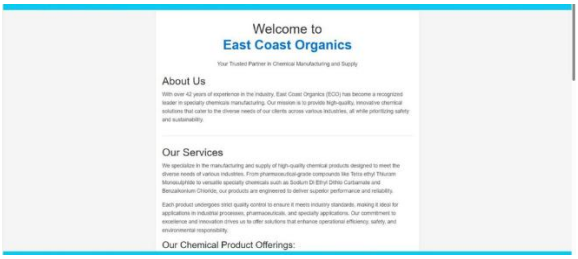

Fig.5About page

This screenshot showcases the About Us section of our Order Management System website. The page highlights the purpose and features of our platform, emphasizing its ability to streamline order processing and inventory management. The design is clean and user-friendly, with a focus on providing a seamless experience for businesses of all sizes. This section also reflects our commitment to innovation and customer satisfaction, making it a central part of our website's narrative.

CART PAGE

Fig.5 Cart page

This screenshot highlights the Cart Page, a key feature of our Order Management System. It displays selected items, allows quantity updates, and enables secure checkouts. Built with HTML, CSS, and JavaScript, the page is dynamic and responsive, while SQLite and blockchain ensure data accuracy and transaction security. Designed for efficiency, it simplifies the ordering process, offering users a seamless and transparent experience.

DATABASE

Fig .6 database

This screenshot showcases the Database Management interface of our Order Management System. It highlights how SQLite efficiently stores and organizes order details, customer information, and inventory data. The backend, powered by Python Flask, ensures seamless data retrieval and updates, while blockchain integration enhances transaction security. This page demonstrates the system's robust architecture, designed for accuracy, scalability, and reliability in managing complex data workflows.

CONCLUSION

The order management system features a frontend built with HTML for structuring content, CSS for styling and layout, and JavaScript for interactivity and dynamic behavior. The frontend provides a user-friendly interface for order creation, tracking, and management. The backend utilizes SQLite, a lightweight relational database, to store and manage order data, customer information, and inventory details. JavaScript facilitates communication between the frontend and backend via APIs or AJAX requests, enabling seamless data retrieval and updates. This architecture ensures efficient order processing, real-time updates, and a responsive design, making the system scalable and easy to maintain for small to medium-sized businesses.

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