ISSN 2347 - 3983
Volume 9. No. 7, July 2021
International Journal of Emerging Trends in Engineering Research
Available Online at http://www.warse.org/IJETER/static/pdf/file/ijeter21972021.pdf
https://doi.org/10.30534/ijeter/2021/21972021

# Cyber Security Intelligence and Ethereum Blockchain Technology for E-commerce

**Mujeeb-ur-Rehman[1], Abdullah Lakhan[2], Zahoor Hussain[3], Fida Hussain Khoso[4], Aijaz Ahmed Arain[5]**
[1,2]Benazir Bhutto Shaheed University Lyari Karachi, Sindh, Pakistan, mujeebshaikh137@gmail.com, abdullahrazalakhan@gmail.com
[3]Computing Department FCIT, Indus University Karachi Pakistan, Email:zahoor.shah@indus.edu.pk
[4]Dept. of Basic Science, Dawood University of Engineering & Technology Karachi, Sindh, Pakistan, fidahussain.khoso@duet.edu.pk
[5]Deptt.of Computer Science, Quaid-e-Awam University of Engineering, Science &Technology Nawabshah, Pakistan, aijaz@quest.edu.pk

**ABSTRACT**

The days, the usage of E-commerce applications in the distributed network has been increasing progressively. These applications bring many advantages such as online shopping from different places. For the sake of simplicity, offloading data of applications from user devices to servers lead to many research challenges. This paper devises a novel blockchain-enabled system for E-commerce applications. The network consists of ethereum nodes that can implement symmetric security to provide valid and secure hashing of data in distributed computing. The simulation results show that the proposed blockchain-enabled system outperforms all existing systems in terms of security

**Key words:** Blockchain, Data, System, Offloading, Application

## 1. INTRODUCTION

### 1.1 E-commerce

The E-commerce has highlighted factors for its popularity like high goods and products, smart transactions and much more relatable services where
some of fields [1] are needed to discuss to cater any request like, generated ID's, location and even phone numbers which may tends towards privacy issue specially for comments section under any product. Here it can be a challenging to threaten any customer
for their delivered reviews against products. To control such activities [12] we have different technologies and blockchain is one of them to ensure privacy of customers for their product reviews and e-payment details.

### 1.2 Blockchain technology

It is distributed inflexible ledger which supports system for keeping records, transactions and tracking resources in network where each node is connected with each other and every node is called as a block. Blockchain is an ideal for information as it supports [15] frequent, distributed and clear delivery of information stored on inflexible ledger which is only available by permissioned network members. As name reflects [8][12][16] Blockchain is consisting on blocks ("digital pieces of information") and chain ("stored in a public database") with involvement of cryptography every block is linked with each other for data security, entered data cannot be amend in block.

### 1.3 Cryptography

A method of storing and transmitting data in a specific way where only reliant can read and process. Cryptography is associated with the way toward altering over familiar plain content into invisible content and the other way around. It is a [17] technique for putting away and meet up information in a particular structure so just those for whom it is expected can examine and handle it. Cryptography shields information from stealing or modification, yet can likewise be utilized for client verification.

In cryptography, we start with the decoded information, mention to as plaintext. Plaintext is scrambled into figure text, which will thusly (for the most part) be decoded once again into usable plaintext. The encryption and decoding influenced by on the sort of cryptography work together being utilized and some type of key.

**1.4 Cryptocurrency** A digital payment system built using Blockchain technology where transactions occur without involving banks as anyone can send and receive money digitally other than carrying physically. This transaction takes place in a public ledger and entries are carried on an online database.

### 1.5 Current Payment Systems

Any electronic devices like, computer, phone, printer and many other are connected through internet are nodes, to ensure the security of blockchain in different fields we have focused on banking sector where offered services like bill payment, fund transfer, account information (personal details) is frequently accessed which needs to be secured, the main idea to state this problem is security, here each of the transaction will be stored in blocks without involvement of third parties. In addition to discuss contemporary payment systems, it is basically to reduce banking procedures and to facilitate community with ease and

comfort. In the year of 2008 *PRISM Pakistan Real-Time Interbank Settlement System* retained by State Bank of Pakistan which was deliberated to reconcile the *large-value payments*. Whereas Retail Payment System (RPS) embrace the outmoded as well as present with dealing of both cheque and cash, these said mode of payments can be dealt for fund transfer. Communal payment methods like Digital cash [2] which required *digital wallet* from where cash is withdrawn in counter to any purchase instantly and the said method does not need and personal identity. In addition with credit cards which only work for pre-defined limits on payment. There holder may purchase any of desired item. To deal such conditions ratio of interest is also implicit on transactions for extension of time length, the limit is set to provide customers comfort for their done transactions. Electronic fund transfer occurs between seller and buyer in terms of fund transfers where the transaction take place with digits or number of series mentioned on cheques. These all transactions proceed under Automated Clearing House (ACH). Other payment methods for E-commerce [19] like U.S postal service, American Express, Western Union, such methods can make payment easy for receivers.

To indulge multiple third parties can be reason of risk with failed transaction status in current payment system, hence the security element [20] is very essential for satisfaction of customers and the loss of trust leading for customer information and money shared among organization and customer can impact negative throughout. In addition, we can fix these problems and improve our financial system blockchain technology is quite trending for creating decentralized applications. To plant [19] trending technology will boost payment methods for any done transaction. In sight of Ethereum [8] which directs for creation of contracts at public network that each single entity can view transaction instead of concerned people.

We discuss several payment systems used worldwide in the light of blockchain technology, which carries different forms of transactions in the form of secured blocks where each of previous hash value is furthered in new block.

## 2. RELATED WORK

### 2.1 E-commerce payments

A. Yadav et.al. [3] propose the work for food court where they divided the menu list in different sections for the ease of customers where they can choose items of their choice, this procedure will place orders in a cart and amount will be raised against such orders, here payments are made with generated token with blockchain technology. the ordering system has division on three segments like money collector web app, shopkeeper web app and customer mobile app. The use of blockchain technology is used to store transactions in the form of blocks over hash pointers.

For attempted transaction. Zurich's Falcon [6] private bank is the first bank which offers crypto currency by blockchain asset management service for clients, our recommended system will roof banking sector where role of banker will be replaced with token generated by [21] initial transaction to measure security for personal details, fund transfer, account statement, amount deposit and withdrawal, investment, managing cards and balance enquiry. The main contribution of this research includes:

- We conducted appraisal on numerous e-commerce websites to analyze different payment methods offered on their products delivery.
- We improve detailed discussion on blockchain and its corresponding technologies, like IPFS, smart contracts and Ethereum.

Previously transaction was taking place physically where the risk for fraud in ledger was high but blockchain technology deals such concern on ease where each information is stored on blocks and these blocks are connected with eachother by client program. In addition S. Sakho et.al [6] depict a system that grant customers to make transactions possible among them, their entered information is stored in registers and banks can review all entered details, the proposed approach is under consensus algorithm through which banks can save the amount instead of utilizing it. Researcher has emit bank transactions at easiest, fastest and cheaper way without indunging third parties but keeping records in blckchain technology and the token can be used for destination tracing. Security is always seen as basic requirement for any organization. Cashless payments [4] like cards are reinstating the amount use in transactions and the ratio of using it is much higher than any debit and credit cards. Adoption of such payment method is beneficial for society that's why its incremental ratio is between 70-100% with reference to debit and credit card they have range within 20%.Moreover today's banks are offering major online services [6] these online services take place among different account holders which can held between domestic and international banking where bank are linked without any involvement of third parties for currencies and financial institutes. To improve data security, user's and transaction information blockchain is a new and top prior technology which directs [7] privacy building for decentralized payment system hence the proposed result like Monero and Zerocash is oppressed for completely centralized anonymous payment such as money laundering activities. In the time of blockchain technology many other researchers have put their contributions as [3] record keeping for restaurants like menu and order placement. The blockchain technology is an arrangement of sequential records associated with nodes. The study [1] and [14] suggested distributed ledger database for durable record tracking within parties, however blockchain has an appealing consideration in different areas due to its uncommon structure. In addition [2] active and protected payment used in education is proposed with crypto-asset for massive open online courses (MOOC) environment where researcher has presented multi-party business model on permissioned blockchain, furthermore the concept of this blockchain technology is highly developed in terms of security and privacy, Today's organizations and institutes are more reliant for security purpose and blockchain technology is offering such features amongst all said areas.

Hence its reflections is forwarded day by day for domestic and international levels for various fields such as[2], [3], [4], [6], [7] and [9] an electronic payment systems for food court, banking transactions, social networks, education and many more. Although as per earlier research [1] stemming of such payments is still ambiguous for recent state of the art blockchain technology for feasible snags and limitations. Apart from blockchain technology, [5] internet of things is the dominant technology for development of user affectionate device for dealing of important activities here concerned devices can get disturbed with external attacks, to make sure these attacks blockchain Is needed for application of worthy security doors for peer to peer connection.

Cryptocurrency [6] is universal expanse currency used in interbank not for payment currency. It has been [9] basic blockchain application and projects [2] like Ethereum (ETH), Ripple (XRP), EOS, the dependency of these cryptocurrencies are on public blockchain which in no involvement of any credible authority. The two factors for dependency of cryptocurrency are supply and demand in market of digital currency. Blockchain technology [10] yields possible results for financial incorporation.

## 3 .RESEARCH GAP (PROBLEM STATEMENT)

Corporation have remarkable features to enhance customer's facility, the inspiration of work is based on security of customer within financial organization here the role of financial institutes is leading, we aim to propose a method under Blockchain technology using Ethereum and make sure to each of transactions will be secured while containing timestamp, and past record hashes. The prevailing system is an active for hackers where they can breach though proposed approach we can work exceptionally where each history will be associated with cryptography cooperation and each block will be secured through generated protocols.

## 4. PROPOSED SOLUTION & ITS JUSTIFICATION

This section will present Ethereum Blockchain which provides end-to-end security, it is used to run decentralized digital application which empower users for direct agreements, and transactions to buy, sell, and trade goods without involving third party. To sidestep related organization for any transaction and creating personal crowd source instead of running crowded sites. Ethereum promote network of computers which act as supercomputers and it is second-largest cryptocurrency supporting platform after Bitcoin.

### 4.1 Smart Contracts

Smart contracts are code sequencing which perform at the time of meeting pre-defined terms and conditions. Smart contracts are highly credible for business collaborations to carry out certain types of agreements without emissary involvement

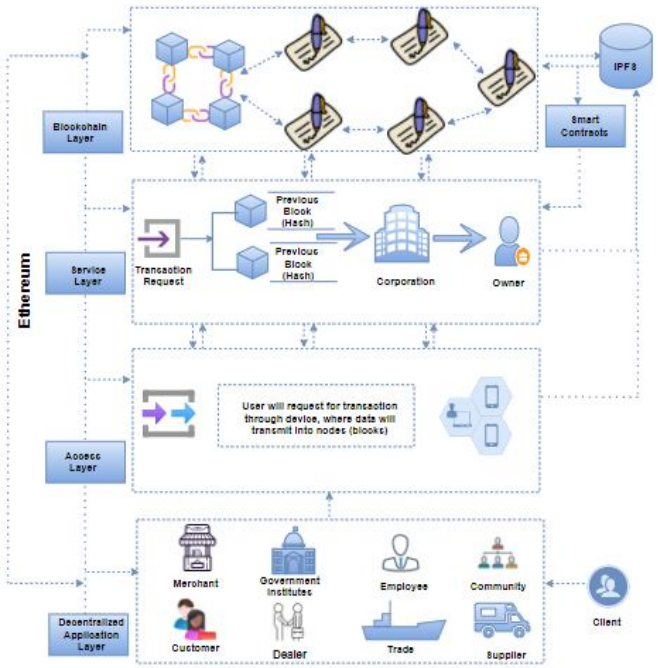


**Figure 1** Blockchain based framework for e-payment using Ethereum

### 4.2 Secure e-payments

The prime impartial of the projected structural design is to allow secure e-payments. We contemplate the picture where we have use Ethereum on cyber security. To promote cyber security we have created security and privacy layer which holds all sensitive data and store in file. The said security and privacy layer has further secured software and application layer along with system security which keeps data more strict within blocks. It is a network composed of nodes [8] which resist unwanted activities and contain auditable record for all transactions on network. This allow users to do task like money transfer, buying and selling, and much more.

The proposed method is consisting on four layers where each of layer performs action.

### 4.3 Blockchain Layer

Blockchain layer where smart contracts take place between customer and merchant with duly discussed agreements and the data like personal ID's, name, address, location, and contact number, these information will be saved in IPFS.

### 4.4. Service Layer

Service layer as name reflects, service layer display the route of transactions among consumer and corporation. When a consumer ask for any query, or put a transaction request the entire process will go under blocks and each next block will carry the information of previous block, this manner a sequence of blocks will be created and we named as blockchain transactions, this technology seems much efficient in terms of privacy as it will be too tough for hackers to attack on sensitive information though the information is divided into chunks we called blocks, these blocks are paying leading role to transact any transactions.

### 4.5 Access Layer

Access layer which actually depicts the flow of transaction or requested put by any customer and here devices are dealt as a source of transformation. Customer may use any of the device to access E-Commerce for their desired goods and products and those payment transactions will made through application accessed on device.

### 4.6 Decentralized Application Layer (DApp)

Decentralized Application Layer (DApp Layer) is created to make sure the stack holders who can be beneficent like merchants, government Institutes, employee, community, customer, dealer, trades, and supplier. These all above designed layers are directly connected to the Ethereum and these all layers are possible and working for proposed solution which is Ethereum.

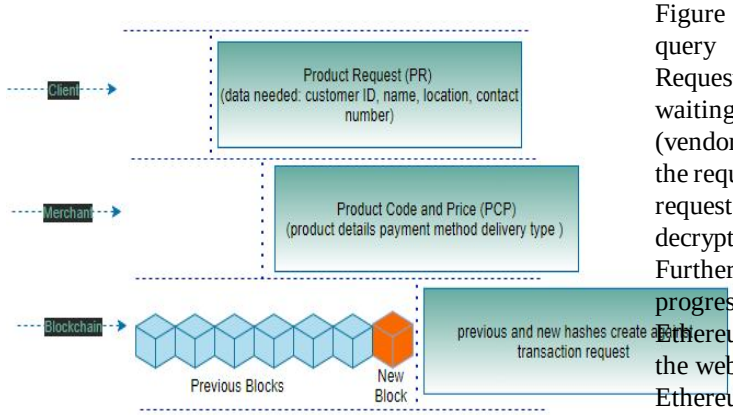


**Figure 2** Payment system architecture for e-commerce

The procedure of entering request on any platform where basic information is needed to carry an enquiry against any product like customer's ID, name, location, and contact number to access details of customer and make delivery easy and comfortable from beneficiary. Here the figure 2 depicts three different stages where each of stage is representing a complete picture. For request entry from client is displayed on stage one and the working on request generated at stage-1 is carried on stage-2 on merchant level here product details are maintained with their product code and price. Customer will choose product according to price and will move for further procedure like payment method, client can get different payment methods to carry forward his/her product steps. On stage-3 we can see the number of blocks generated at each transaction and carrying pervious hash values to make this transaction more secure.

The delination from figure 3 is based on vendor and beneficiary where vendor can send request for its products which is forwarded in hashes and can be encrypted to make request more private, here a passcode is generated which holds a series combination of alphabets, digits and special characters. This generated code is further proceed for request verication code (RVc).

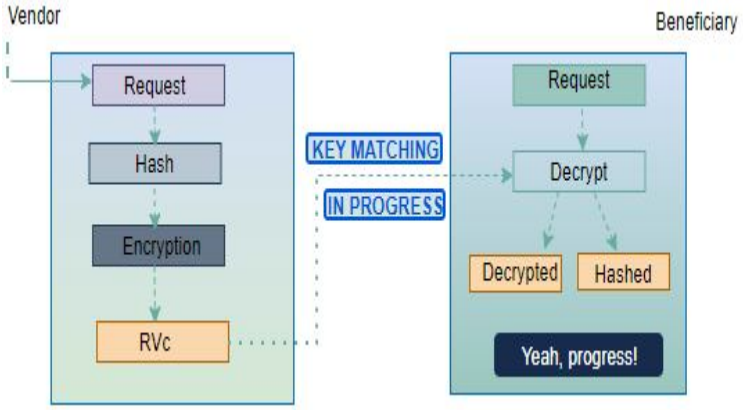


Figure 3 RVc: Request Verification code against product query

Request verification code is a phase where a beneficiar is waiting for approval as it verifies the code on both sides (vendor and beneficiar) untill the code is not varified we call it the request is in progress status as far as the code I svariied the request is moved on its access, here the code is decrypt and decrypted or may get a hashed to complete the procedure. Furthermore the code is varified, it dispays a result yeah progress.

Ethereum offers an interface with the Ethereum network in the web3.js API for developers where apps are interpreted by Ethereum network and transactions can be submitted on its network In order for a transaction, when amount is transferred to the node processing. The apes file is an application format where we have shared e-payment security contract. An application frontend is developed under HTML where users can get input for their desired requirement like fund transfer, money withdrawal, money deposit etc. And the role of cyber security in proposed technique is intended by blocks protocols. These protocols will be generated on each block when request is engendered by user, so the encrypted request will proceed in the form of protected blocks here the said protocols are actually ether, ether will hold random series of mixed numbers made at each request. This random number series will have extension of previous passcodes so organizations can keep tracking the record for spawned request. The main motive of this advancement is to prevent attacks from outsource and provide an approach which can secure data.

### 4.7 System Plan

The blockchain e-commerce secure payment system is comprised on merchant, customer, dealer employee, trades, supplier and community. Blockchain operates as a distributed computing system in orders of magnitude. The maintenance of node communication and truth within faults is basically consensus. It owns steady replicas of all the nodes.

## 5. SIMULATION AND RESULTS

The results are carried in sequence diagrams where figure 4 represents the complete cycle of payment within blockchain technology where the role of each layer is clear like for client, e-commerce, merchant, e-payment, and blockchain. The sequence diagram actually follows the flow of research area that we made in this paper.

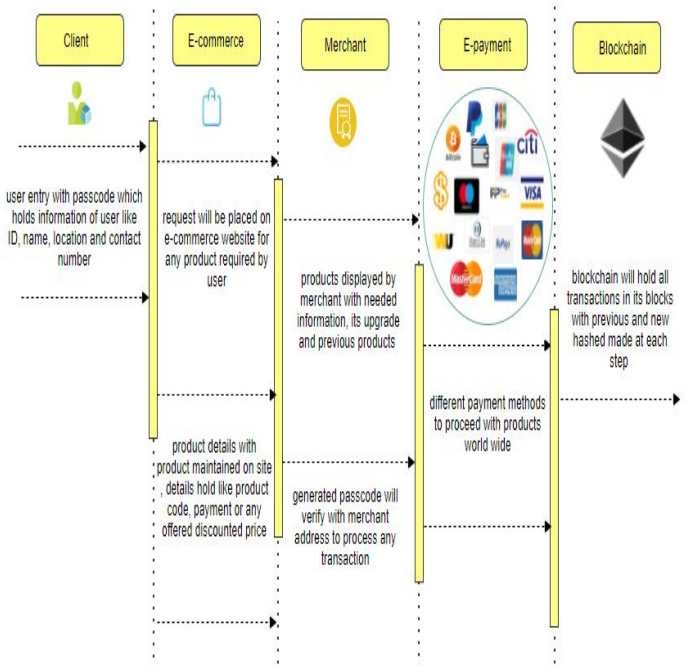


**Figure 4** Sequence diagram of e-commerce payment system in blockchain

Figure 5 shows the complete transactions steps which are taken to proceed any product. The payment measures which we made in our research are Product Enquiry (PE), Payment, Account Details (AD) and Status.

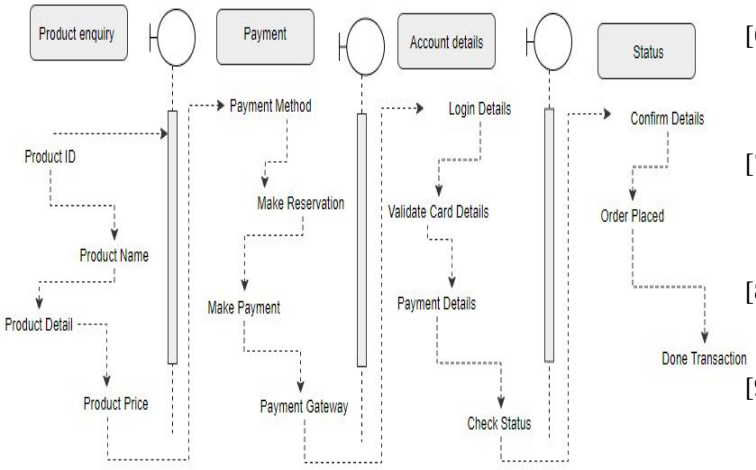


Figure 5 Sequence diagram for e-payment

## 6. CONCLUSION

This paper addresses the privacy concern taken while acting transaction in e-commerce for e-payment systems, such entities which are highlighted in this research are user's ID, name, address and location. We designed secure e-payment model for e-commerce by using Blockchain technology. The user's information is protected by hash strings. We presented the secure e-payment system for e-commerce where user's identity is protected through hashes. In addition we can increase privacy by adding security level on each transaction, and hide their shared personal details for any product. The proposed system is well implicit in the area of e-commerce where the number of users are rapid and their input information is sensitive data. We assure a healthy e-payment system to meet all the weaknesses of current systems.

## REFERENCES

[1] Z. Bezhovski, "The Future of the Mobile Payment as Electronic Payment System," Eur. J. Bus. Manag., 2016.

[2] W. Kersten, T. Blecker, C. M. Ringle, N. Hackius, and M. Petersen, "Digitalization in Supply Chain Management and Logistics Blockchain in Logistics and Supply Chain: Trick or Treat? Blockchain in Logistics and Supply Chain: Trick or Treat?," *Proc. Hambg. Int. Conf. Logist.*, 2017.

[3] T. Oliveira, M. Thomas, G. Baptista, and F. Campos, "Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology," *Comput. Human Behav.*, 2016, doi: 10.1016/j.chb.2016.03.030.

[4] D. Haryadi, Harisno, V. H. Kusumawardhana, and H. L. H. S. Warnars, "The Implementation of E-money in Mobile Phone: A Case Study at PT Bank KEB Hana," 2019, doi: 10.1109/INAPR.2018.8627055.

[5] A. Shandilya, H. Gupta, and S. K. Khatri, "Role and Aplications of Iot in Online Transactions using Blockchain Technology," 2018, doi: 10.1109/ICACCE.2018.8441735.

[6] S. Sakho, Z. Jianbiao, F. Essaf, and K. Badiss, "Improving Banking Transactions Using Blockchain Technology," 2019, doi: 10.1109/ICCC47050.2019.9064344.

[7] S. Chakraborty, S. Aich, and H. C. Kim, "A Secure Healthcare System Design Framework using Blockchain Technology," 2019, doi: 10.23919/ICACT.2019.8701983.

[8] ENISA, "Distributed Ledger Technology & Cybersecurity Improving information security in the financial sector," 2016.

[9] S. Kamble, A. Gunasekaran, and H. Arha, "Understanding the Blockchain technology adoption in supply chains-Indian context," *Int. J. Prod. Res.*, 2019, doi: 10.1080/00207543.2018.1518610.

[10] S. Tanwar, K. Parekh, and skewnessawaeR. Evans, "Blockchain-based electronic healthcare record system for healthcare 4.0 applications," *J. Inf. Secur. Appl.*, 2020, doi: 10.1016/j.jisa.2019.102407.

[11] S. Yaqoob *et al.*, "Use of blockchain in healthcare: A

systematic literature review," *Int. J. Adv. Comput. Sci. Appl.*, 2019, doi: 10.14569/ijacsa.2019.0100581.

[12] H. Albayati, S. K. Kim, and J. J. Rho, "Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach," *Technol. Soc.*, 2020, doi: 10.1016/j.techsoc.2020.101320.

[13] J. Ahn, M. Park, and J. Paek, "Reptor: A Model for Deriving Trust and Reputation on Blockchain-based Electronic Payment System," 2018, doi: 10.1109/ICTC.2018.8539641.

[14] S. V. Akram, P. K. Malik, R. Singh, G. Anita, and S. Tanwar, "Adoption of blockchain technology in various realms: Opportunities and challenges," *Secur. Priv.*, 2020, doi: 10.1002/spy2.109.

[15] A. Yadav, D. Yadav, S. Gupta, D. Kumar, and P. Kumar, "Online Food Court Payment System using Blockchain Technolgy," 2018, doi: 10.1109/UPCON.2018.8596794.

[16] B. Guidi, "When Blockchain meets Online Social Networks," *Pervasive and Mobile Computing*. 2020, doi: 10.1016/j.pmcj.2020.101131

[17] C. Lin, D. He, X. Huang, M. K. Khan, and K. K. R. Choo, "DCAP: A Secure and Efficient Decentralized Conditional Anonymous Payment System Based on Blockchain," *IEEE Trans. Inf. Forensics Secur.*, 2020, doi: 10.1109/TIFS.2020.2969565.

[18] K. J. Smith and G. Dhillon, "Assessing blockchain potential for improving the cybersecurity of financial transactions," *Manag. Financ.*, 2019, doi: 10.1108/MF-06-2019-0314.

[19] W. Xie *et al.*, "ETTF: A Trusted Trading Framework Using Blockchain in E-commerce," 2018, doi: 10.1109/CSCWD.2018.8465233.

[20] S. I. Kim and S. H. Kim, "E-commerce payment model using blockchain," *J. Ambient Intell. Humaniz. Comput.*, 2020, doi: 10.1007/s12652-020-02519-5.

[21] Y. Jiang, C. Wang, Y. Wang, and L. Gao, "A Privacy-Preserving E-Commerce System Based on the Blockchain Technology," 2019, doi: 10.1109/IWBOSE.2019.8666470.

[22] Z. Liu and Z. Li, "A Blockchain-based Information Model of Cross-Border E-Commerce," 2019.