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A Blockchain Ethereum Technology-Enabled Digital Content: Development of Trading and Sharing Economy Data

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ABSTRACT The idea of a shared economy becomes one of the companies as an enterprise type. Especially with the advanced development of digital smart devices and the internet, several forms of the mutual economy have been advanced in accord with the need for sharing of separate income. Shareable commodity and digital content are also seeking to utilize. When digital content is used as a sharing economy, various possible threats may arise in the course of transactions, the potential for theft, alteration, and hacking of contents. This paper presents a comprehensive overview of the security and privacy of Blockchain. Blockchain promise transparent, tamper-proof and secure systems that can enable novel solutions, especially when combined with smart contracts. In this research, we proposed a content protection and transaction method using Blockchain Ethereum Technology. The encryption algorithm is incorporated in proposed system to make transparent transactions and it is also implemented on content itself to prevent from smart forgery and hacking. The experimental results signify that the proposed method has strong potential to enhance transactions transparency by minimizing the security threats in digital content transactions.

INDEX TERMS Ethereum, blockchain, shared economy, smart contract.

I. INTRODUCTION

Blockchain Technology (BT) has gained worldwide attention over the last few years. It is a distributed system aimed at an innovative future in collaboration and the business market [1]. BT is assumed as a global ledger to permanently store the transactions in a chain of blocks and has developed continuously [2]. Ethereum [3] is a Blockchain application that presents a public medium, where anyone can build their applications on top without the need of the cost-intensive development of Blockchain. The Ethereum initiates smart contracts (SCs) that are programmable in various programming languages such as Java [4]. The Ethereum Protocol was designed by the Ethereum foundation [5] and considered as an upgraded version of crypto-currency comprised of on Blockchain escrow, gambling markets, and financial contracts [6]. Since 2019, the smart contract technology represented by Ethereum has become a hot spot of attention from all walks of life, and has attracted widespread attention from government departments, financial institutions, and technology companies. The Block chain Ethereum Technology, is suitable for trading in digital goods and is easy to combine with artificial intelligence and virtual currency. The industrial revolution is the aimed at concentrating information or data characterized by communicating, sharing, opening, and releasing in a cloud computing system, and analyzing big data. Collecting information, and flourishing people's well-being with the help of Information and communications technology by utilizing smart devices.

Blockchain technology is expected to be a full-fledged fusion of digital, biological and physical boundaries. Everything in the world is connected to the online network, and the trend of 'Blockchain' technology is getting attention because it is a core technology for realizing a super connective society.

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The Blockchain is a chronological order of data blocks into chains. The method is combined into a specific data structure, and the non-tampering and unforgeable decentralized shared ledger. Blockchain technology does not require under the premise of third-party credit institutions, through distributed databases, digital Encryption technology and unique consensus algorithm solve the problem of decentralized system.

Therefore, reliability of the pivotal information or data is critical and it is important for the participants being transparently shared, without the data or information being forged. Blockchain is a widely known technology that changes the network paradigm and the industrial structure. Companies across different sectors are excited about Blockchain technology and its potential to drive their digital transformation while solving real-life problems. However, to use the Blockchain Ethereum technology is a key feature of decision-making based on the structure of decentralization and consensus. It is necessary to discuss the in-depth details of the sharing economy growing worldwide. The sharing economy provides various types of assets held by individuals to others. We discuss the problems that Blockchain technologies can address, as well as the potential problems and drawbacks that must be overcome for Blockchain technologies to be implementable. It is a new method of industrialization that can share and take advantage of goods [7]. A criterion for the inclusion of literature in this study is its current trends, as Blockchain and sharing economies are both new and fast-moving phenomena.

As sources, scientific articles, as well as popular literature and press articles, are used. The search terms are mainly Blockchain sharing economy, smart contract, and their combination. Digital contents are also pursuing new values with various forms of sharing economy. Although extensive research has been done on Blockchain technology as well as on the sharing economy, there is a relatively very small amount of research has been carried out on the amalgamation of these two fields to create a decentralized sharing economy platform. We are intended to contribute to the advancement of Blockchain technology in the sharing economy to organizations. Blockchain Ethereum Technology allows creating a self-regulating and self-controlling sharing economy, in which transactions are performed through fulfilling digital contracts. The Existing literature describes many types of distributed consensus being developed, each providing distinctive the features, advantages and disadvantages. The methodology used for reaching consensus in Blockchain networks determines to a large extent key performance characteristics such as scalability, transaction speed, transaction finality, security and spending of resources such as novel modification of the processing method. Broadly speaking, every method requires a procedure for generating and subsequently accepting a block. The characteristics of Blockchain technology, the privacy protection mechanisms of Blockchain can be divided into three categories: privacy protection at the network layer, privacy protection at the transaction layer, and privacy protection at the application layer Economic development through the sharing economy can be expected in the sense of creating new economic benefits by utilizing the assets owned by individuals.

The risks of personal information security for the transactions between unprofessional individuals are the various problems of forgery that may occur during transactions that are still to be studied. The industrial ecosystem of digital content is divided into offline distribution, and distribution through mobile and cable, and has an unfair relationship in the value chain of producers, distributors, and consumers. Existing digital contents have been traded by protecting and Commercializing copyrights through methods such as watermark display [8]. However, digital content is illegally reprocessed to distribute and infringe copyright. Various acts of doing are still being tried.

The essence of Blockchain technology is that it establishes a distributed consistency standard in the cyberspace, creates an exact record of all digital events that cannot be tampered with on the distributed database, and makes all parties in the Blockchain be able to accurately and credibly understand the digital events that occurred.

Also, in the distribution process, digital contents are accessed by a middleman. A significant fee has to be paid for each transaction, and the threat of hacking is also threatened through the interim transaction process. To this end, diversification on distribution channels and digital content creators may cause hindrance. To protect the rights and interests in digital content transactions through Blockchain is increasing.

Features such as transparency, collective maintenance, and non-tamper ability, which happen to be smart contracts provides a safe and reliable record carrier and execution environment. First, the Blockchain technology uses purely mathematical methods, without sacrificing privacy or without with the participation of third-party credit institutions, a distributed consistent expression can be established for all past and current digital events. The system further enhances the flexibility of Blockchain applications. The major contribution of this study include the implementation of Merkle Trees method for Blockchain technologies. This is performed by using smart contract based on Blockchain Ethereum Technology. The digital contents are traded with the help of sharing economy and by reducing the security threats that may occur during transactions. Moreover, we proposed a novel modification of the processing method by applying the hashing function to some data processed at the time of hashing. Finally, we covered the explanation of framework on the adoption of the technology, limitations, and implications that might emerge with mainstream use of Blockchain. The rest of the paper is organized as follow: Section-II discuss the preliminaries of digital content markets and shared economy. Section-III highlights the proposed method, while Design and Implementation details are mentioned in Section-IV. Performance Evaluation is given in Section-V followed by Conclusion in Section-VI.

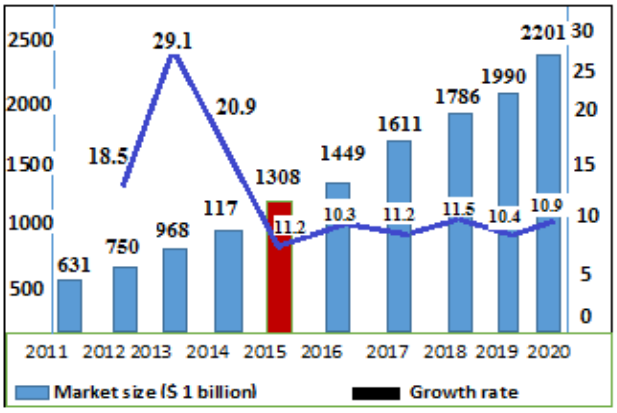

FIGURE 1. Digital contents market size.

TABLE 1. Prediction of domestic distribution in five new technologies unit: 100 million won.

DIVISION	2016	2017	2018 (E)	2019 (E)	2020 (E)	ANNUAL AVERAGE GROWTH RATE
VR	**4,734**	**13,019**	**20,120**	**29,588**	**36,689**	66.8
AR	8,903	10,146	11,512	13,061	14,818	13.5
CG	3,390	3,812	4,287	4,821	5,421	12.4
Hologram	5,435	6,138	6,876	7,489	8,155	10.2
Five Senses Interaction	4,510	5,367	5,936	.-	.-	17.5
Smart Media Distribution	74,252	81,653	90,258	.--	.	12.5

II. PRELIMINARIES

A. DIGITAL CONTENTS MARKETS

The digital content market is increasing due to the development of various types of content and the development of smart devices. According to the 2016 survey, the global digital content market is expected to grow 11% in 2020 as shown in Fig.1. [9]. The domestic digital content industry is also expecting annual growth of 9.2% [10]. As in [3], the domestic distribution market for the five new technologies is about to reach 9 trillion in 2018.

Distribution of new types of digital content requires more rational contract process and thorough protection of the content. As various digital contents market technologies are developing such as virtual reality, hologram, and five senses interaction, it is necessary to industrialize different aspects of new technologies. Sharing economy is a new way of creating value for various types of contents owned by individuals. Due to the sharing economy of digital content, it is expected to activate the economy as a distribution channel for goods owned by individuals and organizations.

B. SHARED ECONOMY

As the sharing economy is an umbrella structure, there is considerable variation in definitions [11]. The sharing economy is based on the following transactions; (selected by the appropriate consumer, manufacturer), or either fully automated based on (smart contracts) or manually. Transactions are reflected in a chain of blocks with protection against additional interference. The sharing economy can be defined as an economy that utilizes the ICT platform, to deals with transactions between individuals and business providers with specific services [7].

The world's sharing economy is growing rapidly that allows private individuals to share their property or provides services through online platforms. It became clear that the sharing economy is a successful business model, with Airbnb worth $31 billion in 2017 [12]. According to the PWC, the global revenue of five major sharing economy sectors will be increased from $15 to $335 in 2025 [13]. This reliance on the brand of the sharing economy is important because consumers are likely to trust the providers [14]. As shown in Fig. 2, the sharing economy provides the right to use the assets owned by the supplier through the transaction, search through the ICT platform between the consumer and the supplier [15]. The consumer pays the appropriate market price, and platform takes the brokerage fee, respectively.

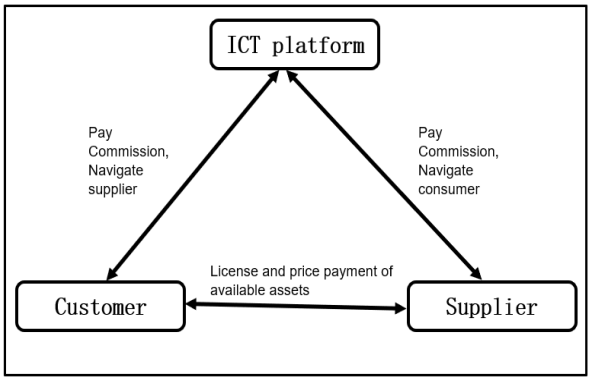

FIGURE 2. Definition of shared economy.

Transactions are made online, but actual service provision and use are mostly done offline. The major sectors of the sharing economy currently used are accommodation, vehicles, finance, and talents. As shown in Fig. 3, the size of the sharing economy is growing more than 50% every year. Considering the market size of $ 5.1 billion in 2013, it is expected that a market size of $ 335 billion, up 22 times a year. Fig. 3 shows the size of the global sharing economy market.

The penetration rate of smart phones in Japan and the use of SNS have been increased. The size of the domestic sharing economy is expected to grow at a higher rate of growth than the global sharing economy market.

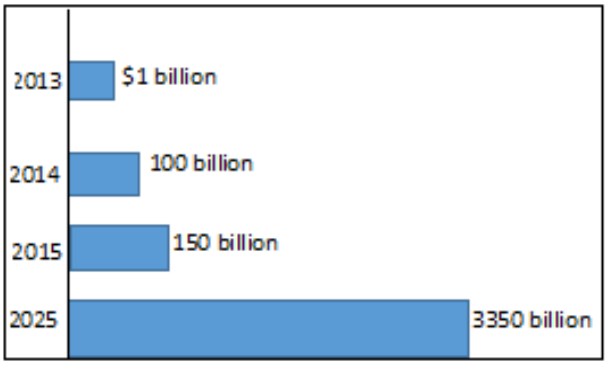

FIGURE 3. Size of the world shared economic market.

C. RELATED WORK

Blockchain can open up new opportunities to increase the efficiency of processes in many areas of WTO work. Blockchain helps businesses to become paperless. Blockchain is considered a game-changer for digitizing and automating trade finance processes in specialized finance loans and facilitating supply chain finance. Currently, Blockchain technology is applied to a wide variety of fields including business services, settlement of financial assets, prediction markets and economic transactions [49]. Blockchain is expected to play an essential role in the sustainable development of the global economy, bringing benefits to consumers, to the current banking system and the whole society in general [50]. A series of banks working with financial technology (Fintech) start-ups and information technology (IT) companies are considering the potential of technology. The use of Blockchain does not pose a single point of failure since the Blockchain is unnecessarily stored on all participating nodes, guaranteeing high availability [16].

Kishigami *et al.* [17] proposed super distribution concept for Blockchain-based digital content distribution. The proposed system has no enticement method for the mining calculation which means no cost can be covered if each minor calculates the hash value. Another open source Blockchain system was introduced the Australian Telecommunication industry to improve the efficiency and transparency of digital contents [18]. There are allowed Blockchain that require authorization to a transaction on the ledger. Blockchain technology is also known as distributed ledger technology. It allows participants to secure the settlement of transactions, achieve the transaction, and transfer of assets at a low-cost [45]. Blockchain refers to a digital ledger in which information to be traded is encrypted and connected to all members by a specific algorithm. This Blockchain contains all the transactions that occurred during this time. It is linked to the original block in the network through the digital signature [46].

The consensus stage is achieved through the use of a consensus algorithm. This process is called mining. Namely, Peer to peer network reaches consensus on the current state of the distributed ledger [47]. The blocks containing the ledgers of a transaction between the individuals are connected through a long online chain, wherein various transactions can be connected and formatted. A block is transmitted to all the network participants for verification. Once the verification procedure has been completed, the block is then registered to the existing Blockchain because it is difficult for individuals to manipulate data.

The data is consistent with more than 50% of verified users. If anyone attempts to manipulate the ledger, the computation capacity must be higher than a half of the users, which is particularly impossible since the benefit from the manipulation is less than the cost of the manipulation. The agreement on all the details of transactions is made in a variety of ways, such as a public method in which whole content is shared with all members. To ensure that the transaction is valid, the sender will sign the transaction with its private key [19]. This makes it possible to track everyone to re-identify and check transaction status [20]. However, it's also possible to restrict access to the Blockchain for a specific audience (such as an internal organization) known as the private Blockchain [21], [22].

Blockchain is inherently resistant to modifying data. It is an open, distributed ledger that efficiently and permanently records transactions between two parties [20]. The most popular Blockchain is the Bitcoin Blockchain, which tracks all Bitcoin transactions [14]. The private method of determining whether or not to be disclosed by agreement and sharing of members and the transaction details can be disclosed and traded only to specific persons. It is possible to transparently protect and share transaction related content in a variety of ways, such as the existing consortiums method, and to conduct transactions safely without third party intervention [23]. A Blockchain based technique namely reputation based knowledge sharing (RBKS) was used in [24] to tackle the transparency and security of knowledge sharing problems.

A reputation evaluation algorithm was incorporated in Blockchain to form a hybrid stake for the RBKS system. Fig.4. shows the Blockchain transaction when processing between transactions; it is processed using a hash function. Reputation evaluation in e-commerce is considered as a major concern to build trust amongst stakeholders. Various P2P applications such as P2Prep [25] and Eigen Trust [26] are developed for decentralized reputation of management. However, these reputation-based systems don't guarantee self-policing trustworthiness over other peers to acquire global consistent trust value for each peer.

Table 2 shows, examples of global startups using Blockchain. There are various cases of using Blockchain in commodity trading services, IoT and investment, loans, lending, and security. Provenance, a British software company, has provided consumers with a transparent contract tracking of the distribution channels of food; it provided a trust relationship different from existing restaurants [27]. A Blockchain technology is applied to a wide variety of financial fields, including business services, settlement of financial assets, prediction markets and economic transactions [28]. Blockchain is expected to play an essential role in

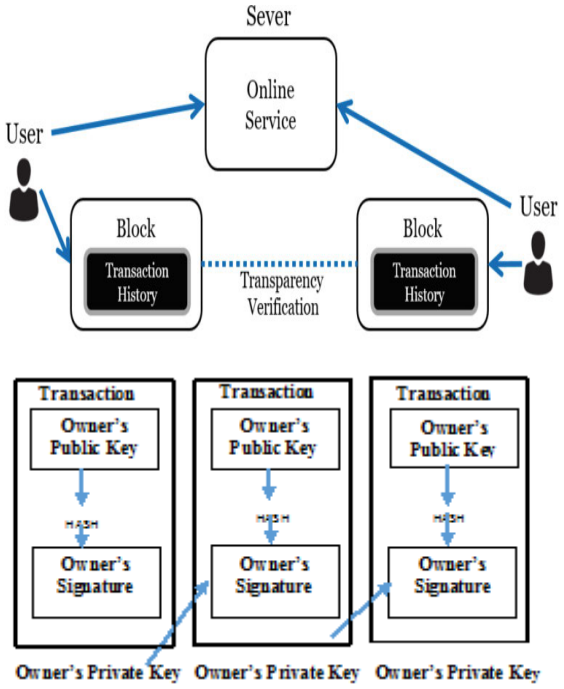

FIGURE 4. Transaction transparency in Blockchain.

the sustainable development of the global economy, bringing benefits to consumers, to the current banking system and the whole society in general [29]. The global financial system is exploring ways of using Blockchain enabled applications for financial assets, such as securities, fiat money, and the derivative contracts [30]–[33]. Currently, research on the utilization of digital contents using Blockchain Ethereum technology is representative of the streaming method used by copyright, distributors of all rights content, and 'Intel' is also trying to protect digital contents fees and copyrights. Furthermore, online games and advertising market attempts to trade through Blockchain have been studied in various ways [34]–[36]. The use of a Blockchain in a startup is mentioned in Table.2.

In 2017, a team of engineers working on Blockchain development based on Ethereum launched Swarm City initiated from the decentralized carpooling service called Arcade City. A decentralized peer-to-peer platform provides access to a global community of customers and service providers [37]. Swarm City offers anyone the opportunity to build their own brand at home without third parties intervention. Ethereum commonly referred to as ''2nd generation Blockchain, inserts reservation-related codes through smart contracts as well as existing simple transactions. Eliminating the intervention through the intermediary of the excitation zone, and the burden of the fees paid to the intermediary exists between the provider and the demander [15].

Blockchain will become not only more scalable and efficient but more durable as well. Blockchain technology can be used to create a reliable review system that allows the transfer of reputation data from one platform to another. Also,

TABLE 2. The usage of Blockchain in startup.

DIVISION	CONTENT
Commodity Trading Service	Kraken: Collaborating with Fidor Bank of Germany. To develop digital call service platform. Lykke: Blockchain base leaky coin trading platform.
IoT	Ascribe: Share and sell digital content assets through copyright registration.
Invest, Loan	Funder Beam: Provide start-up connectivity, platform with investors
Security	Chain Analysis: Blockchain based AML and KYC service
Circulation route	Provenance: Circulation route tracking

Blockchain has the potential to make the sharing process more social by connecting people directly. There are several challenges associated with this BT such as exposing transaction information to members participating in the transaction, recording, and archiving transaction details. To overcome such security issues is an open problem that may improve the transaction transparency and reliability. In particular, when transaction security and trust are important, such as in the financial sector and the sharing economy, it is being applied more actively.

The Ethereum technology proposed in this paper is called SHA-256. It is virtually impossible to omit and hack the transaction history. Because it hashes the transaction history by using singer function and hashes the rehashed contents to construct Merkle Trees [38]. Also, smart contracts using solidity can be used to prevent smart forgery and hacking that may occur during the transaction. However, digital content produced and traded in a digital environment requires higher security than the existing product. The Blockchain ethereum technology encrypts the content itself to provide transparent transactions.

III. BLOCKCHAIN ETHEREUM TECHNOLOGY BASE DigiCon SYSTEM

In this research, we focus on increasing the 'transparency of transactions and contracts' and the security of traded contents. Ethereum is a Blockchain-based data structure that can be realized. The smart contract and open source underlying system was developed by Buterin in 2013.Ethereum is the next generation of crypto currency and decentralized application platform''. The goal of Ethereum is to integrate and improve the concept of scripting language, digital encryption currency and on-chain meta-protocol (on-chain meta-protocol), enabling developers to create any consensus-based, scalable, standardized, and feature. Complete, easy

to develop and coordinate distributed applications. The Ethereum Virtual Machine (EVM) is the operating environment of the Ethereum smart contract and its application, providing a Turing complete script language.

To this extent, we have studied the encryption method of digital content to guarantee the transparency of the agreement and prevent forgery. Hacking and forgery can be avoided by using contract-related codes in Blockchain Ethereum technologies [39], [40]. Ethereum provides a decentralized Ethereum Virtual Machine (EVM), which can execute scripts using an international network of international nodes [41]. Early Blockchain developed in the Ethereum platform that use PoW, which can deal a maximum of 20 transactions per second [48]. The block trade was tested to prove the superiority of various threat factors. The following procedure is adopted to design the system:

1. Transparency in transaction and contracts: Smart contract of Blockchain Ethereum.
2. Securing the content of transaction; Password handling for random portion of content.

The digital content sharing system proposed in this research (hereinafter referred to as (Digi_S) provides an EVM (Ethereum Virtual Machine) as a platform. To provide a smart contract-enabled environment using Ethereum is as follows.

- Server: Ubuntu 18.04LTS
- Platform: EVM
- Browser: Geth (Web3.js)
- Solidity Implement: browser solidity
- Blockchain: Ethereum

The purchase request processing process to be used in the digital system is shown in Fig.5

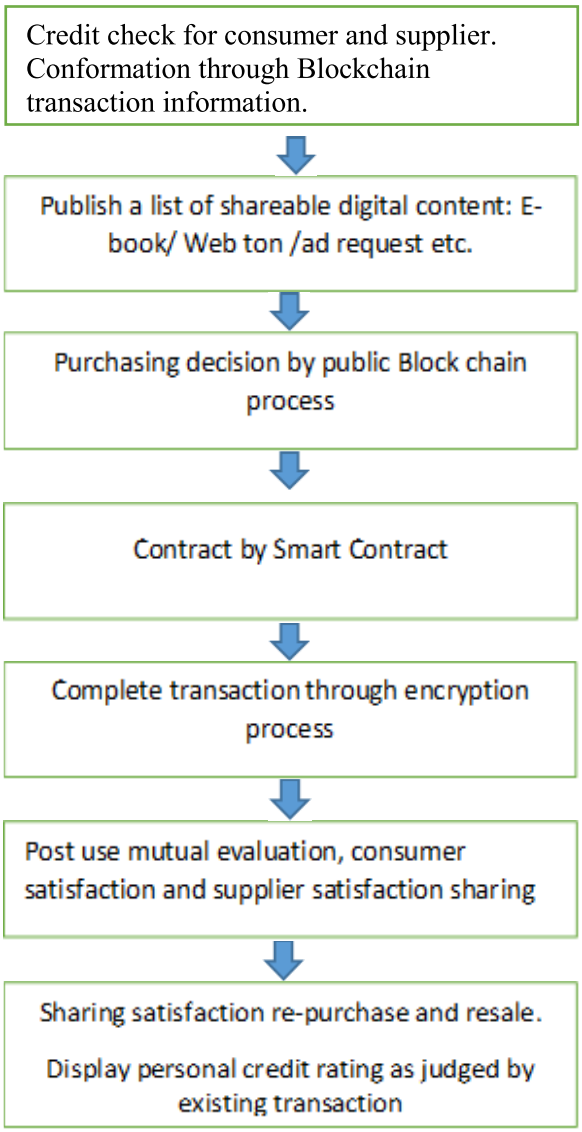

FIGURE 5. Processing process.

IV. DESIGN AND IMPLEMENTATION

A. SMART CONTRACT DESIGN

The smart contract provides a complex protocol framework for standardized contract applications, and can identify the behavior and status of the contract by identifying the key parameters of the smart contract. Smart contract is a programming language description of professional knowledge in a certain field. It has higher requirements for the security of the core interests (such as assets) involved in the contract and the logical correctness of the contract code. The sharing economy is mostly traded online and offline. There are always various forms of security threats that can arise in online transactions. A Smart Contract running on the Ethereum Blockchain network is essentially a computer protocol that simulates a real contract (such as economic transactions, employment, etc. [42]. The smart contract is essentially a distributed transaction program running on the verification node to automatically execute specific business rules and finally update the state of the ledger. Smart contracts are divided into three types: public, confidential and access control, which are initiated by members with different permissions.

A Smart contracts are high-level programming abstractions that are compiled down to EVM byte code and deployed to the Ethereum Blockchain for execution. The smart contract is a technology with the potential to combine Blockchain and create tremendous added value.

Transparent contracts are an important part of the successful establishment of digital content as a sharing economy. Block chain and smart contracts help to manage cross-border policies and national single windows (an entry point where business stakeholders can submit documentation and other information to complete customs procedures) to help trade data more efficiently, transparently, securely, and accurately. The German company Slock has developed its Blockchain infrastructure, which allows for the complete automation of sharing economy businesses by calling them ''smart objects.'' For example, a smart object could be a locked, apartment, or a vehicle that automatically provides access to a tenant.

This makes it possible to rent items without any interaction between the tenant and the owner, which saves time and is

convenient for both parties. Kosba *et al.*, [42] developed a decentralized smart contract system that guarantees on-chain confidentiality, which means that transactional data cannot be viewed by anyone who is not involved in the transaction. In this research, it is possible for consumers and suppliers can transparently trade through a solidity-based Smart Contract. As shown in Fig. 5, when the code input for the contract is made. It is converted into the byte code format through compilation. The byte code is further shared through P2P as an authorized transaction target. The schematic of the smart contract processing is given in Fig.6.

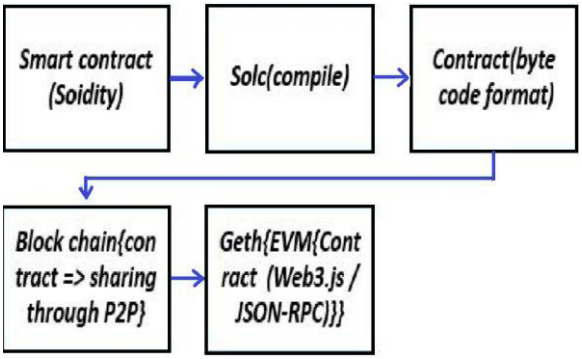

FIGURE 6. Smart contract processing.

Considering the trust among traders is considered as one of the important factors in the sharing economy. The Smart Contract proposed in this paper adds the credibility of trading partners, not just a trading contract. The structure of the smart contract is shown in Fig.7.

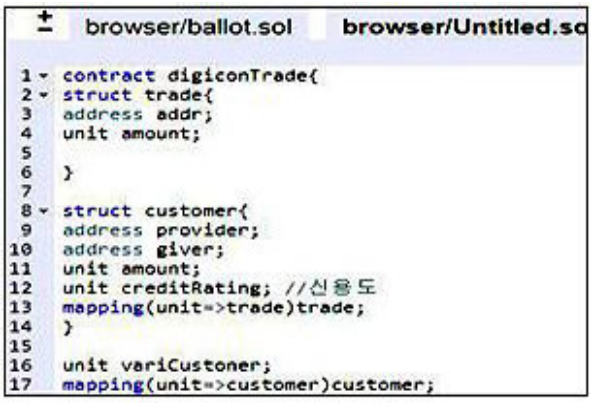

FIGURE 7. Smart contract structure.

To evaluate the credit of the consumer and the supplier, the credit rating of the unit type can be added to measure the confidence of the consumer and the supplier. Both parties can measure the confidence index, and credit rating can be useful in contracts. Because it is based on the values measured in other existing transactions In order to effectively apply the Smart Contract on the system, a block is created by using Geth and the smart contract can be shared between consumers and suppliers through browser solidity. Solidity is a

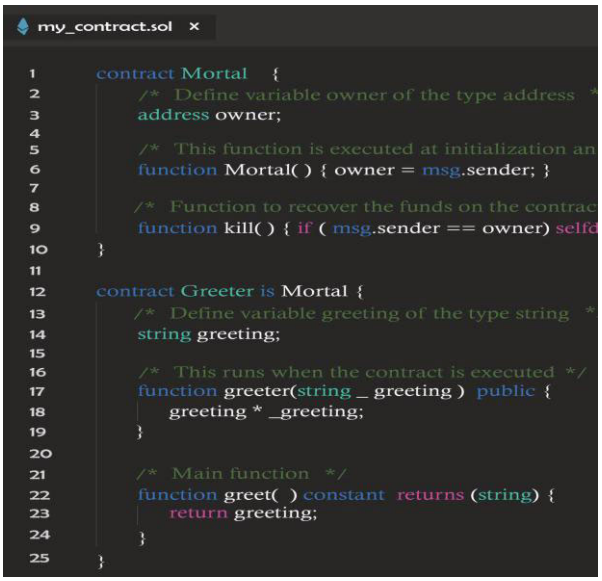

FIGURE 8. Browser solidity.

programming language for contracts. It can be programmable to be implemented in EVM, and developed to enable Smart Contract on platforms where Blockchain Ethereum is used. Through Fig. 8, the browser solidity is made into a Smart Contract, and the contents of the Smart Contract, with the proposed structure, are shared and the transaction is made transparently.

In case of using Remix, it is more convenient to check trading partners as depicted in Fig. 9 and Fig. 10. The transaction related to the proposed virtual network system are made by using built-in application programming interface (API)

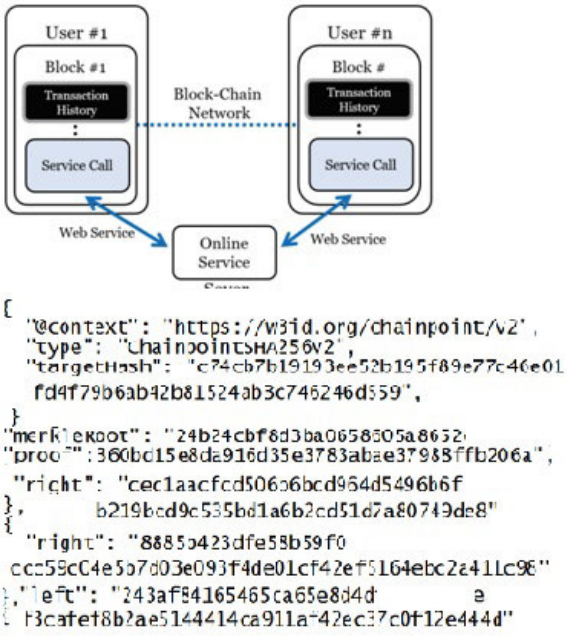

FIGURE 9. Transactions through virtual networks.

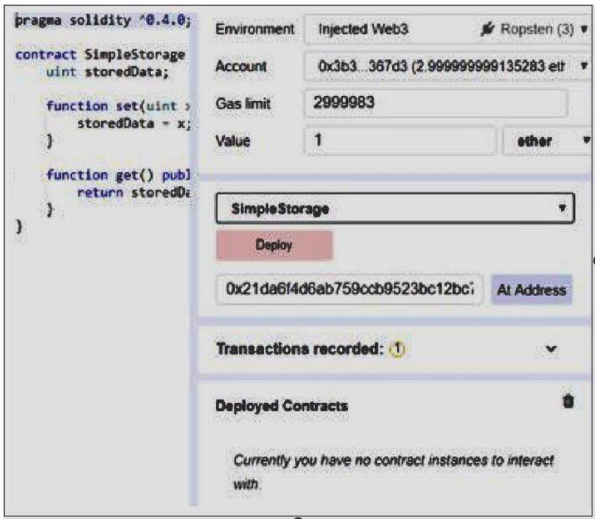

FIGURE 10. Contract complete screen by application.

applicable for the transaction, and showing that the transaction has been completed.

If there is solid proof of the transaction for Fault Tolerance, Check Transaction Receipt and present address to suggest you can check it. The Transaction Receipt information is shown in Fig.11, in which address is also included.

FIGURE 11. Transaction receipt.

B. ENCRYPTING DIGITAL CONTENT

Smart contracts can allow users to own and control their own digital identities, and build user-centric personal networks, such as personal digital reputation and digital assets. At the same time, it can also specify which personal data can or cannot be shared with others.

Digital Records: Smart contracts can realize the automation of compliance, improve the transparency of data, reduce service costs, and realize the automatic processing of records. For example, using smart contract technology to manage clinical trial data can improve the transparency of data. Smart contracts can promote simplified global commodity transfers and bring higher asset liquidity. Realizing the automated initiation of credit certification and trade payment processes can create a more efficient and less risky process between customers, suppliers and financial institutions.

Encryption is the process of converting information into a secret code that hides the true meaning of information. In computing, unencrypted data is also called plain text and encrypted data is called cipher text. The data entered into the Blockchain are hashed. It is converted into a new digital string of fixed length using the mathematical function, and encrypted. To ensure data integrity, prevent forgery, and ensure that the message is created and sent. The sender was claimed and not shipped in transit. Encryption is commonly used to protect data and other data in transit. Every time someone uses an ATM or buys something online with a smartphone, encryption is used to protect the relayed information. Businesses are increasingly relying on encryption to protect applications and sensitive information from reputational damage during a data breach.

The principles used to encode and decode messages are called encryption algorithms or ciphers. Encryption is a long-standing way for sensitive information to be protected. Historically, it has been used by militaries and governments. In modern times, encryption is used to protect data stored on computers and storage devices, as well as on data transmitted over networks. Merkle trees that handle transaction details. Hash trees allow efficient and secure verification of the contents of large data structures. Ethereum Blockchain uses Merkle trees, for security reasons, to improve scalability, and to optimize transaction hashing. As with any Merkle tree implementation, it allows for storage savings, set membership proofs called Merkle proofs, and light client Synchronization. An importantly, data such as account balances are not stored directly in the blocks of the Ethereum Blockchain. Only the root node hashes of the transaction trie, state trie, and receipts trie are stored directly in the Blockchain.

Merkle Trees is changed to a hash value that cannot be decrypted using a hash algorithm, and various transactions that can occur during the transaction can be managed without deletion. Currently in Blockchain Ethereum, for the sake of management, transparency of transactions is guaranteed through the SHA-256 hashing algorithm. However, it does not encrypt the transaction itself. If digital content is traded, it does not mean that the digital content itself is secured. Through Merkle Trees, the transparency and legitimacy of transaction details can be guaranteed. Strategies for managing encryption keys throughout their lifecycle and protecting them from theft, loss or misuse should begin with an audit to establish a benchmark for how the organization configures, controls, monitors and manages access to its keys. In case of encryption using complex cryptography, there will be a transaction efficiency problem such as transaction time, encryption time, and decryption time. In this research, various contents of transactions are recorded through metadata of Smart Contract, and whether to encrypt or not is determined based on the recorded metadata. Fig. 12 is the encryption process of Merkle Trees proposed in this paper. Merkle

tree-based authentication has been accepted worldwide for various Blockchain technologies i.e. Bitcoin.

In the proposed process, we extract some random data of digital contents and apply the MD5 hash function. A seed value is required to determine the position of random data. In this study, the current date is simply applied. Through this, the metadata for each transaction and the hash value is changed. The MD5 algorithm applied to the digital system is a 128-bit cryptographic hash functions and is a simple algorithm. But it is possible to determine forgery and alteration by encrypting. A random portion of digital content improves reliability for the safe distribution of digital content. Fig. 13 is a process of extracting arbitrary data generated from the digital system and processing MD5.

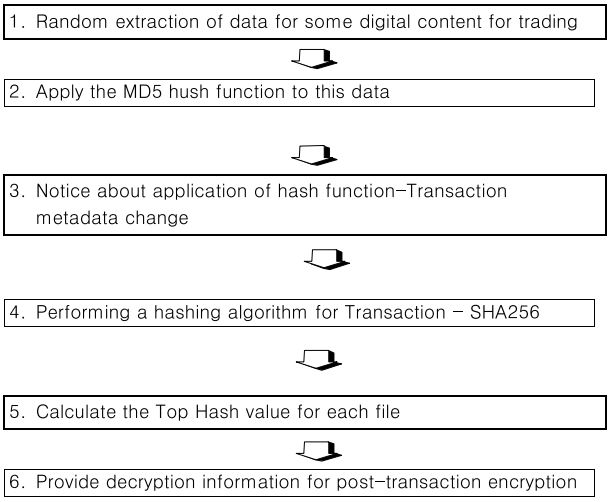

FIGURE 12. Processing process.

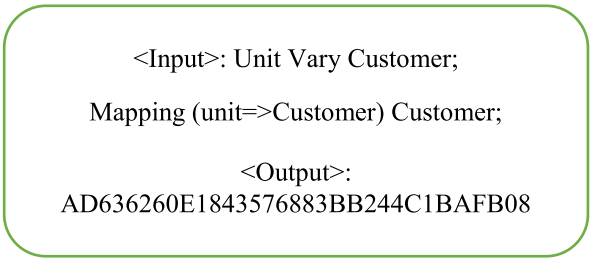

FIGURE 13. MD-5 process.

As proposed, 0 random areas are encrypted for the digital content itself to be shared, and when applied to the sharing economy, stability for the content itself to be traded can be increased.

V. PERFORMANCE EVALUATION

In this paper, digital content is utilized as a sharing economy. Digital contracts are used to secure the contents of transparent contracts and transactions, Design and develop the system. The speed among the indicators for performance evaluation is not meaningful in this paper. In Lo *et al.*, [43] the authors propose an evaluation framework for Blockchain-enabled applications in specific industrial domains like supply chain, EHRs, identity management, and the stock market. In Wüst and Gervais [44] an analysis is provided related to the properties of different Blockchain types (i.e., permissioned and permission less) and a methodological framework is developed for identifying the suitability of Blockchain-enabled applications across several domains.

Therefore, for the performance evaluation of the proposed research contents, the block creation and confirmation time were examined. Transactions were conducted through the virtual network of a private network rather than the general p2p environment. In consideration of the transaction requester and provider, two nodes were set up and the evaluation items were tested through the Geth platform. The event function used at this time is as fallows.

As the above mentioned, factors for performance evaluation are Blockchain creation time and confirmation time through the Blockchain speed (TPS). The recent Ethereum Transaction through ethers scan Io is shown in Fig.15.

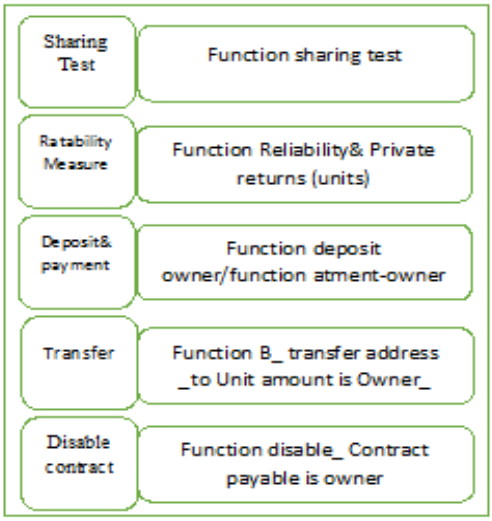

FIGURE 14. Event function.

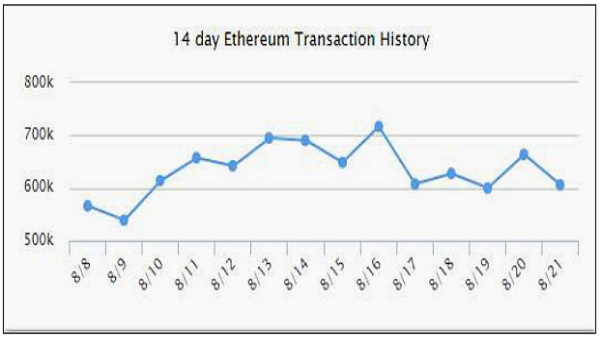

FIGURE 15. Ethereum transaction history [6].

Two different accounts and Smart Contract prepared for the experiment of this paper was requested at a rate of 50 per

second, and the results through transaction processing from contract creation. The block body in generation time and final time was examined. In each process, analysis of the Message Transaction occurred through the contract creation and deploy for each process to identify transaction. The results of the experiment were tested with the process as in Fig.16.

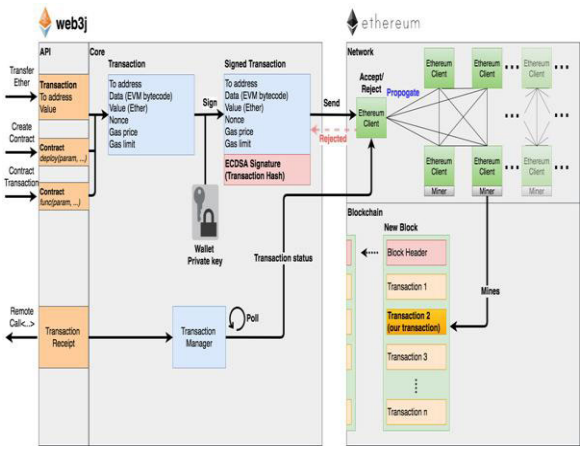

FIGURE 16. Evaluation process.

Contract creation / deployment JSON RPC API Ethereum.
Network (contract creation transaction) Contract creation.
Input: unit type parameter. Contract content:
Transfer to customer's account. 0
Check customer information checking the transaction of digital
Contents variable: N (message number of transaction)
N=100.
N=2000

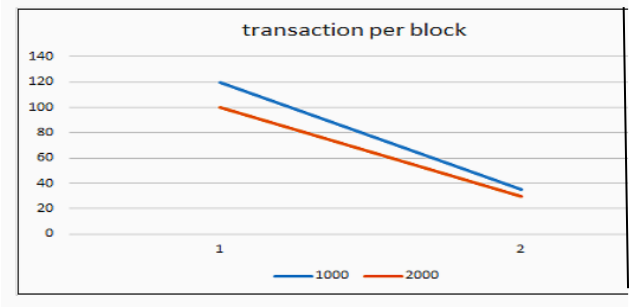

FIGURE 17. Evaluation result graph.

The results of these experiments are shown in Fig.17. The same evaluation process as in Fig.16 is used to acquire transaction per block results. It can be observed in Table-3, when a large amount of message transactions were requested, the platform performed the block creation first and then smart contract execution was performed slowly.

VI. DISCUSSION

The existing problems of smart contracts although the smart contract technology based on the Blockchain has attracted many researchers with its unique advantages, the smart contract technology of the Blockchain is still in the early stage

TABLE 3. Evaluation results.

Division	Sec	Transaction per block
N=1000	1---10	100
	11	Under 30
N=2000	1---10	100
	11	Under20

of development and there are many problems. At present, researchers have begun to try to solve such problems, such as data fragmentation technology and indexing technology [51]. Therefore, how to improve the Blockchain ability to handle affairs is an important issue that needs to be solved urgently by Blockchain technology. At present, the basic theory and technical research of Blockchain technology are still present. At the initial stage, there is still a lack of basic theories, key technologies, research and exploration of scientific issues that are vital to industry development. There are many challenges in this field. It should be pointed out that for Blockchain Ethereum Technology challenges. Giving an introduction or summarizing does not cover all research directions and issues. This paper systematically introduces the full life cycle, basic structure, key technology, research status, main technology platforms and application scenarios of Blockchain Ethereum Technology, and discusses possible problems. It is a summary and summary of the current research results of technology. Hence, it is clear that Blockchain technologies have already passed the proof of concept stage for several use cases but require further development to achieve desired operational and performance objectives. Several recent developments, such as the Web Blockchain, can be scaled up to thousands of transactions per second. Similar future developments will significantly determine Blockchain adoption in several applications, such as for IoT platforms and services that require very fast confirmation and large numbers of transactions. Blockchain or distributed ledger technologies can clearly benefit transaction system operations, markets and consumers. They offer disintermediation, transparency and tamper-proof transactions, but most importantly, Blockchain offer novel solutions for empowering consumer's satisfaction. Many research and commercial parties' currently pursuing Blockchain innovation. Blockchain are a fast-moving area of research and development, therefore a review on this emergent technology is required to improve understanding, inform the body of knowledge on Blockchain and realize their potential.

VII. CONCLUSION

Our work contributes towards a thorough understanding of the Blockchain features and provides a snapshot of current Blockchain-enabled applications across sectors. We present a comprehensive classification of

Blockchain-enabled applications across diverse sectors. The sharing economy is emerging as a new industrial distribution channel. Consequently researches for trading digital contents of sharing economy are being activated but the threats of transaction and management information protection has increased. To overcome content protection and transaction problems, we investigated "Digi_S" system that can apply the smart contract by using Blockchain Ethereum Technology. Blockchain Ethereum Technology can be used to create a reliable review system that allows the transfer of reputation data from one platform to another. We also point to the shortcomings identified in the relevant literature, particularly limitations the Blockchain technology presents and how these limitations spawn across different sectors and industries. The encryption algorithm is incorporated in proposed system to make transparent transactions. Moreover, we implemented encryption algorithm on content itself to prevent from smart forgery and hacking. The experimental results indicate that the proposed method has the potential to improve transaction, transparency and lessen the risks of deformation and hacking.

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