# Autonomous Transaction Model for E-Commerce Management Using Blockchain Technology

Sekar S., Sengunthar Arts and Science College, India

Annamalai Solayappan, Sri Subramaniya Swamy Government Arts College, India

Srimathi J., Vivekanandha Institute of Information and Management Studies, India

S. Raja, SRM Valliammai Engineering College, India

https://orcid.org/0000-0002-0727-4798

Durga S., KLEF, K. L. University, India

Poongodi Manoharan, Division of Information and Computing Technology, College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar*

https://orcid.org/0000-0001-6801-6138

Mounir Hamdi, Division of Information and Computing Technology, College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar

Godwin Brown Tunze, Mbeya University of Science and Technology, Tanzania

https://orcid.org/0000-0002-7991-9962

## ABSTRACT

A blockchain is an advanced technology that can power over a decentralized network. The authors bring it up to design the autonomous transaction system for e-commerce applications; because of the dramatic increase in IoT devices, communication between physical things is enabled. This brings more efficiency and accuracy, which benefits the outsiders while human interaction reduces. There is a big challenge in data storage after payment in the e-commerce application. Blockchain presents an appropriate platform for the distributed data storage; it also protects the data from outsiders. The authors create blocks that check and record each transaction that took place in the e-commerce application. Blockchain is going to protect the user's privacy from outsiders/banks that are being violated. The authors deliver this research in this paper in terms of the method with detailed design and full implementation. The system captures the user data, processes it, and gives a visual representation of the processed data.

## KEYWORDS

Autonomous, Blockchain, E-Commerce, Management, Transaction Model

*Corresponding Author

## INTRODUCTION

Satoshi Nakamoto, the Bitcoin creator, originally suggested the blockchain idea in 2008, when he launched Bitcoin as a peer-to-peer electronic money system. While the bulk of the technologies discussed in the research work were developed decades before to publication, their unique combination resulted in a solution to the issue of double expenditure, as indicated. In 1983, David Chaum suggested a payment system based on "blind signatures" that would be untraceable. (i.e., concealing the content of a message before signing it). This system operated under the auspices of a centralized authority The notion of blockchain and comparable technologies was largely explored in specialist computer science and cryptography circles in the years after Bitcoin's launch, with little effect on different sectors of the governance. This is similar to the Internet's modest origins in the late 1960s, when the ARPANET, a ground-breaking TCP/IP packet switching network, was founded with the main goal of enabling communication and resource sharing between academic and military groups. Not only did Bitcoin's value and price increase in 2015, but a flood of practitioner-focused papers were also published, highlighting the technology's economic potential. Popular journals such as Nature, Harvard Business Review, and MIT Sloan Management Review immediately cast doubt on blockchain technology's economic viability. Simultaneously, articles and requests for papers examining the economic value that may be created via the use of blockchain technology began to appear in magazines devoted to information systems and business.

Meanwhile, other writers have recommended the blockchain-based research activities in areas such as governance, supply chain management, and the economy and other different sectors, as well as frameworks for differentiating between different levels industries. While the industry's rapid expansion produced unrealistic expectations during the bubble, the desire to identify profitable blockchain use cases has remained persistent. IBM, Maersk, Carrefour, and Walmart are all doing research into blockchain to see if technology can increase transparency, speed up processing, and eliminate paperwork in a sector plagued by fraud and inefficiency. Amazon has filed a patent application for a blockchain-based verification system to certify the legality of consumer goods. Medici Ventures, an Overstock.com subsidiary, invented the blockchain technology. The objective of H. Treiblmaier et al. (2021) is to enable peer-to-peer transactions without the need of massive intermediaries

Another instance is Dubai CommerCity, a $870 million free trade zone devoted to aiding Dubai's transformation into the "happiest city on Earth" via the use of blockchain technology for government efficiency, industrial growth, and global leadership. According to Research and Markets, the global blockchain industry will develop at a 67.3 percent compound annual growth rate (CAGR) from USD 3.0 billion in 2020 to USD 39.7 billion in 2025.According to experts, retail and e-commerce are projected to expand at the fastest rates of all application areas. This trend has been exacerbated by the COVID-19 epidemic, which has resulted in an upsurge in bitcoin transactions during times of disaster.

### E-Commerce and Blockchain

The following sections summarize e-history commerce and highlight some of the most significant research issues that have surfaced. Then, significant advances in blockchain are addressed, some of which even outperform the e-commerce period in terms of expectations and, to a degree, market acceptance. The emphasis of the talk is on the aspects of blockchain that can have a significant effect on e-commerce.

The remaining sections of the manuscript are described as, Section II, tells about the existing techniques on SME Financing, blockchain technology with autonomous transactions. Section III gives idea about the proposed work, system design and system model. Section IV, gives complete insight for the Implementation. Section V, concludes the paper with Conclusion and Future works.

## LITERATURE SURVEY

This section reviews pertinent literature on SME financing, platform operations, and blockchain technology.

### SME Financing

SME finance is a significant source of company capital Wang et al. (2014a), but owing to insufficient financial knowledge, a lack of risk tolerance, and a lack of creative capacity, SMEs face substantial difficulties and expenses in getting financing Xia et al. (2007). Financing problems are now hampering SME expansion. Many studies have proposed new financing methods to solve the current financial crisis, especially in supply chain finance.

The three main financing kinds are accounts receivable, prepayment, and inventory financing Lin et al. (2012a). A business that uses accounts receivable as collateral to get bank loans is called accounts receivable financing. The loan amount is usually between 50 percent and 90 percent of the receivables' face value.

The company sends receivables to the bank and informs the buyer that any arrears must be paid. When a buyer applies to a bank for a short-term loan based on the prepayment generated by the actual trade transaction, this is known as prepayment financing.

With its sales revenue, the lending company pays the bank first. This may help companies overcome the capital constraints they face throughout the acquisition process. Inventory financing refers to a business's utilization of goods stored in a warehouse (typically stipulated by the bank) to secure bank loans. These financing alternatives include companies submitting collateral or invoices to show their ability to repay; financial institutions must examine and keep collateral and bills, putting additional strain on banks and raising SMEs borrowing rates.

Nakamoto originally suggested blockchain, the technology at the core of Bitcoin, in 2008. Encryption algorithms, consensus processes, and smart contracts are among the blockchain's core technologies, ensuring that the system is genuine, secure, transparent, and unforge- able Chen et al. (2017); Harrouz et al. (2017). The features of blockchain technology have led to its use in supply chain management. First, the blockchain's chain architecture guarantees the validity and immutability of data, allowing for transaction traceability.

Lin et al. created a blockchain-based food management program that allowed for accurate commodity tracking while maintaining data privacy.

The origin and planting method of agricultural products are significant variables influencing the price of commodities. They utilized blockchain to record and track all information about agricul- tural goods, thereby eliminating product counterfeiting Xia and Hamdi (2008). Second, encryption reconciles the conflict between the requirement to preserve data privacy and the need to share infor- mation Pun and Hamdi (2002). To make educated choices, nodes on the blockchain may access data from other nodes on the chain, deconstructing the data island and improv- ing information flow. To record and monitor transaction data, Rejeb et al. integrated the Internet of Things with blockchain technology, allowing data sharing and privacy pro- tection. To coordinate commodities shipping and inventory management, Dwivedi et al. suggested a blockchain system.

This system offers precise and reliable data, allowing businesses to make better supply chain choices Wang et al. (2014b). The intelligent contract conducts the transaction automatically based on specified criteria, lowering the cost of human communication, increasing transaction efficiency, and successfully eliminating opportunistic and moral hazards Chan and Hamdi (2003); Rawal et al. (2021).

For countering black-market transactions, Here in this research work, presented Blockchain Technology for Automatic Transactions: a light-weight, autonomous E-commerce transactions and the upgraded administration system by supervised privacy-preserving.

## PROPOSED SYSTEM

The creation of an E-commerce Autonomous Transaction based on BlockChain. It begin by establishing the major design objectives, followed by a discussion of the most common blockchain approaches. Finally, in this manuscript, discuss our proposed framework.

To solve the inefficiencies of IoT E-commerce, in this research contribution, designed a self-contained and lightweight transaction management system. To achieve enhanced transaction speeds and scalability, switch from a one layer blockchain to a multi layered sharding blockchain network, with every tier doing various functions.

Sharding is a commonly used concept that gives the variant of different blockchain network into many levels, each with its own function. Tests have demonstrated that it improves transaction speed and stability while lowering data redundancy. The sharding blockchain technology was used to create this content.

This network architecture adheres to the hierarchical design methodology, which separates the blockchain network into three hierachy, each with its own set of responsibilities. This hierarchical architecture may considerably increase the performance of the blockchain system by classifying jobs and distributing them to the most appropriate employees. As shown in Figure 1, this architecture comprises three levels: transaction, approval, and oversight. The transaction chain and the supervision chain are the two chains that make up the whole blockchain system C. Liu et. al. (2019).

### System Design

The Autonomous Blockchain Technology framework is designed by identifying the primary design goals and then discussing the primary techniques deployed in a blockchain context. Finally, here in this research, describe the characteristics of the proposed architecture:

- Capacity to monitor while preserving privacy, as well as the ability to apprehend offenders.
- Transaction efficiency and data integrity.
- The blockchain network's sharding architecture ensures data integrity and transaction efficiency. Transaction monitoring is ensured via the system in combination with the Digital ID.
- E-smart contracts (or E-contracts for short) are intended to ensure self-management of transactions and enforced execution.

Figure 1. Architecture
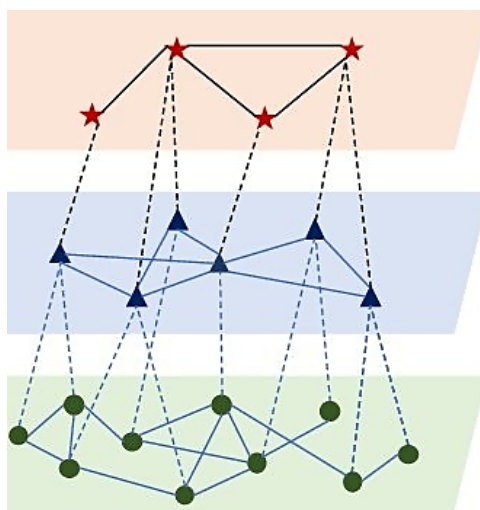
## Design of Layered Method

The sharding network is made up of multiple levels. As a consequence, each layer should have its own chain for storing certain data kinds. In this research manuscript, look at a transaction chain, which is communal by the transaction and approval layers for recording transaction accounts, as well as a supervision chain for keeping track of all searches and surveillance activities, in this article.

In aggregate, these chains ensure the integrity and non-reputability of all transactions while also prohibiting supervisors from misusing their power.

Figure 2 shows specific activities that are done by each module. It describes the application, features, date transformation and saves it into the blockchain.

Figure 3 describes the collaborations in the application where the process is going and how data will add to the chain.

In our sequence diagram (see Figure 4) specifying processes operate the one another and in order.

It describes the use cases of every module and who is accessing those use cases (see Figure 5).

The main building element of object-oriented modeling is the diagram shown in Figure 6. It is used for both broad conceptual system to application modeling and specific modeling transactions for the model into programming code.

## DataFlow Diagram

See Figures 7-9.

**Figure 2. Activity diagram**
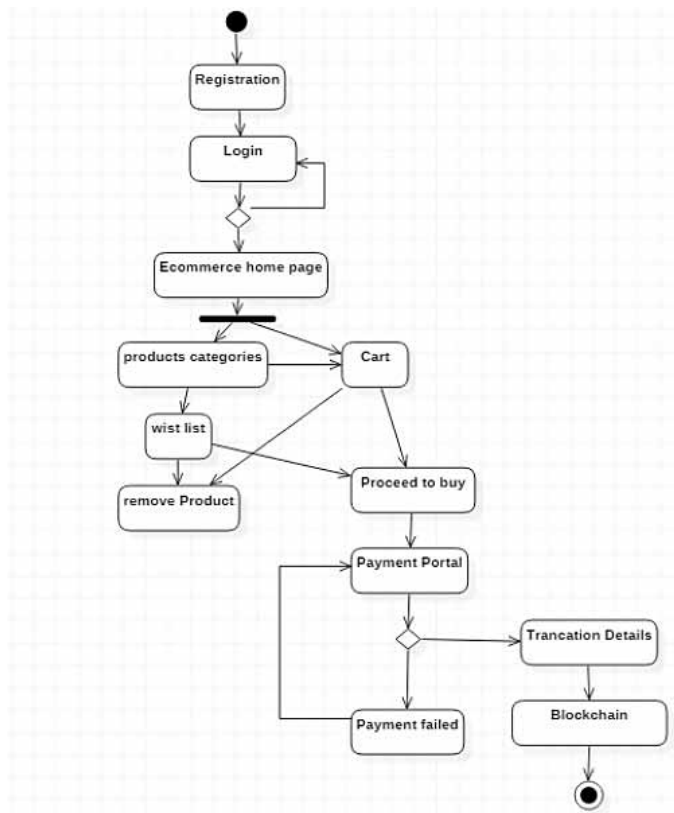
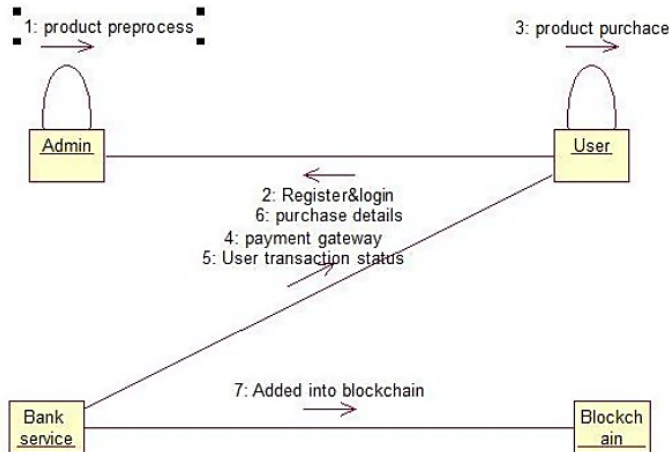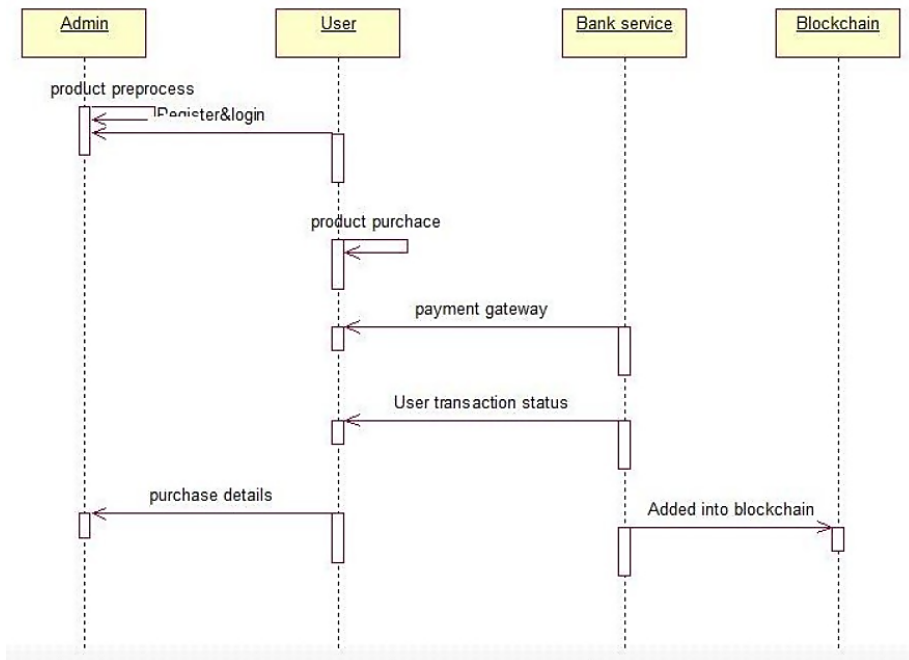**Figure 3. Collaboration diagram**



**Figure 4. Sequence diagram**



## MODULES AND IMPLEMENTATION

### E-Commerce Application

In this module, it build a basic infrastructure to highlight the expected benefits of adopting blockchain for increased security and legality. In this research, have a propensity towards creating user-to-user e-commerce transactions here. When individuals transact with one another, a hypothetical e-commerce store is formed. Users' monetary transactions were first saved in a highly informative manner. Here,

**Figure 5. Usecase diagram**
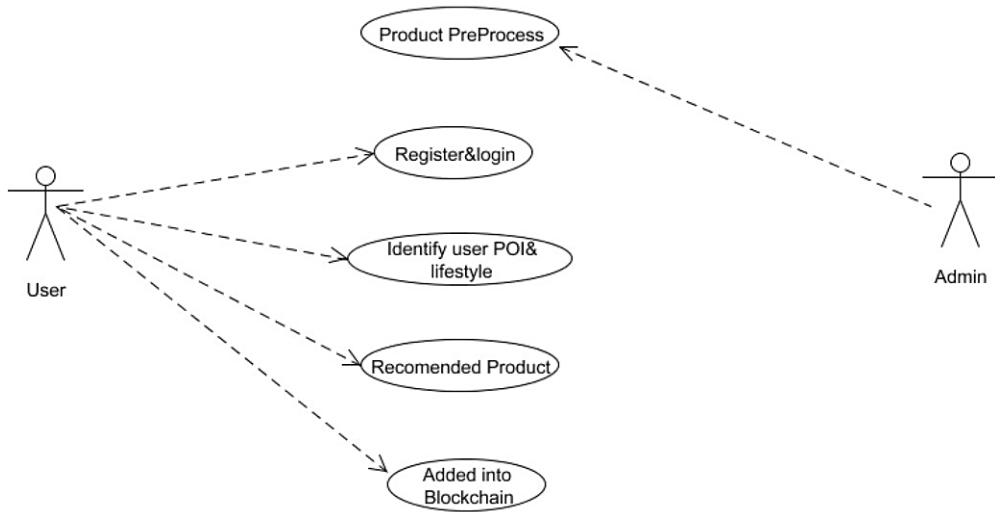


**Figure 6. Class diagram**
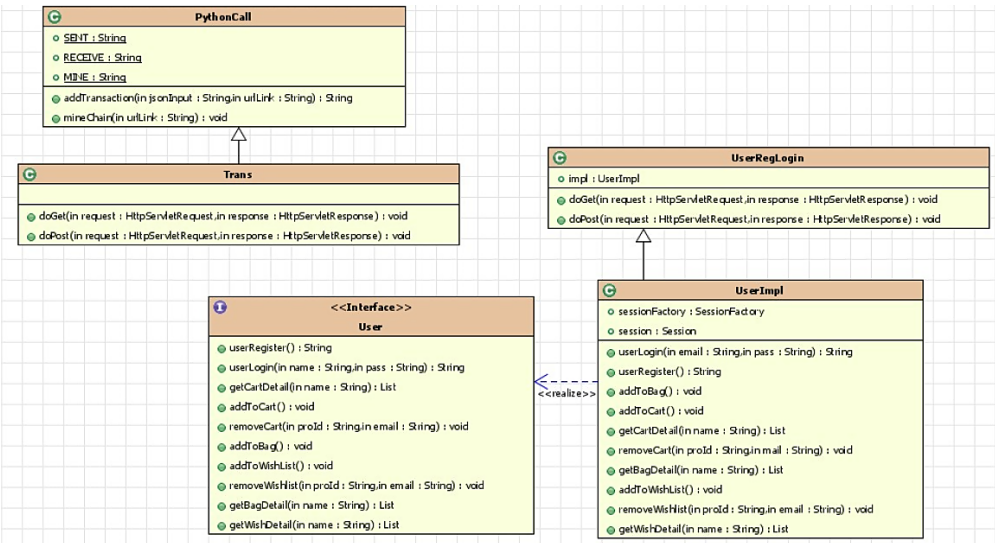


working on a fully functioning e-commerce website with product listings, user registration, and a purchasing cart.

## Payment Transaction Gateway

E-commerce transactions are incomplete without establishing monetary transactions—the act of two consumers completing a financial transaction. The creation of electronic contracts between two parties is the starting point for transactions. When each side completes a financial transaction, the contract is officially completed. The bank should be included in all financial transactions. The bank should be able to track where the money was moved without jeopardizing the user's privacy. This transaction will be carried out at a later point in the chain.

**Figure 7. Dataflow diagram – Level 0**
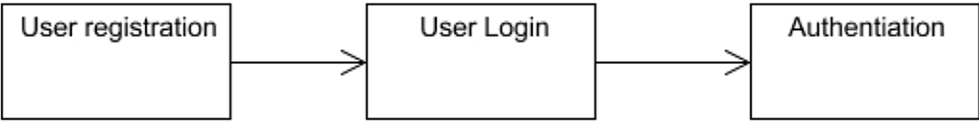


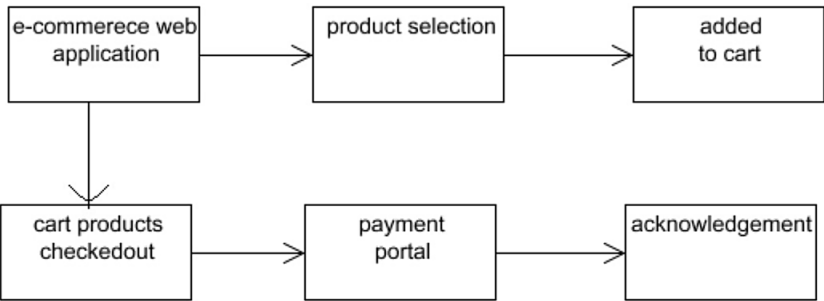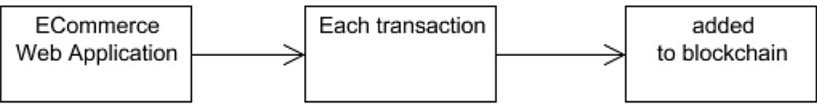**Figure 8. Dataflow diagram – Level 1**



**Figure 9. Dataflow diagram – Level 2**



## BlockChain Implementation of Transaction

A blockchain is a kind of secure storage technology that enables data to be stored safely. A block in the chain controls each group activity. A genesis block is the first block in a blockchain. Each chain is linked to the block before it. The digital identity of the previous block is contained inside the current block. Python is a language that is built on the concept of a blockchain. It is possible to display, list, and chain a block. The program will contain a block that will be chained based on a set of criteria. The business group plans to use a blockchain to safeguard it.

## Authorization Through BlockChain

The blockchain has several layers of security built-in. Blockchain technology is used to keep track of the activities of a corporate organization. This joint effort does not include the Bank. The source and destination banks for each group activity are recorded in the IoT-based blockchain server. The Raspberry Pi, a tiny low-power computer, is utilized to build a blockchain in the IoT device. The Raspberry Pi is a popular setting for launching IoT-based apps because of its tiny form size and ability to build in advanced programming languages. On the Raspberry Pi, Python is installed, and the blockchain is enforced. The bank information connected with the business group activity is kept in the blockchain as a secure and sophisticated layer.

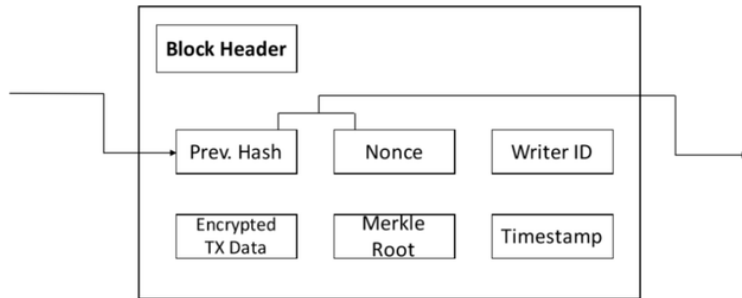Figure 10. Transaction chain structure



Figure 11. Blockchain implementation



## IMPLEMENTATION AND RESULTS

Chain has a linked list whose node contains the below attributes:

- **Block variety:** A sequence variety assigned to the block.
- **Nonce:** Generating Hash value starts with 4 zero is called mining.
- **Knowledge:** The particular user knowledge related to the block.
- **Hash:** Current block's Hash price (generated mistreatment SHA-256). All the attributes excluding Hash, e.g. Block #, Nonce, data, to calculate the Hash of this block.

Transaction data is saved into the blockchain and it save in the blocks format.

## CONCLUSION AND FUTURE WORK

The Blockchain-based E-commerce Transaction, a normalized autonomous group action settlement mechanism for IoT-based e-commerce, was introduced in this study. The Intelligent Multilayer sharding blockchain network design. Here in this research, propose at the start is our significant contribution to this paper. Then, the manuscript created a novel localized cryptosystem and show that it is resistant to ciphertext assaults, cryptography, and collusion. Finally, in this research contribution, have a track record of developing completely autonomous group action resolution systems designs.
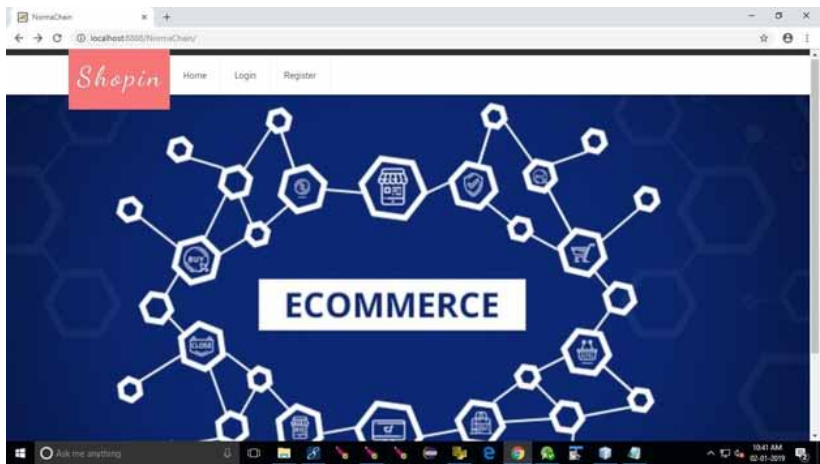
**Figure 12. E-commerce homepage**
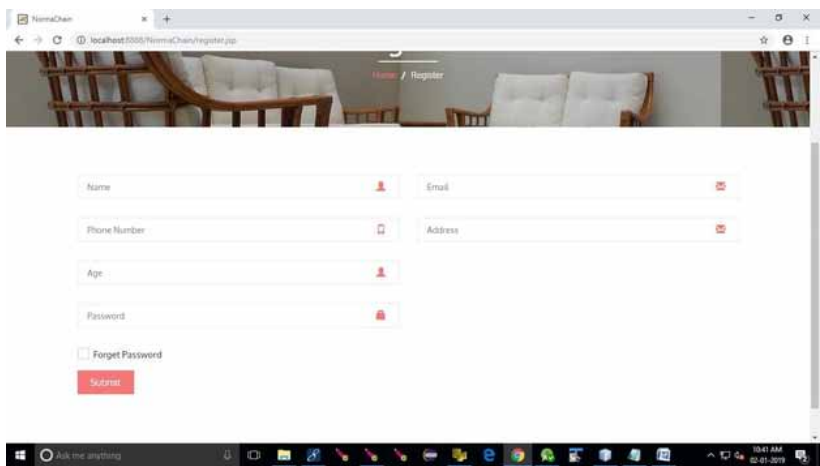


**Figure 13. Product checkout**



**Figure 14. Bank Server Operation 1**

**Figure 15. Bank Server Operation 2**



**Figure 16. Bank Server Operation 3**



**Figure 17. Payment module operation 1**

**Figure 18. Transaction status**
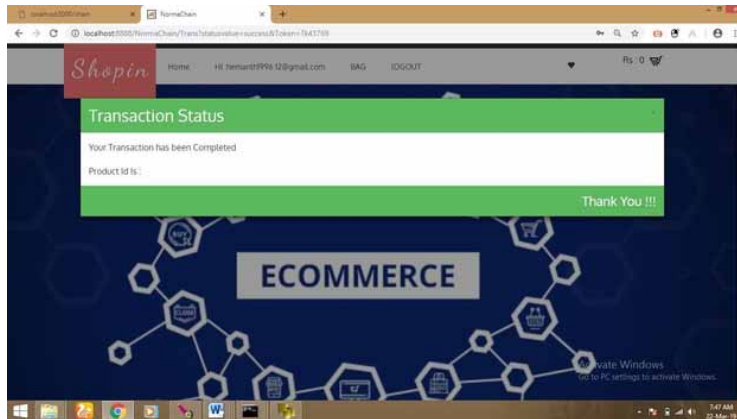


**Figure 19. Data processed**
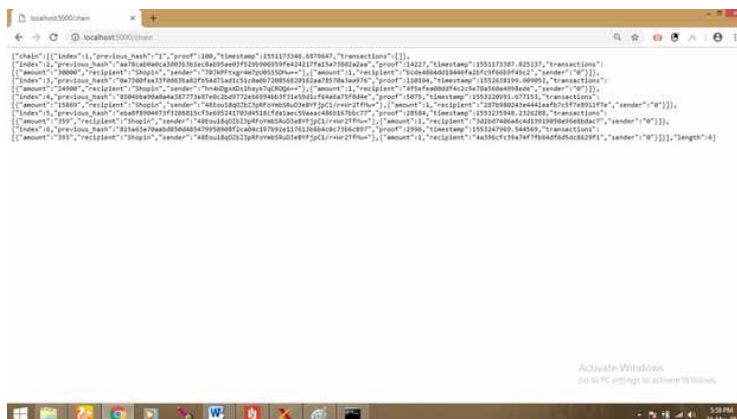


Experiments shows that our technology is effective at coordinating group activities and performing extrajudicial criminal keyword searches while maintaining privacy. In this research work, updating the operating system on the e-commerce website, which will cause faster transactions and including swiping transactions to the blockchain (i.e., the Raspberry pi tool will attach to the system). The system will be more secure with these in place. The research contributions are resolving issues with performance. The system will be expanded with new products.

## FUNDING AGENCY

# REFERENCES

Bourouis, S., Band, S. S., Mosavi, A., Agrawal, S., & Hamdi, M. (2022). Meta-Heuristic Algorithm-Tuned Neural Network for Breast Cancer Diagnosis Using Ultrasound Images. *Frontiers in Oncology*, *12*, 834028.

Dhanaraj, R. K., Ramakrishnan, V., Poongodi, M., Krishnasamy, L., Hamdi, M., Kotecha, K., & Vijayakumar, V. (2021). Random Forest Bagging and X-Means Clustered Antipattern Detection from SQL Query Log for Accessing Secure Mobile Data. *Wireless Communications and Mobile Computing*, 2021.

Dhiman, P., Kukreja, V., Manoharan, P., Kaur, A., Kamruzzaman, M. M., Dhaou, I. B., & Iwendi, C. (2022). A Novel Deep Learning Model for Detection of Severity Level of the Disease in Citrus Fruits. *Electronics (Basel)*, *11*(3), 495.

Hamdi, M., Bourouis, S., Rastislav, K., & Mohmed, F. (2022). Evaluation of Neuro Image for the Diagnosis of Alzhimer's Disease Using Deep Learning Neural Network. *Frontiers in Public Health*, 35.

Lilhore, U. K., Poongodi, M., Kaur, A., Simaiya, S., Algarni, A. D., Elmannai, H., & Hamdi, M. et al. (2022). Hybrid Model for Detection of Cervical Cancer Using Causal Analysis and Machine Learning Techniques. *Computational and Mathematical Methods in Medicine*, 2022.

Maurya, S., Joseph, S., Asokan, A., Algethami, A. A., Hamdi, M., & Rauf, H. T. (2021). Federated transfer learning for authentication and privacy preservation using novel supportive twin delayed DDPG (S-TD3) algorithm for IIoT. *Sensors (Basel)*, *21*(23), 7793.

Muniyappan, A., Sundarappan, B., Manoharan, P., Hamdi, M., Raahemifar, K., Bourouis, S., & Varadarajan, V. (2022). Stability and numerical solutions of second wave mathematical modeling on covid-19 and omicron outbreak strategy of pandemic: Analytical and error analysis of approximate series solutions by using hpm. *Mathematics*, *10*(3), 343.

Poongodi, M., Bourouis, S., Ahmed, A. N., Vijayaragavan, M., Venkatesan, K. G. S., Alhakami, W., & Hamdi, M. (2022). A Novel Secured Multi-Access Edge Computing based VANET with Neuro fuzzy systems based Blockchain Framework. *Computer Communications*.

Poongodi, M., Hamdi, M., Gao, J., & Rauf, H. T. (2021, December). A Novel Security Mechanism of 6G for IMD using Authentication and Key Agreement Scheme. In 2021 IEEE Globecom Workshops (GC Wkshps) (pp. 1-6). IEEE.

Poongodi, M., Hamdi, M., Malviya, M., Sharma, A., Dhiman, G., & Vimal, S. (2022). Diagnosis and combating COVID-19 using wearable Oura smart ring with deep learning methods. *Personal and Ubiquitous Computing*, *26*(1), 25–35.

Poongodi, M., Hamdi, M., Sharma, A., Ma, M., & Singh, P. K. (2019). DDoS detection mechanism using trust-based evaluation system in VANET. *IEEE Access : Practical Innovations, Open Solutions*, *7*, 183532–183544.

Poongodi, M., Hamdi, M., Varadarajan, V., Rawal, B. S., & Maode, M. (2020, July). Building an authentic and ethical keyword search by applying decentralised (Blockchain) verification. In IEEE INFOCOM 2020-IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS) (pp. 746-753). IEEE.

Poongodi, M., Hamdi, M., & Wang, H. (2022). Image and audio caps: Automated captioning of background sounds and images using deep learning. *Multimedia Systems*, 1–9.

Poongodi, M., Malviya, M., Hamdi, M., Rauf, H. T., Kadry, S., & Thinnukool, O. (2021). The recent technologies to curb the second-wave of COVID-19 pandemic. *IEEE Access : Practical Innovations, Open Solutions*, *9*, 97906–97928.

Poongodi, M., Malviya, M., Hamdi, M., Vijayakumar, V., Mohammed, M. A., Rauf, H. T., & Al-Dhlan, K. A. (2022). 5G based Blockchain network for authentic and ethical keyword search engine. *IET Communications*, *16*(5), 442–448.

Poongodi, M., Malviya, M., Kumar, C., Hamdi, M., Vijayakumar, V., Nebhen, J., & Alyamani, H. (2022). New York City taxi trip duration prediction using MLP and XGBoost. *International Journal of System Assurance Engineering and Management*, *13*(1), 16–27.

Poongodi, M., Nguyen, T. N., Hamdi, M., & Cengiz, K. (2021). Global cryptocurrency trend prediction using social media. *Information Processing & Management*, *58*(6), 102708.

Poongodi, M., Sharma, A., Hamdi, M., Maode, M., & Chilamkurti, N. (2021). Smart healthcare in smart cities: Wireless patient monitoring system using IoT. *The Journal of Supercomputing*, *77*(11), 12230–12255.

Poongodi, M., Vijayakumar, V., Al-Turjman, F., Hamdi, M., & Ma, M. (2019). Intrusion prevention system for DDoS attack on VANET with reCAPTCHA controller using information based metrics. *IEEE Access : Practical Innovations, Open Solutions*, *7*, 158481–158491.

Ramesh, T. R., Lilhore, U. K., Poongodi, M., Simaiya, S., Kaur, A., & Hamdi, M. (2022). PREDICTIVE ANALYSIS OF HEART DISEASES WITH MACHINE LEARNING APPROACHES. *Malaysian Journal of Computer Science*, 132–148.

Ramesh, T. R., Vijayaragavan, M., Poongodi, M., Hamdi, M., Wang, H., & Bourouis, S. (2022). *Peer-to-peer trust management in intelligent transportation system: An Aumann's agreement theorem based approach*. ICT Express.

Rathore, M. S., Poongodi, M., Saurabh, P., Lilhore, U. K., Bourouis, S., Alhakami, W., & Hamdi, M. et al. (2022). A novel trust-based security and privacy model for Internet of Vehicles using encryption and steganography. *Computers & Electrical Engineering*, *102*, 108205.

Rawal, B. S., Manogaran, G., & Hamdi, M. (2021). Multi-Tier Stack of Block Chain with Proxy Re-Encryption Method Scheme on the Internet of Things Platform. *ACM Transactions on Internet Technology*, *22*(2), 1–20.

Rawal, B. S., Manogaran, G., & Poongodi, M. (2022). Implementing and Leveraging Blockchain Programming.

Rawal, B. S., Manogaran, G., Singh, R., Poongodi, M., & Hamdi, M. (2021, June). Network augmentation by dynamically splitting the switching function in SDN. In 2021 IEEE International Conference on Communications Workshops (ICC Workshops) (pp. 1-6). IEEE.

Sahoo, S. K., Mudligiriyappa, N., Algethami, A. A., Manoharan, P., Hamdi, M., & Raahemifar, K. (2022). Intelligent Trust-Based Utility and Reusability Model: Enhanced Security Using Unmanned Aerial Vehicles on Sensor Nodes. *Applied Sciences (Basel, Switzerland)*, *12*(3), 1317.