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An Efficient Inventory Management System with QR Code using Blockchain

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ABSTRACT

Vendor-managed inventory (VMI) is a commonly used collaborative inventory management policy. Several prerequisites are information sharing, trust, systems integration and long-term collaboration. However, nowadays supply chain networks are becoming more complex, highly disjointed and geographically spread. As a consequence, the implementation of a VMI strategy may be a difficult task. In this paper, we propose a new interaction mechanism between retailers and vendors, which aims to improve their supply chain strategy and inventory policies based on a trustless and distributed mechanism. In particular, we use an autonomous trustless framework based on smart contracts and blockchain technology for governing the relationship between multiple vendors and multiple retailers.

Keywords – Supply Chain, Blockchain, VMI (Vendor Managed Inventory).

I. INTRODUCTION

In the last decades companies increased their interest in optimizing their supply chains. The spread of globalization and the development of information and communication technologies stimulated research towards the development of integrated logistics models with the aim of improving coordination. The main contributions in this direction are devoted to develop optimization models focused on two or more sequential logistics activities in the supply chain, such as inventory and routing, production or inventory, location and routing. All the resulting optimization models are based on two–echelon networks, in which one or more suppliers provide freight to many retailers or customers. Our problem falls within the field of two–echelon optimization problems in which customers must be supplied from different depots over a finite planning horizon, while transportation and inventory costs are minimized. In this setting, Vendor-Managed Inventory (V MI) gained importance in different companies. V MI consists of a vendor/supplier, and a set of customers/retailers located in a given geographical area. The supplier monitors the inventory and decides on the replenishment policy of each retailer. The V MI setting assigns to the supplier the role of leading actor in the decisional process, in order to establish when and how much to deliver. This system applies a win-win

strategy, because it guarantees an overall reduction of the logistic cost for the supplier and saving in the ordering cost for the customers. VMI is considered an example of virtual integration across the SC in which no merge is required like in vertical integration. The adoption of VMI approaches may have significant benefits for all the participants within a SC network (retailers, vendors etc.,). The overall SC VMI offers reduced inventory overstocks and stock shortages, stronger retailer relationships and improved end-customer experience.

II. LITERATURE SURVEY

The supply chain overall performance. Minimize the negative consequences of information asymmetry over the echelons of a supply chain. Since supply chain management research on blockchain is still in its infancy, it is worth to start looking into possible applications and benefits that may convince supply chain managers to adopt this technology and operate in an environment where everyone trusts each other.

Vendor-managed inventory (VMI) is a very common supply chain (SC) management approach for improving multi-firm SC performance while establishing a mutual beneficial relationship between a vendor and a retailer [1]. The main idea behind VMI is that the vendor is authorized to oversee product inventory for the retailer, therefore, the vendor is responsible for tracking, monitoring and replenishing the retailer's agreed-upon inventory. VMI is a streamlined approach to inventory management and order fulfilment in which both the retailer and the vendor may smoothly and accurately control the availability and flow of goods across the SC. VMI was first introduced as a fundamental element in the partnership between Wal-Mart and Procter & Gamble and since then has been widely adopted by many industries. VMI is considered an example of virtual integration across the SC in which no merge is required like in vertical integration.

A transaction is initiated, and the data is encoded into a "block". The block of data is broadcast to the network [2]. The transaction is independently verified by the network. This block of data is connected to the one before it through a unique identifier, creating a chain. Blockchain technology is not easy to implement. They are hard to implement and analysis over large data like Inventory Management System takes a significant amount of time.

RFID tags are small transmitters that wirelessly respond to reader requests and transfer serial number or similar ID [3]. Blockchain, that helps to solve excessive problems and simplifies the process of managing the inventories. It is used beyond budget and is suitable for existing management. Any transaction recorded in blockchain is immutable (there is no possibility of deletion) and there is no possibility of fraud. RFID tags are not cost efficient, they cost ten times the cost of Bar code readers. Implementation of RFID tags can be hard and time-consuming. Blockchain technology does not allow easy modification of data once recorded, and it requires rewriting the codes in all of the blocks, which is time-consuming and expensive.

Reduce paper load for the overall VMI process. As, the central operator is eliminated it provides inclusiveness, longevity and ability to deliver [4]. Focus on the interaction of VMI with external auditors such as insurance companies, to provide enhanced functionalities. Automated pricing control mechanism is not implemented between vendors and retailers.

Smart inventory system has the ability to keep track of inventory level, scalability with the provision of security and backups [5]. In the retail industry smart inventory system is required for example through the concept of smart shelves real time inventory management has become possible. Blockchain technology does not allow easy modification of data once recorded, and it requires rewriting the codes in all of the blocks,

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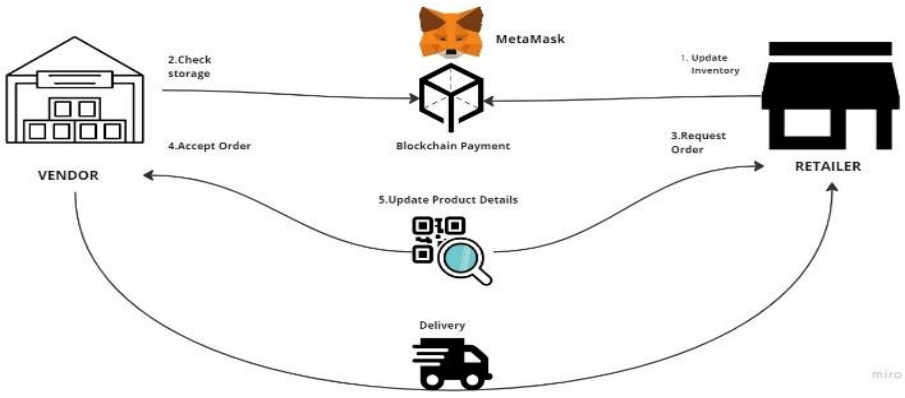
The MDIRP is an NP-hard problem that aims at optimizing the trade-off between inventory and transportation management in an integrated way[6]. With respect to the state of the art, a different context is presented, characterized by a complex urban environment. Clustering phase: an integer linear programming model is solved to generate a partition of the set of customers into a set of clusters, one cluster for each depot p∈P. Routing construction phase: a set Rof routes is built for the clusters generated in the first phase.

III. SYSTEM OVERVIEW

As per the proposals, the detection method is based on image acquisition and change detection. This system is proposed for real time abandoned object detection and its addressing using IoT for enhancing our public security with the help of alert system.



A. DATA ACQUISITION:

An inventory management system (or inventory system) is the process by which you track your goods throughout your entire supply chain, from purchasing to production to end sales. It governs how you approach inventory management for your business. Our objective is to create efficient inventory management system with QR Code using Blockchain and reduce the gap between the vendor and the retailer. And to notify the vendor before the requirement before a product runs out of stock by the use of QR scanning.

B. WORKING OF VMI via BlockChain:

The Retailer can update the requirements by sending the data which consists of the products by scanning the QR Code. Each time the QR Code gets scanned the total number of products in the retailer's inventory is reduced. Once it reaches an expected minimum quantity ,a notification request will be sent to the vendor of the details about the requirements of the retailer. Once the request is acknowledged and accepted by the vendor, the vendor will deliver the requested product to the Retailer .And the transactions will be done through metamask.

IV. IMPLEMENTATION AND RESULTS

Select a blockchain platform that meets the system requirements, such as Ethereum or Hyperledger Fabric. Design and implement the QR code system to scan items as they are added to or removed from the inventory. Develop a smart contract to store data on the blockchain, including information about each item, such as its location, quantity, and history of transactions. Link the QR code system with the blockchain to automatically update the inventory data on the blockchain as items are scanned. Retailers pays for the product using Blockchain Cryptocurrency. Users select the products from the website User scans and pay to website. A mail containing QR code with product details are send to each vendor. Users can select more than one product from different vendors. Once the user completes their purchase, they specify the quantity and confirm the order. After confirmation, a QR code is generated using user transaction details and order cost. After the vendor and retailor gives a conformation the funds are send to the vendor.

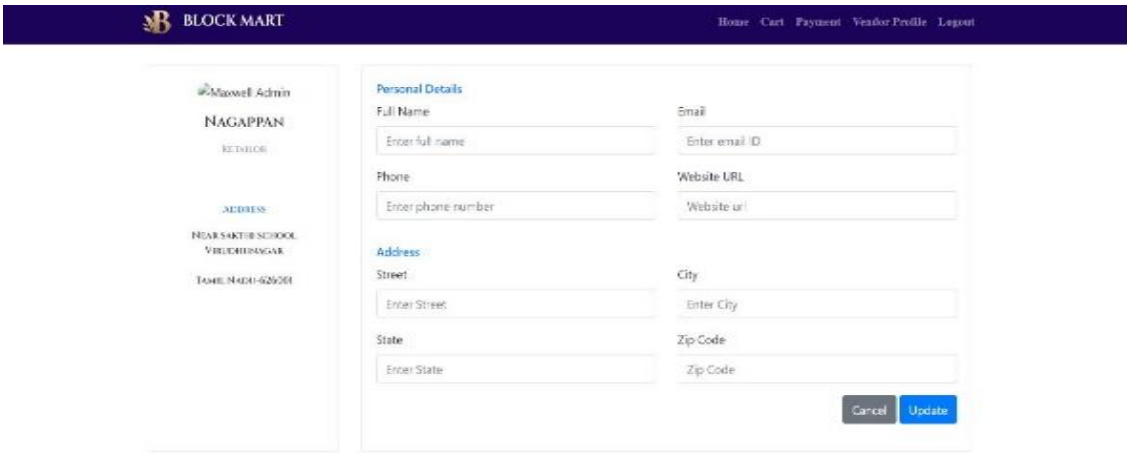


Fig 1. Registration Page

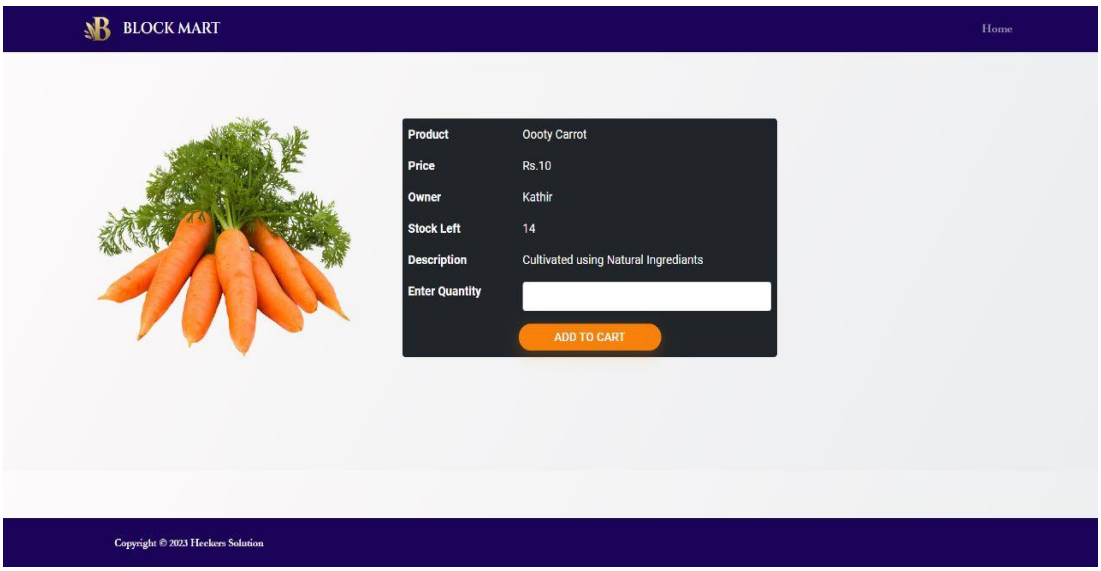


Fig 2. Add to Cart

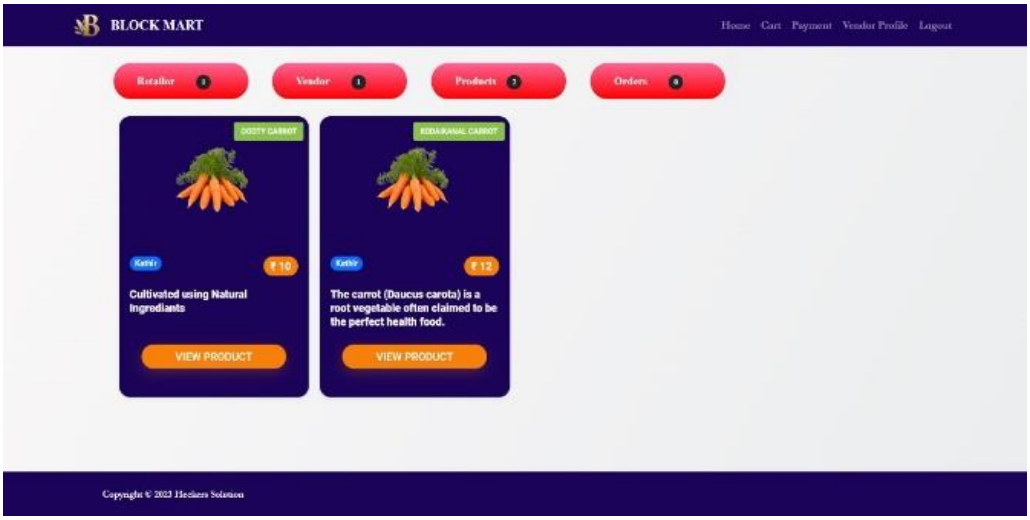


Fig 3. View Products

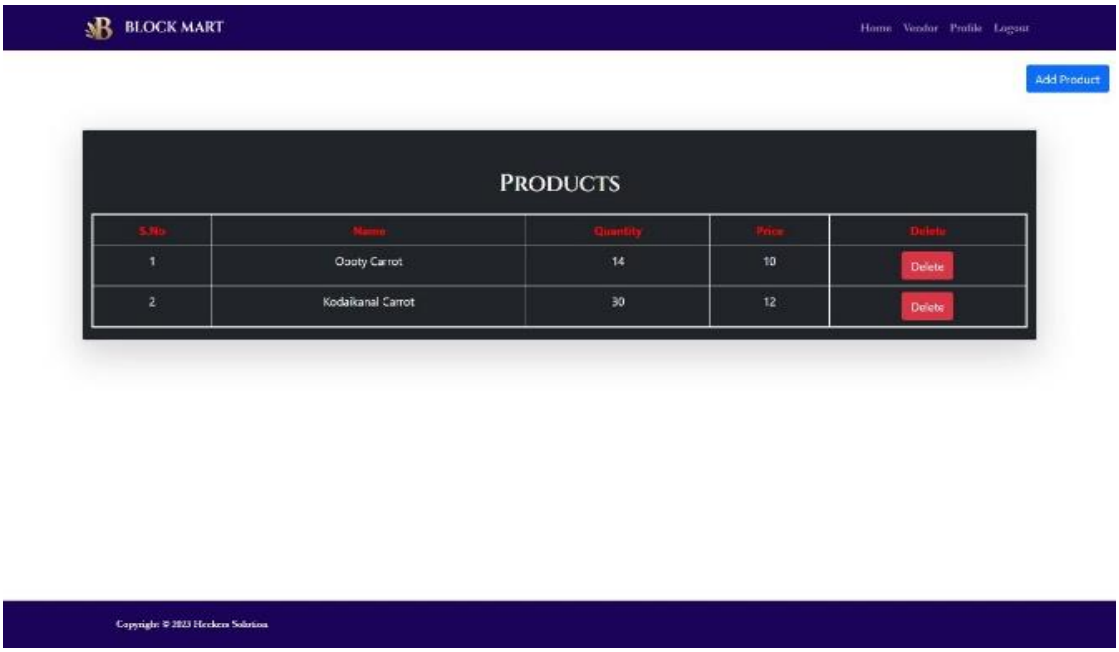


Fig 4. Updated Products

V. V.CONCLUSION

Blockchain technology is able to overcome certain impediments traditional VMI approaches present like lack of security, integration difficulties and opportunistic behaviour. In this work, we have proposed a novel VMI architecture based on blockchain and smart contracts for improving inventory policies between multiple vendors and retailers. Moreover, we provide a functional implementation through the use of a local private blockchain and various smart contracts, which implement a set of functions that enable different characteristics/benefits of VMI implementation. Therefore, we have presented a use case VMI scenario in which multiple vendors and multiple retailers may interact with each other based on a trustless and distributed mechanism. This solution enables several benefits like cost reduction, increased visibility, security and operations' automation. Future work will focus on the interaction of VMI with external auditors such as

insurance companies, to provide enhanced functionalities. Finally, other promising topics for future research include the usage of blockchain technology and smart contracts for the establishment of an automated pricing control mechanism between vendors and retailers as well as the use of blockchain tokens for establishing a more detailed VMI approach and QR.

VI. REFERENCES

[1]. Fran Casino∗ Member, IEEE, Thomas K. Dasaklis† and Constantinos Patsakis‡ , Member, IEEE – August 2019 "Enhanced Vendor-managed Inventory through Blockchain"

[2]. Nwosu Anthony Ugochukwu, 1 S. B. Goyal, 1 and Sampathkumar Arumugam 2 1 Faculty of Information Technology Dollo University, Ethiopia d 24 April 2022; Revised 13 May 2022 "Blockchain – Inventory management's next revolution or just an overdue trend"

[3]. Shirzada Ferdaus "Combining RFID Tags & Blockchain for Inventory management".

[4]. Enhanced Vendor-managed Inventory through Blockchain

[5]. Edward Probir Mondol Global Academy of Holistic Leadership and Coaching Inc. "The Impact of Block Chain and Smart Inventory System on Supply Chain Performance at Retail Industry"

[6]. Leandro C CoelhoThe Multi-Depot Inventory Routing Problem: An Application of Vendor-Management Inventory in City Logistics

[7]. Sultan N. Turhan Özalp Vayvay April 2012 International Journal of Business Information Systems "Vendor managed inventory via SOA in healthcare supply chain management"

[8]. Xiaohui Liu1,2, Youwang Sun1 1 School of Transportation Engineering, Tongji University, Shanghai "Information Flow Management of VendorManaged Inventory System"

[9]. Tom Costello Published in: IT Professional (Volume: 15, Issue: 6, Nov.-Dec. 2013 "Vendor Management"