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IMPACT OF BLOCKCHAIN TECHNOLOGY IN THE E-COMMERCE SECTOR

Shivaji Godawale [1]
Prashant Deshmukh

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A B S T R A C T

Blockchain technology is considered as a significant development after the invention of the internet. Blockchain technology records the transactions on database which are encrypted and distributed over many computer networks like a digital ledger of online transactions. This technology can be utilized in the e-commerce industry to develop a decentralized online buying and selling platform. E-commerce industry presently facing many unique challenges like security measures of the e-commerce system, transparency, and trust, efficiency, etc. These challenges can be answered by the implementation of blockchain technology in the e-commerce industry. This paper discussed opportunities for using blockchain technology in the e-commerce industry. Blockchain applications and opportunities are discussed for various aspects of e-commerce like Payment, Security, Supply chain, Work automation with Smart contract, Ethical practices for transparency in e-commerce transactions. The paper seeks to explore the possible uses of blockchain technology within the e-commerce sector.

1. INTRODUCTION

The paper seeks to explore the possible uses of blockchain technology within the e-commerce sector. The World Economic Forum suggests that blockchain could become a significant tool for transactions, enhancing trust, empowering users, and mitigating corruption (Trump et al., 2018). The Internet has fundamentally transformed our daily lives. It enhances every aspect of our existence, from sharing our opinions and engaging in virtual interactions on social media to digital entertainment, marketing, and online transactions. To leverage the latest Internet technologies, organizations must adopt strategic approaches. One crucial area for focus is e-commerce. Electronic commerce represents a ground breaking shift, continually evolving the way businesses operate and establishing a new global business model. E-commerce relies on technologies such as Electronic Data Interchange (EDI), the Internet, the World Wide Web, and various networks. Recently, blockchain has emerged as a significant technological advancement. It is grounded in disruptive computing, cryptographic science, and diverse software solutions. Essentially, blockchain is a system where online transactions are recorded as a shared ledger across numerous computers in a peer-to-peer network (Bulsara & Vaghela, 2020).

2. LITERATURE REVIEW

2.1 E-commerce

E-commerce involves conducting transactions over the internet, including both buying and selling. Beyond just financial exchanges between customers and businesses,

[1] Corresponding author: Shivaji Godawale
Email: avinash.n@pvgcos.ac.in

e-commerce also encompasses non-financial interactions that customers engage in with the company (Chaffey, 2007). In contemporary terms, a transaction is considered electronic commerce if it involves the use of the World Wide Web at any stage of its process (Rosen, 2002; Qin 2010; Mohapatra & Mohapatra, 2013). The e-commerce sector remains the fastest-growing industry. It is anticipated that the global e-commerce market will reach $5 trillion, with an approximate growth rate of 20 percent (Mäki & Toivola, 2019). As reported by Statista, global B2C e-commerce sales amounted to $3.53 trillion in 2019, and are forecasted to reach $6.54 trillion by 2022 (Bulsara & Vaghela, 2020).

2.2 Blockchain

Don and Alex Tapscott, authors of *Blockchain Revolution*, describe blockchain as an unalterable digital ledger for economic transactions that can be designed to record not only financial exchanges but nearly any valuable asset (Halaburda, 2018). According to an article published by Forbes magazine, blockchain functions as a secure, distributed database that maintains an ordered sequence of records, referred to as blocks, which cannot be altered. It can be compared to a word file that is distributed across multiple computers, where several copies can exist on a network and the file can be updated regularly. Initially, blockchain technology was used for the cryptocurrency Bitcoin. It acts as a secure, shared database that keeps an organized list of records, or blocks, that remain unchanged.

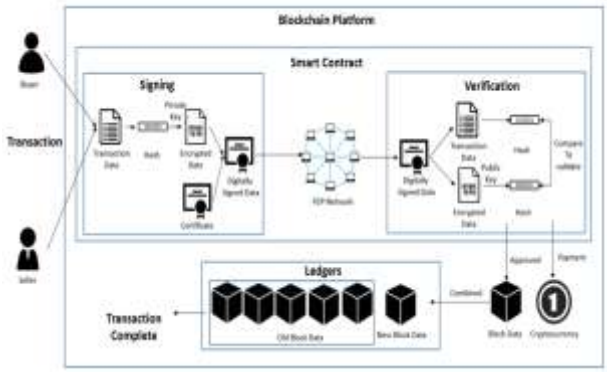

Figure 1. Blockchain as E-commerce Platform Architecture

This distributed database is based on decentralization and is not linked to any single computer system. Access to a block is limited to its owner and those the owner grants digital key access. Each block can store various types of data, and transactions are added sequentially in a chain of blocks, which is why it is termed a blockchain (Shankland, 2019).

2.3 Blockchain uses in e-commerce

E-commerce has expanded rapidly and has become a significant industry over the past decade. Online shopping has become the preferred choice for consumers, driven by numerous recent technological advancements, one of which is blockchain (Geer, 2018). In recent years, blockchain technology has made a notable impact and garnered interest from various industries due to its potential uses. Major companies such as VISA, IBM, and Microsoft are investing in blockchain to explore how it can be integrated into their operations (Arora et al., 2020). Blockchain technology offers numerous potential applications for the e-commerce sector, which can assist companies in addressing both immediate and long-term challenges. The next section of the article explores the potential advantages of adopting blockchain technology and its effects on e-commerce businesses (Figure 1) (Xuan et al., 2020).

3. METHODOLOGY

3.1 Analysis

The exact number of users in India who have adopted blockchain technology for e-commerce over the past Seven years is not readily available in the public domain. However, the adoption of blockchain technology in various sectors, including e-commerce, has been growing rapidly (Esfahbodi et al., 2022).

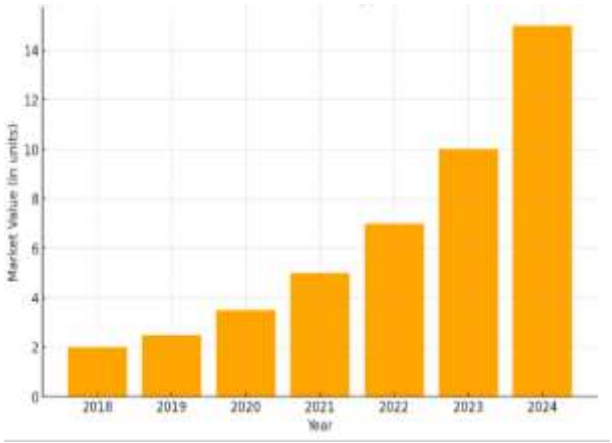

Figure 2. Projected growth of blockchain technology market in India (2018-2024)

The graph (Figure 2) above shows the projected growth of the blockchain technology market in India from 2018 to 2024, based on a compound annual growth rate (CAGR) of 58%. Starting with an assumed market value of 1 unit in 2018, the market value increases significantly each year, demonstrating exponential growth due to the high CAGR.

3.2 Payment by using Cruptocurrency

Transaction costs on blockchain-based platforms are lower compared to conventional e-commerce transactions, facilitating the potential for quick micropayments. Additionally, blockchain transactions are quicker than traditional payment methods in e-commerce. According to research by Monetha, traditional payment systems involve approximately 16 stages and incur processing fees ranging from 2 percent to 6 percent for customers (Wang et al., 2024). In contrast, blockchain-based platforms such as Ethereum's Lightning Network can process millions of transactions

per second (Xuan et al., 2020). Additionally, while numerous payment solutions exist for e-commerce, trust and transparency remain significant challenges for both consumers and online retailers. Blockchain could address these issues. Transactions recorded on a blockchain are documented in an immutable ledger, which cannot be altered. Blockchain also offers enhanced security, quicker processing times, and traceability through a decentralized network. This can build greater trust between consumers and online retailers (Arora et al., 2020). Blockchain-based payments are unaffected by the restrictions, fees, and exchange rates that often hinder traditional international e-commerce payments. As a result, this technology can facilitate cross-border e-commerce transactions. Additionally, e-commerce payments are typically processed through third-party payment gateways. Many startups are developing blockchain-based payment gateways to enhance the functionality of traditional systems. In the future, it may become possible to use blockchain-based payment cards and digital wallets for e-commerce transactions, allowing direct transfers of money between buyers and sellers (Bulsara & Vaghela, 2020).

4. SECURITY BY USING DIGITAL SIGNATURE

Blockchain offers the highest level of security against hackers and fraudsters. Transaction data is distributed and shared across a network of millions of computers. This data is verified and encrypted by network nodes. As the chain of nodes grows longer, it becomes increasingly difficult to hack. In a blockchain system, decentralization is crucial for ensuring data security and reliability. E-commerce companies can leverage this technology to manage consumer databases. Typically, e-commerce companies store such data in a centralized location or on cloud services, which can be vulnerable to hacking. In contrast, blockchain stores data in a decentralized manner, significantly reducing the risk of hacking (Treiblmaier & Sillaber, 2021). E-commerce retailers typically use email or physical copies to send receipts, invoices, and after-sale service terms. With blockchain technology, it is now possible to store all this information in a cryptographic format within a data block. This approach simplifies the process for buyers to claim services and for retailers to fulfill these claims (Liu, & Li, 2020). Reward points can be redeemed across any e-commerce platform with a high degree of authenticity and trustworthiness. In a blockchain system, there is no central authority with the power to collect and manage customer data. Control of this data remains with the customers, who can choose whether or not to share their information with third parties (Dunt & Harper, 2002). A significant challenge in the e-commerce industry is the lack of transparency. Blockchain technology has the potential to offer the highest level of transparency in e-commerce transactions. It can detect even the smallest changes in transactions and allows customers to monitor their transactions at any time, enhancing their sense of security. In this context, both Unilever and Walmart have recently announced blockchain projects to incorporate this technology into their operations (Verma & Kulkarni, 2023; Xuan et al., 2023).

5. SUPPLY CHAIN MANAGEMENT

One challenge facing e-commerce is the inefficiency in supply chain and distribution networks. Companies often engage in unethical practices to manage their supply chains, making it difficult for customers to verify the authenticity of transactions at each stage. For instance, a retailer might use substandard parts while claiming they are genuine or misrepresent non-organic food products as organic. Implementing blockchain technology can address these issues by enhancing supply chain management in e-commerce. Blockchain's transparency and immutability will hold each stage of the supply chain accountable and allow customers to trace the origin of the products they purchase (Sunny et al., 2020). It is possible to minimize or even eliminate intermediaries between the company and the end customer, which can lead to lower supply chain costs. Additionally, online retailers might need fewer human resources for managing product delivery and distribution (Send & Cox, 2020). Additionally, e-commerce companies can leverage blockchain technology to enhance their supply chain management. This technology offers a secure, precise, authentic, and dependable platform for tracking products during transit. Both retailers and customers will be able to monitor their shipments in real time (Helo & Shamsuzzoha, 2020).

6. SMART CONTRACT

Smart contracts facilitate the automatic execution of agreements according to predefined rules and conditions. This technology can optimize workflows through its integrated management systems. E-commerce companies can utilize smart contracts for collaborating with payment and logistics intermediaries (Lahkani, et al., 2020), as previously discussed, smart contracts operate based on predefined rules that execute automatically when certain conditions are met. This system functions independently without relying on others. Such technology offers two key benefits for e-commerce: cost-efficiency and rapid response times for customer service requests. For example, if a customer cancels an online order and requests a refund, the traditional e-commerce system may take a considerable amount of time to process the refund. With smart contract implementation, the refund process can be expedited. The system will follow the established standards and credit the customer's account in real-time. Additionally, if a customer updates their delivery address while an order is in transit, a smart

contract can automatically adjust the address in the system (Hasan et al., 2019). This technology can automate specific e-commerce processes based on predefined rules, potentially reducing the need for human resources. For instance, smart contracts can be employed for managing inventory. Smart contracts can be utilized for managing and automating loyalty programs. Since each online purchase transaction is recorded in a blockchain, it becomes easier for online retailers to automate the issuance of loyalty points and discounts to their customers (Treiblmaier & Sillaber, 2021). It will assist e-commerce companies not only in tracking inventory but also in automating inventory replenishment. Effective implementation will prevent stockouts in online stores, thereby enhancing convenience for end consumers (Breugelmans et al., 2006).

7. BEST ETHICS PRACTICES

Ethical practices are regarded as the major challenge encountered by e-commerce companies (Sunny et al., 2020; Send & Cox, 2020) the topic of transparency is increasingly being discussed among various stakeholders and government agencies. Recently, President Donald J. Trump expressed his concerns about the transparency of e-commerce companies such as Amazon on social media. This issue could be addressed through the adoption of blockchain technology in e-commerce, where all transactions are recorded in a shared ledger and are nearly impossible to alter (Haque et al., 2022). This will ensure that the online platform maintains its integrity, offering the highest level of transparency to consumers. Implementing blockchain will significantly reduce the likelihood of fraud (Dai et al., 2017). For example, Bitboots, a blockchain-based e-commerce company, offers a decentralized platform for transactions between buyers and sellers. Consequently, major e-commerce players such as eBay, Alibaba, and Amazon are already exploring blockchain technology to create new business models (Hu & Xu, 2022).

Positive Impacts:

- **Increased Awareness and Experimentation**:
  Major e-commerce players like Amazon, Alibaba, and eBay have begun exploring blockchain applications. Startups focused on integrating blockchain into e-commerce have emerged.
- **Enhanced Security Solutions**:
  Companies are looking at blockchain for secure data storage of customer information and product details, reducing hacking risks.
- **Supply Chain Tracking Pilots**:
  Pilot programs using blockchain to track goods in the supply chain have shown promise in improving transparency and efficiency within specific product categories.
- **Payment Innovation:**
  Research and development on blockchain-based payment systems for faster and cheaper transactions in e-commerce is ongoing.

Challenges and Limitations:

- **Scalability Issues:**
  Current blockchain technology often struggles to handle the high transaction volume typical of large e-commerce platforms.
- **Lack of Standardized Regulations:**
  The evolving regulatory environment surrounding blockchain creates uncertainty for businesses hesitant to invest in a technology without clear guidelines.
- **Low User Adoption:**
  Consumer awareness and understanding of blockchain remain relatively low, hindering widespread adoption of blockchain-based e-commerce solutions.
- **Integration Costs:**
  The cost of integrating blockchain technology into existing e-commerce systems can be significant for businesses.

Case Study:

1. **Ola** and **Uber** are exploring blockchain technology to improve ride-sharing services. Blockchain enhances data security, ensuring the privacy of user information and transaction details. It also facilitates decentralized ride-sharing platforms, reducing dependency on central authorities and potentially lowering costs for users. Additionally, blockchain can streamline payment systems, making transactions faster and more transparent.
2. **Alibaba** and **Ant** Financial use blockchain technology to enhance transparency and trust in e-commerce. Alibaba's blockchain-based tracking system ensures the authenticity of luxury goods, reducing counterfeiting. Ant Financial's blockchain platform improves cross-border remittances, offering faster and more secure transactions, demonstrating blockchain's potential in streamlining e-commerce operations and financial services.
3. **Walmart** uses blockchain technology to enhance food safety and traceability in its supply chain. The blockchain system allows for real-time tracking of products from farm to store, reducing the risk of contamination and improving transparency and efficiency in the supply chain.
4. **Amazon** leverages blockchain technology to improve its supply chain transparency and enhance customer trust. The company uses blockchain for tracking products and verifying their authenticity, ensuring more secure and efficient transactions, and reducing the risk of counterfeit goods in the e-commerce ecosystem.
5. **OpenBazaar** utilizes blockchain technology to create a decentralized marketplace, enabling peer-to-peer transactions without intermediaries. This reduces transaction costs and enhances security, allowing for

direct and transparent interactions between buyers and sellers in the e-commerce sector.

8. CONCLUSION

The traditional e-commerce sector faces numerous challenges, including issues with online transaction processing, data security, order and payment processing, and transparency. Upgrading e-commerce systems with blockchain technology could address these challenges effectively. Blockchain technology has the potential to improve the efficiency of the e-commerce industry. This paper explores various applications of blockchain in areas such as Payment, Security, Supply Chain, Work Automation with Smart Contracts, and Ethical Practices for Transparency. Companies like MultiChain (which offers services for establishing private blockchains for financial transactions), Elinext (a software development firm), Eligma (an AI-driven blockchain platform functioning as a personal commerce agent), Coupit (a blockchain-based affiliate platform), and Ravain (a blockchain-based review platform) are already working on and have developed solutions for implementing blockchain in e-commerce (Sheikh et al., 2019). Although consumers may need considerable time to grasp how to use blockchain-based e-commerce platforms, this technology will foster an environment of transparency and trust within e-commerce platforms (Albshaier et al., 2024). This provides customers with increased control. Blockchain allows e-commerce platforms to deliver an efficient payment system, decentralized control to prevent the dominance of large companies, an anti-fraud mechanism, reduced transaction processing fees, and an overall more effective e-commerce platform (Bulsara & Vaghela, 2020).

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Shivaji Godawale
Savitribai Phue Pune University, Pune India.
sgodawale912@gmail.com
ORCID: 0009-0007-6867-6217

Prashant Deshmukh
Savitribai Phue Pune University, Pune India.
deshmukh.pc@gmail.com
ORCID: 0009-0009-3102-2337