

## BLOCKCHAIN-ENHANCED E-COMMERCE: SECURE AND TRANSPARENT TRANSACTIONS

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**Abstract—** The swift progression of cryptography and distributed computing systems is expected to revolutionize numerous industries through enhanced transparency, superior security, and reduced transaction costs. Nonetheless, the scalability and performance of blockchains constrain their utility and appropriateness in online services, particularly in e-commerce. This project presents an analysis of blockchain technologies to elucidate their advantages and obstacles in e-commerce. Consequently, we propose two blockchain-based e-commerce applications accompanied by comprehensive design guidelines: social shopping and loyalty program. The entire foundation of e-commerce relies on the online transfer of goods and transactions, eliminating the necessity for physical travel. Transferring transactional data and transactions in e-commerce is susceptible to cyber threats. The primary aim of our research is to create a system that safeguards against such incidents, particularly during the transmission of transactional data, and to establish an automated mechanism that guarantees these transactions are executed flawlessly. We are utilizing emerging technologies known as blockchain and smart contracts to implement this. Blockchain facilitates a decentralized, immutable digital ledger for the secure storage and transfer of data across the network. Blockchain technology is employed in e-commerce to facilitate transactions in a secure, efficient, and expedited manner. Blockchain facilitates a peer-to-peer transaction framework and data encryption, ensuring the secure transfer of transactional information.

**Keywords:** Cryptography, Blockchain, Digital Ledger, Peer-to-Peer Transactions, Encryption, E-Commerce, Online Shopping.

### INTRODUCTION

This project endeavors to revolutionize the landscape of ecommerce by integrating blockchain technology. Recognizing the challenges of trust, security, and transparency in traditional online marketplaces, the study aims to leverage blockchain's decentralized and immutable characteristics to create a secure and trustworthy ecommerce platform. The paper will explore the conceptual framework, design principles, and technical architecture of the proposed blockchain-based ecommerce website, emphasizing its potential to enhance security, transparency, and user empowerment. The goal is to contribute to the discourse on the transformative impact of blockchain in ecommerce, envisioning a future where digital transactions are characterized by increased trust and transparency..

### MOTIVATION & BACKGROUND

#### ◦ Motivation

The motivation behind developing a blockchain-based ecommerce website is rooted in the imperative to revolutionize the current landscape of online commerce. By harnessing the transformative potential of blockchain technology, this project seeks to address the persistent challenges of trust, security, and transparency in traditional ecommerce platforms. The immutable ledger and decentralized nature of blockchain promise to instill unparalleled levels of security and transparency, mitigating concerns related to data manipulation, fraud, and disputes. By introducing features like smart contracts for trustless transactions and creating an immutable product history, the project aims to redefine the dynamics of online transactions, offering users a more secure, reliable, and empowering ecommerce experience. Through the fusion of cutting-edge blockchain technology with ecommerce, the project aspires to pave the way for a future where digital transactions are characterized by heightened trust, efficiency, and global accessibility.

#### ◦ Background

Traditional e-commerce platforms face challenges such as data breaches, payment disputes, and a lack of transparency. The introduction of blockchain technology addresses these issues by providing a decentralized, secure, and transparent framework for conducting transactions. This project aims to leverage the unique features of blockchain to revolutionize the e-commerce industry. The use of a blockchain ledger ensures that all transactions are recorded in a tamper proof manner, enhancing the integrity of the platform. Smart contracts automate and enforce agreements, reducing the need for intermediaries and streamlining the transaction process. This not only improves efficiency but also lowers costs for both buyers and sellers. Additionally, by incorporating tokenization, the project can introduce a new layer of flexibility and ownership in e-commerce. Users can tokenize assets, facilitating fractional ownership and enabling a more diverse range of transactions.

2 The global nature of blockchain allows for seamless international transactions, eliminating barriers associated with

currency conversions and traditional banking systems. This project envisions creating a truly global e-commerce ecosystem that is accessible to users around the world.

### **OBJECTIVES**

#### *◦ To Create Secure Platform*

Develop a robust blockchain-based platform that ensures secure transactions, data integrity, and protection against fraudulent activities market..

#### *◦ To Implement Transparent Transactions*

Utilize blockchain's decentralized ledger to enable transparent and tamper-proof transaction records, fostering trust between buyers, sellers, and the platform .

#### *◦ To Enable Secure Payments*

Integrate secure cryptocurrency and traditional payment methods, allowing customers to transact seamlessly while leveraging the benefits of blockchain's secure payment infrastructure. .

#### *◦ To Establish Provenance Tracking:*

Implement a traceability system powered by blockchain to track the provenance of each product providing buyers with detailed historical information about the components they purchase.

#### *To Ensure Data Privacy*

Prioritize user data privacy by implementing advanced encryption and decentralization techniques, giving users full control over their personal information.

### **LITERATURE REVIEW**

In conducting the literature review for our project, we delved into several IEEE papers to acquire a comprehensive understanding of the current state-of-the-art in the relevant field. These IEEE publications served as invaluable resources, offering insights into key methodologies, technological advancements, and theoretical frameworks that informed and guided the development of our project. By synthesizing information from these rigorously peer-reviewed sources, we aimed to ensure the robustness and validity of our approach, aligning our work with established research and fostering a foundation of knowledge that enhances the credibility and innovation of our project. The wealth of knowledge gleaned from these IEEE papers not only facilitated a nuanced comprehension of the existing literature but also inspired creative solutions and methodologies, positioning our project within the broader context of cutting-edge research in the field.

#### *Data Security and Privacy:*

Issue: Centralized storage of user data makes traditional e-commerce platforms vulnerable to data breaches and privacy concerns.

#### *International Transactions and Currency Conversion:*

Issue: Traditional e-commerce platforms may face challenges in providing seamless international transactions, including issues related to currency conversion and cross-border payments.

#### *High Transaction Costs:*

Issue: Traditional payment gateways and financial intermediaries often impose transaction fees, especially for international transactions, leading to higher costs for both buyers and sellers.

### **PROBLEM STATEMENT**

"To create a secure and transparent marketplace to confidently buy, sell, and trace authentic products and to boost the preservation and growth of the businesses."

### **IMPLEMENTATION**

#### **Framework:**

Define the goals of the experiment. What do you want to learn about using blockchain technology for e-commerce ?

Identify the key metrics that will be used to measure success. This could include metrics such as the number of transactions processed per second, average transaction time, percentage of successful transactions, cost per transaction, number of active users, and customer satisfaction.

Choose a blockchain platform. There are a number of different blockchain platforms available, each with its own strengths and weaknesses. Factors to consider when choosing a platform include scalability, security, and cost.

### CIRCUIT DESIGN

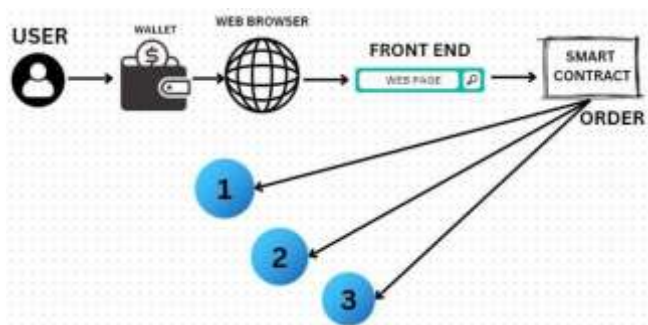


Fig.1 Smart Contracts

In the above diagram the user will connect his wallet to the website that we have created for our e commerce store. Then through the web browser and with the help of the user friendly UI the user can purchase any product using ether. As this is being carried out the smart contracts will handle the transaction that is meant to be executed over the block chain. Taking care of the order and all the details of the product the smart contracts will then act upon the blockchain to do so.

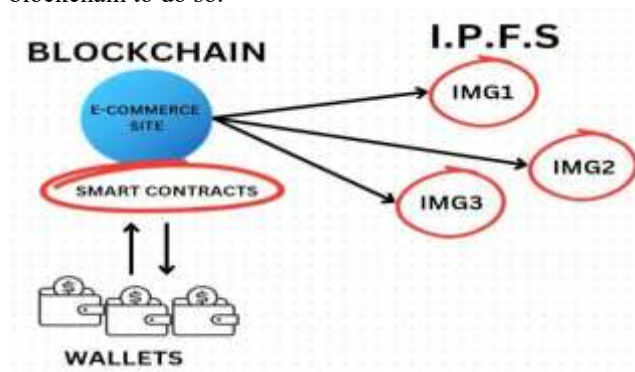


Fig.2 IPFS (Inter Planetary File System)

INTER PLANETARY FILES SYSTEMS is like a backend of the block chain that helps store files and pictures in the blockchain and we use this to obtain the pictures on our front end to display for the users to make it easy for them to get a discrete view of the product.

### SOFTWARE USED

#### ◦ Vs Code

Visual Studio Code (VS Code) is a lightweight, cross- platform source code editor developed by Microsoft. It supports numerous programming languages, offers smart code completion, integrates Git for version control, includes an integrated terminal, and is highly customizable through extensions. VS Code is widely used for its speed, versatility, and a large community contributing to its ongoing development. It will be used for front-end design.

#### ◦ Pinata

Pinata is a cloud-based service that simplifies and accelerates the development of decentralized applications (DApps) on blockchain networks, particularly for the Inter Planetary File System (IPFS). It offers tools and services for managing, pinning, and distributing content on IPFS, making it easier for developers to handle the storage and retrieval of data within decentralized applications. Pinata simplifies the process of interacting with IPFS, providing developers with an efficient solution for managing and sharing data in a decentralized and distributed manner. It will be used for IPFS(Inter Planetary File System)

#### ◦ Ethereum

Ethereum is a decentralized blockchain platform that enables the creation and execution of smart contracts and decentralized applications (DApps). Its native cryptocurrency is called Ether (ETH). Ethereum's key features include a Turing-complete scripting language for smart contracts, a decentralized virtual machine (EVM) to execute these contracts, and a consensus mechanism called Proof of Stake (PoS) that is transitioning from Proof of Work (PoW). Ethereum aims to provide a global, open- source platform for building decentralized applications, fostering

innovation in the blockchain space. It is using ethereum blockchain for online payment purposes.



Fig 10.1 Result 1

### CONCLUSION AND FUTURE SCOPE

In conclusion, our experiment on the "Blockchain-Based E- commerce Website" has been a significant journey marked by notable achievements and advancements in the realm of de centralized and secure online transactions. Over the course of this semester, we successfully conceptualized and implemented smart contracts, elevating the integrity and transparency of our e-commerce platform. The utilization of smart contracts not only streamlined the listing of products but also ensured a trustless environment for both buyers and sellers.

A pivotal aspect of our project involved harnessing the power of Pinata to seamlessly integrate images into the The project is currently using HardHat framework with Solidity and JavaScript coding languages. We created SmartContracts for product listing section. We also used Pinata for storing the data (images) onto IPFS(Inter Planetary File System) which will be required to display data on front-end.

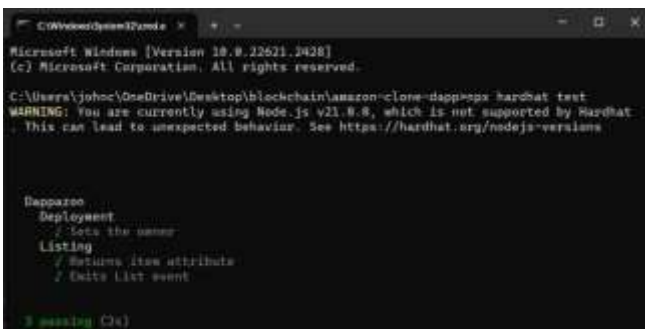


Fig.10.2 Result 2

Initially we studied the basics of Solidity language. Using Solidity we programmed the Smart Contracts and we also used JavaScript for programming. This is the output of SmartContracts on Cmd. The Hardhat deploys the Solidity and JavaScript files using Mocha framework and Chai libraries.

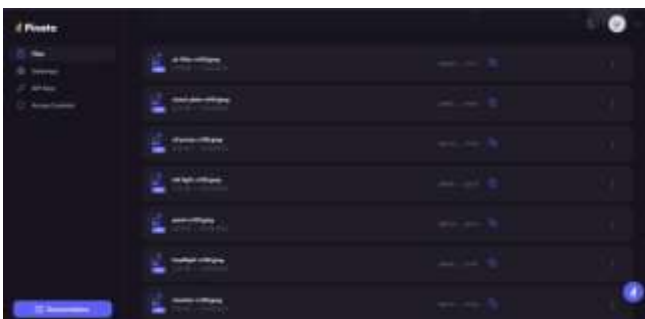


Fig. 10.3 Result

Since the blockchain does not display images directly we will be using Pinata database. This is the output we obtained after we uploaded data using Pinata onto IPFS(Inter Planetary File System). This data will be further displayed on the front-end of the website. This is a separate database used to upload images onto blockchain.

InterPlanetary File System (IPFS). This strategic move not only enhanced the accessibility and durability of our data but also contributed to the overall decentralization of our e-commerce ecosystem.

Looking ahead, the next semester holds the promise of further refinement and completion of our project. We are determined to finalize the front-end of the website and seamlessly integrate all components to provide users with a seamless and intuitive experience. The journey doesn't end here; rather, it extends into the next semester, where we aim to bring the vision of a fully functional blockchain-based e-commerce platform to fruition.

In summary, this semester has been instrumental in laying the foundation for our blockchain based e-commerce website. The incorporation of smart contracts, Pinata, and IPFS has positioned our project at the forefront of technological innovation in the e-commerce landscape. As we continue to evolve and refine our platform, the upcoming semester holds the promise of transforming our vision into a tangible, user-friendly reality.

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