DIGITALIZATION AND ITS IMPACT ON THE ECONOMY

IN WAKE OF BLOCKCHAIN TECHNOLOGY

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DIGITALIZATION AND ITS IMPACT ON THE ECONOMY IN WAKE OF BLOCKCHAIN TECHNOLOGY

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DECLARATION OF ORIGINALITY

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ABSTRACT

Digitalization and its Impact on the Economy in Wake of Blockchain Technology

As being one of the most recent digital technologies, the Blockchain (BC) technology has a profoundly transformative and empowering role in economic activities in terms of production and consumption choices and marketing activities. However, the consumers familiarity and perception of BC technologies is not a well-studied issue in the literature. In this thesis, research is conducted to determine the usability and familiarity of the BC technologies by the consumers. Reviewing the related literature, a model is designed to analyze the effects of BC technologies in consumer behavior. The probable effects are identified in four dimensions in the model; dimension of uncertainty removal, dimension of being a solution tool and reliability, dimension of mediation, creativity and innovation and dimension of data management, ecology and digital economy dimension. A questionnaire is formed to test the effects of BC technologies on consumers in these dimensions. Findings of the study shows that in terms of gender, age, education and seniority of the participants; there is no significant differentiation in practicing BC-based technologies in any dimension. However, the results justify the literature that the job positions of the participants and their knowledge on BC technologies are significant on their use of BC technologies. The companies and the public authorities should design technology policies taking the technology diffusion of the society into consideration. As the society's technology-friendliness increase, the use of BC technologies will be more effectively used especially in certain sectors. In this regard, the thesis supports the use of BC technologies in economic activities.

ÖZET

Blokzincir Teknolojisi Sonrasında Dijitalizasyon ve Ekonomiye Etkisi

En yeni dijital teknolojilerden biri olan Blokzincir (BZ) teknolojisi, ekonomik faaliyetlerde üretim ve tüketim tercihleri ile pazarlama faaliyetleri açısından son derece dönüştürücü ve güçlendirici bir role sahiptir. Ancak tüketicilerin BZ teknolojilerine aşinalığı ve algısı literatürde iyi çalışılmış bir konu değildir. Bu tezde, BZ teknolojilerinin tüketiciler tarafından kullanılabilirliğini ve bilinirliğini belirlemek hedeflenmiştir. İlgili literatür taranarak, BZ teknolojilerinin tüketici davranışı üzerindeki etkilerini analiz etmek için bir model tasarlanmıştır. Olası etkiler modelde dört boyutta tanımlanmıştır; belirsizliği giderme boyutu, çözüm aracı olma ve güvenilirlik boyutu, aracılık boyutu, yaratıcılık ve yenilikçilik boyutu ve veri yönetimi boyutu, ekoloji ve dijital ekonomi boyutu. Bu boyutlarda BZ teknolojilerinin tüketiciler üzerindeki etkilerini test etmek bir anket oluşturulmuştur. Araştırmanın bulgularına göre, katılımcıların cinsiyet, yaş, eğitim ve kıdemi açısından; BC tabanlı teknolojilerin herhangi bir boyutta uygulanmasında önemli bir farklılaşma yoktur. Ancak literatürü doğrular şekilde katılımcıların iş pozisyonları ve BZ teknolojileri hakkındaki bilgileri BZ teknolojilerini kullanmalarında önemlidir. Şirketler ve kamu otoriteleri, toplumun teknoloji yayılımını dikkate alarak teknoloji politikaları tasarlamalıdır. Toplumun teknoloji adaptasyonu arttıkça özellikle belirli sektörlerde BZ teknolojilerinin kullanımı daha da etkin olacaktır. Bu bağlamda tez, ekonomik aktivitelerde BZ teknolojilerinin kullanımını desteklemektedir.

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CHAPTER 1

INTRODUCTION

The development of technology creates important turning points in the history of humanity in social and economic life. The transformation that started with mechanical techniques continues today with digital technologies. Blockchain (BC) technology, which ensures the successive addition of information nodes by securing them cryptographically and ensuring their safe and transparent traceability between the parties, is one of the last points reached as of 2022. BC technology has a transformative and empowering position in the context of computing applications in the public and private sectors. Used as a way to order transactions in a distributed ledger, data and information in BCs offer an unanimity record with a cryptographic audit trail that can be stored, protected, and verified with multiple nodes.

BC is one of the driving forces of the digital economy. Its relationship with consumption, production and sales and marketing begins at this point. Interrelated machines, object learning, machine learning, artificial intelligence and augmented reality technologies have been influential in the development of solutions "Marketing 4.0". Information, digital and mobile technologies, powered and empowered by BC are recognized as pioneers of a new era defined as the information society, all thanks to their profound impact on consumers' daily lives. These developments have brought sales' side to a new era and have revealed digital marketing. Digital marketing, on the other hand, is a process based on using digital tools and channels in marketing activities to gain competitive advantage, increase sales and brand awareness, bring products to consumers, motivate them to buy, establish interactive

relationships and increase brand loyalty. In this process, its development, dissemination and sustainability are based on BC technologies.

The emergence of the internet, information technologies, social media, and social networks under BC has reshaped the way marketers interact with consumers and manage their marketing campaigns in a digital world. The emergence of the internet, information technologies, social media, and social networks under BC has reshaped the way marketers create and design a digital design for their marketing campaigns. Digital marketing by combining the digital world and the real world created a new environment that is both competitive and in demand for companies, brands and marketing professionals. The adoption of BC technologies by consumers has also been instrumental in redesigning the marketing mix and strategies in particular, promotion in general. BC has created advantages in creating a unique and extremely valuable data set for companies, especially in the marketing communication process. Determining consumer preferences, designing the products and services to be offered/to be offered, establishing communication with the market, observing the mobility in the market, etc. BC has brought many advantages in vital processes such as digital transaction tools and assets at the core of the BC and marketing relationship; In the near future, traditional business models in more than 50 sectors may change drastically. Concepts such as real-time transactions, transparency, security, openness, diversity, comparison, intermediation, 7/24 access are at the center of the marketing process, both on the part of businesses and customers.

In the first part of this study, which was prepared in three parts, BC technology is explained as it effects the general economic activities; basic concepts

about blockchain, features and types of blockchain. In the second part, the concepts of digital economy and marketing and their situation in terms of BC are examined. For this purpose, BC and marketing, blockchain applications and solutions in marketing are included. In the third part of the study, research was conducted to determine the usability and experientiality of the technologies that can be used in the digital marketing processes. The major motivation of the conducted analysis is to understand how BC is perceived by the consumers so that it can be used to improve the marketing capacities and the economic efficiency.

CHAPTER 2

BLOCKCHAIN TECHNOLOGY

2.1 Blockchain

Today, cryptological (data, information, units, nodes, money, signs, etc.) units have become a popular field of study in almost every industry and academia. Blockchain can basically be considered as a public ledger and data units called nodes are stored in these ledgers. As information is added to the ledgers, it grows in the chain (Pierro, 2017). As the Blockchain (BC) is the ledger where interested parties add information to various levels of authority, cryptography and distributed unanimity algorithms are applied in the asymmetric model to ensure user security and ledger consistency. Thus, the added information becomes permanent in the book, namely BC, and it becomes impossible to change, manipulate or cheat (Crosby et al., 2016).

"Blockchain" as a term was originally defined in 1991 by Stuart Haber and W. Scott Stornetta. There are various studies that they carry out by making use of cryptography on the inability to change digital documents (Dhobale & Mishra, 2020). However, they could not go beyond being the idea ancestors of today's Bitcoin, and the world recognized Blockchain technology through Bitcoin because of its popularity. Because Bitcoin is the first project to implement BC technology (İşler, Takaoğlu & Küçükali, 2019). Ecash electronic money application, defined by David Lee Chaum in 1982, is known as the ancestor of such cryptocurrencies (Sherman, Javani, Zhang & Golaszewski, 2019). Although numerous attempts were made later, Nakamato's Bitcoin was the first work in this sense accepted by the society. Because in the related article, the details of the realization of money transfer between peers without being dependent on the initiative of a third party were explained. It was

explained that the safest method by combining many previously defined technologies was BC. Thus, the first crypto money that could have an economic value for people was created (Alnıçık, 2018).

BC technology is a decentralized data storage method where transactions can be carried out in confidence without the need for any intermediary or an authority between the parties, and where it is not possible to delete, change or lose data. BC technology was not born all of a sudden, and many technologies that developed by referencing each other over time formed the infrastructure of today's BC technology (Crosby, Pattanayak, Verma, & Kalyanaraman, 2016). However, the reason why the subject has become a popular idea that has spread all over the world is undoubtedly Bitcoin. The article named Bitcoin: A Peer-to-Peer Electronic Cash System, sent by the person or group known as Satoshi Nakamoto, to the mail group of the site called metzdowd.com, where shares on cryptography are made, in October 2008, had the greatest impact on the popularity of BC technology (Nakamoto, 2008).

BC is the process of data exchange and addition among “trusted” members (P2P- Peer to Peer) directly on the network without an intermediary (Gibson and Kirk, 2016). P2P, on the other hand, is a peer-to-peer system and is a network protocol created to provide communication and data sharing between two or more “peer” clients (Tijan, Aksentijević, Ivanić, & Jardas, 2019). BC is essentially a data system with information secured by cryptographic sealing. This system is basically; distributed ledger technology (DLT) and smart contracts. While DLT is a cryptographic record, contracts are a decentralized transactional dataset that can be shared, replicated and aligned with other data. It is simply a situation where everyone adds a record, or block, to a ledger. However, since this ledger is cryptographically

protected, the added blocks form a chain by sequentially ordering them. A “Block Chain” is created when there is no break, addition, subtraction or change in the chain consisting of blocks (Pierro, 2017).

BC is a trust system developed by using mathematics and cryptology. It is actually a computer network. Computer owners are the building blocks of this network with the information that they produce. BC has paved the way for great developments and changes in social, social, financial, scientific, legal, or rather every field, through internet networks (Tüfekci & Çetin, 2019). Since the BC consists of nodes added end-to-end, the process of adding new blocks is called initiation or genesis. In a sense, this process, which is also a mining operation, is the recording, processing, viewing and transfer of every information contained in the miners and participants BC (Çarkacıoğlu, 2016).

BC technology has a profoundly transformative and empowering impact on computing applications in both the public and private sectors. The consensus provided by many different users is that data, which are transaction records in the distributed ledger using a proprietary cryptographic method, carry a trace that can be stored, secured and verified in different nodes. With a protocol agreed upon by all parties in the contract, the parties can dynamically track all assets, transactions and of course information. Individuals and institutions organize the verification process both within themselves and against third parties (Treleaven, Brown & Yang, 2017).

2.2 Blokchain basic concepts

BC, as it bears its name, presents a "chain" form, consisting of "block" parts. The structure and features of the chain also vary according to the number of blocks, the

number of transactions and the type of block. However, although there are many variables, BC, data and flows only progress through blocks (Öz Demetoğlu, 2019). In this context, some of the concepts in BC technologies are explained below.

2.2.1 Record

Blockchain records are a record information that consists of placing the contents, namely data, on the chain structure. According to the design, this information can be values such as money transfer, fixture entry, customer records. For virtual currencies, these records are money transfer information. Transfers made from a user registered in the system to another registered user are kept through these records. New transfer requests are also queued and saved during the next transaction.

2.2.2 Block

The data in the form of a package that enables all permanently recorded data to be carried on the blockchain system is called a block. Blocks store information about the transactions made on the system, which individuals participated in the transactions, and the differences that distinguish them from other blocks.

Each block contains the hash code of the block before it and is included in the hash code of the block that comes after it. All of the blocks are linked with each other by hash codes, and as a result, the blocks form a chain. All blocks consist of the block head and the block body (Baumung, Fomin, 2018). Inside the block header; version type, previous block's hash, nonce, difficulty target, timestamp, and merkle tree. The body of the block consists of all transactions made. The data in the block header enters a hash function, and the result of this hash function creates the block hash (Gambhir, Bevan, & Devemport, 2018).

Hash algorithm in another name Secure Hash Algorithm (SHA), is the hashing process used to express the authenticity of any data, document or message. Hash functions are used to quickly find the data sought in databases or to compare data. Regardless of the size of the data, fixed-length data emerges after passing through the Hash algorithm. The hash function is a function that passes data of different lengths through the algorithm and turns it into a fixed-length message. For a better explanation of the SHA function, the cube root ($f(x) = \sqrt{x}\ 3$) function can be exemplified as follows (Gültekin, 2017)

$f(x) = 3\sqrt{x}\ 3$

Number of inputs (X)= 1453

The output will be number = 11.3263124527669.

If the comma is removed from the resulting number; The hash value will be = 113263124527669. It can be stated that hashing with the SHA-256 algorithm is a reliable operation, as it is necessary to make countless attempts to find the number 1453. The more complex the algorithm results, the more secure and robust the security of the transaction (Gültekin, 2017). The hash version type indicates in which version the block was created. Each block has the hash value of the previous block, and all blocks are linked to each other through these hashes (Baumung-Fomin, 2018).

2.2.2.1 Genesis block

The Genesis block (initial block) is the first block recorded in the blockchain network. The Genesis block (Figure 2) is also referred to as 'Block 0-1'. Under normal conditions, a block transferred to the blockchain contains information that refers to the previous block. Since the starting block is the first block on the

blockchain, there is no block before it. For this reason, genesis blocks are readily available in the software of cryptocurrencies.

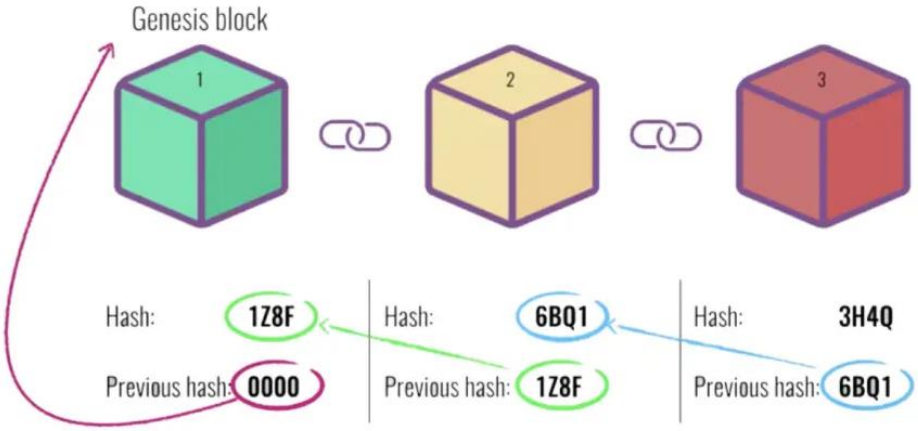

Figure 1. Genesis block

Source: (Ba-Works, 2019)

As it can be seen in Figure 1, the genesis block carries only its own Hash. However, the following block will carry the Hash of the previous block along with its own Hash. Thus, a sequential record structure becomes possible in our digital world. On the other hand, starting with the unique genesis block, BC contains data and information on each face of each block. Genesis blocks are particularly important as they form the basis of a blockchain and often contain interesting stories or hidden meanings. Genesis blocks are important blocks with interesting stories and hidden meanings that form the basis of the blockchain. To give an example, the genesis block of Bitcoin, the most well-known cryptocurrency, contains the message “The Times 03/January/2009 Chancellor is on the verge of a second bailout package for banks”, referring to the financial crises experienced at that time. With this message, this genesis block tells us why cryptocurrencies such as Bitcoin and Ethereum were created. refers to the reason for its creation. (CMCAP, 2020).

2.2.2.2 Orphan blocks

Blocks that are not part of the chain are called orphan blocks. A miner publishes the block he is working on as soon as he produces it. In this way, the miner receives the reward. However, at similar times, another miner may have produced the same block (Çiçek, 2019). These two identical chains begin to spread in the network. For this reason, two chain entanglement situations arise in the system, with different blocks. This number is sometimes not limited to two but can also increase to 3 or 4. This issue does not cause any problems in the blockchain database. Because the chain with higher computational difficulty is accepted by the miners and block production continues through this chain. The other chain is excluded by the system. The block in question, which is excluded by the system, is called orphan block (Demirkan, 202).

Transactions taken to the orphan block are re-released to the transaction pool and included in the production process. For this reason, it is expected that a few blocks will occur over the generated transaction in order to verify the transfer transactions. The fact that 6 different blocks pass through the block where the transaction is recorded, so we could say this situation generally means that the block has sufficient security (Sarıkaya, 2020).

2.2.2.3 Uncle blocks

Uncle blocks are usually associated with the Ethereum protocol and are equivalent to orphan blocks. There is only a small difference between them. Uncle blocks are blocks that are still built and rejected by the network, but still valid. Unlike orphan block, where miners are not rewarded even though they have produced them, miners can get rewards here by producing uncle blocks (Demirkan, 2021). For a valid block that is successfully revealed as a result of the work done on the Ethereum network, a

miner is rewarded with 3 Ether block rewards. Uncle gives 2,625 Ether rewards for the production of the block. This has two different purposes. The first is to try to maintain the decentralized nature of mining by rewarding miners for producing uncle blocks. The second is to try to increase overall safety of the chain (Sarıkaya, 2020).

2.2.2.4 Stale blocks

Stale blocks are formed as a result of another miner re-finding a resolved block. This block type, which is also described as old block, is confused with orphan blocks. Stale blocks are not included in the blockchain system like orphan blocks. However, the biggest difference of stale blocks from orphan blocks is that they consist of blocks that have been verified but not active (Demirkan, 2021). Once a block is successfully created, the possibility of it being bought by other miners should be stopped. Otherwise, it causes the resolution process performed by one miner to be performed again by a different miner. For this reason, miners extract stale blocks, and as a result, they spend unnecessary resources because they cannot receive a reward (Sarıkaya, 2020).

2.2.3 Distributed ledger

BC is also called Distributed Ledger Technology (DLT). The distributed ledger system is characterized as a database in which public or private ledger records of all digital events and exchanges carried out among its participants are kept or shared. As a result of each public transaction, with the unanimous verification of the majority of the participants in the blockchain system, the information is fixed and can never be deleted. In short, distributed ledger technology includes a precise and verifiable record of all transactions made so far (Ünal & Uluyol, 2020; Yavuz, 2019). In DLT, the records kept on the ledgers are not controlled by any center and these records,

which are always updated and created, are kept independently by each node that we see accordingly (Figure 2).

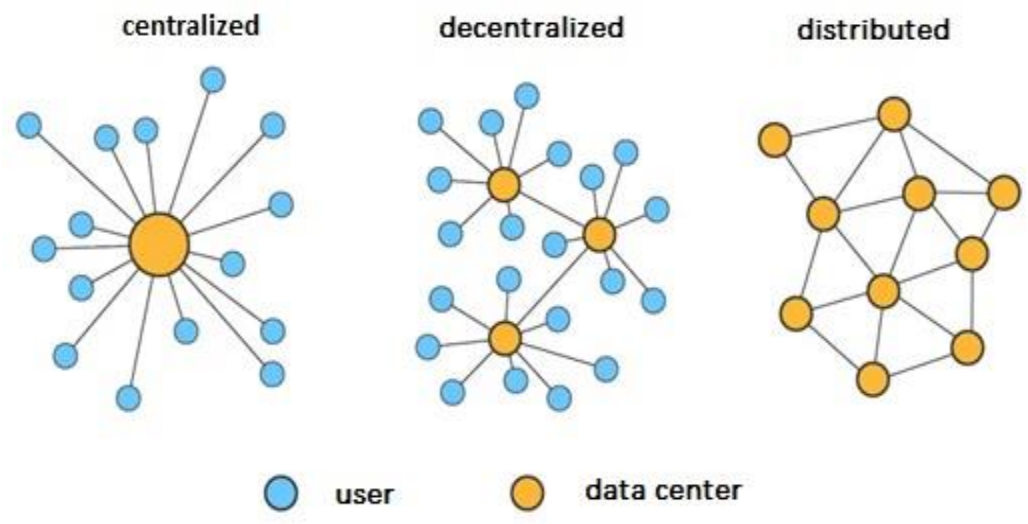

Figure 2. Distributed ledger technology
Source: (Özkaya, 2022)

As seen in Figure 2, DLTs are grouped as centralized, decentralized and distributed as user and data center. The places shown with the end points show each central node (node, station) to which it is connected, and the lines connected to the center show the connection path of these nodes to each other or to the center. DLT, which was born as a revolution in collecting this information and communicating these results to the parties, creates the node record results by recording all the transactions entered, and the accuracy of these records is ensured by all parties by majority vote. It is also valid for transactions that can change (Safak, Arslan, Gözütok & Köprülü, 2021).

Single-center and multi-center DLT networks constitute distributed networks. This structure, where users can get data by connecting to a single server, is an example that fits into a centralized network structure. Many government institutions and banks have interconnected network structures with multiple centers. The number

of servers in the current application here is low, there is a lack of information security due to the small number of servers in the system and used. In this situation, if a server in the center is in the hands of malicious people, it seems possible to access the data and information of all recipients. In this regard, the distributed network structure system is seen as the most secure network type. It is almost impossible to have the data scattered all over the world (Kırbaş, 2018).

In the consensus mechanism, all computers on the distributed structure have a compatible copy of the data in the blockchain network. A consensus on the entire existing network is essential to establish compliance. In order to accept any transaction recorded in a system with multiple parties and multiple parties, it is necessary to ensure that all parties in the system comply with the existing rules. The agreement created by providing all these rules and reaching a unanimity by everyone is called an agreement (Doğantekin, 2018).

2.2.4 Nonce value

The nonce value is a randomly selected integer used to generate the desired block hash value. This value is used by data miners. The difficulty goal indicates how long it will take to build a block. As the difficulty level increases, the time taken to create the block increases. The moment the block is added to the blockchain is shown with a timestamp (Ataşen, 2019). The nonce value is different from the nonce value in the number 1, that is, the genesis block. Because this nonce value is different for each block, it is a singular number. The “nonce” value in block 2 also shows how many times the value is made in the loop according to the entered transactions and the reward mechanism. Nonce is a 4-byte field that usually starts with 0 and increases for each calculation (Tanriverdi, Uysal, & Üstündağ, 2019).

2.2.5 Merkle tree

The Merkle tree is made up of all the blocks sorted down like a pedigree and is also called a Merkle root or hash tree. The hash values of the data blocks are shown at the leaf nodes in the Merkle tree. In non-leaf nodes, the summary values of the blocks under each block are shown (Demirkan, 2021). The Merkle tree root summary shows the hash value of all data in the block. Recorded transactions are grouped in pairs and hash values are obtained. This process continues until the last two hashes are left, as if going from the branches of the same tree to the roots, and when the value of them is taken at the last, the Merkle root value is found. Thus, the hash value of the block is calculated (Tanriverdi, Uysal & Üstündağ, 2019).

The Merkle tree, one of the most important elements of the blockchain, fulfills two tasks at the same time. First, since the Merkle root is formed by obtaining hash values in pairs, any change will change the Merkle root, so the title of the block and the hash value of the title will have changed. Since this value, which is the input of the next block, has changed, the next blocks will also be invalid. Instead of getting the hash value of the whole block, it will be sufficient to get only the hash value of the block header. The second task is to ensure that transaction confirmations are made very easily (Guven & Şahinöz, 2018).

2.2.6 Consensus

Consensus mechanism, on a distributed structure, a machine has a peer-to-peer copy of all data in the blockchain network. A full network-wide consensus is required to ensure this concurrency. In order for any transaction to take place in this BC system, the parties in the system must be accepted by a majority of votes. The process of providing these rules and reaching a consensus is called consensus (Durbilmez &

Türkmen, 2019). The most used consensus systems are Proof of Work-PoW (Proof of Work) and Proof of Stake-PoS (Proof of Stake), and explanations are made about them in the following sections.

2.3 Blockchain features

It is seen that different classifications are made about the properties of BC in various sources. With the development of technology and the spread of BC, these classifications are constantly changing. The key features of the General BC are as follows (Gambhir, Bevan & Devemport, 2018; GSMA, 2018; Petersson & Baur, 2018; PWC, 2017; Hackius & Petersen, 2017);

• Decentralization: Thanks to the systematic infrastructure and decentralized structure offered by BC, the process can only be encrypted between the parties with cryptography, and the process can operate independently of any authority. Thanks to applications and platforms built on decentralization such as BC, it has become possible to find solutions to all problems. BC technology can remove intermediaries by ensuring governance and interaction between individuals or organizations with the use of secure digital signatures.

• Security: In BC, data is recorded in blocks connected to each other in the form of chains, with very difficult security measures such as cryptography and hashing function; In addition, security is ensured thanks to its structure designed to completely change the network integrity with the change of any of the blocks recorded in the past.

• Continuity: In business processes dependent on a single-centered authority, the dysfunction of any unit may lead to situations such as disruption or cessation of

the workflow. Due to BC's use of a decentralized and distributed structure, in case the nodes in the system are largely dysfunctional, the system protects itself and ensures its continuity in case a single full node works.

• Node/Node: Users who ensure the integrity of the network they are in, control transactions and update information about new blocks, as well as keep a copy of the entire transaction history of the network.

• Anonymity: The opportunity it provides to digital identity has made BC the key to the economy of trust, and this has been turned into an opportunity by businesses. So much so that it is predicted that BC will create the great impact and real revolution that technology will bring about in our lives in the upcoming period. BC has provided individual users with unprecedented control over their digital identity with an anonymous identity.

• Transparency: Since the records are recorded in a decentralized structure where all users participating in the network can perform their storage and auditing processes, absolute transparency can be ensured.

• Auditability: Able to keep BC data records transparently, visible to everyone; It has an auditable record ecology that can be reviewed and used by companies, regulators or customers. BC's use of distributed ledger technology enables transactions to be processed and audited without the need for centralized structure auditing.

• Openness to the public: The fact that the platform is decentralized and open to everyone enables it to be updated and developed according to the needs. Instead of

the top-down control mechanism, which is based on the hierarchy in central systems, supervision in the BC structure is carried out by everyone from the bottom up.

• Protection: Recording of all transactions by consensus consensus in BC, keeping data in interconnected blocks offers unalterable and reliable data integrity. Since the slightest change to any of the historical records will disrupt the structure of the entire chain, BC offers a highly innovative solution to ensure the security of historical records.

• Efficiency: Another saving of BC is that it provides an effective and easy auditing opportunity by avoiding the expenditures made to control the accuracy of records in public institutions. BC provides opportunities to greatly reduce production and logistics costs, accelerate production processes and decision-making, reduce intermediaries in the process, and prevent possible fraud in documents and processes.

• Authenticity: At the stage of recording the information in the blocks, verifying the information to be recorded by checking the data in the previous blocks, recording the correct information during the recording phase and removing the doubts about the authenticity of the information in the blocks.

• Trust: For the first time in human history, BC has provided a suitable environment where people all over the world can trust and transact without knowing each other. Trust here is the process created by cooperation, encryption and smart coding from person to person without the need for a third party.

• Interoperable: BC is designed to avoid duplicate spending while keeping records of value transfers. Before an expenditure is made, the validity of the expenditure transaction is checked. Since the control process is done by taking into

account the records of all users in the system, it is possible to work together. Although there is no authority in a decentralized structure, real records are created by working together.

• Real-time: Since records are kept in a decentralized distributed structure, accessing historical records is extremely fast. This makes it possible to quickly access historical records for inspection or control when needed.

2.4 Types of blockchain

BC types are divided into three main groups: Public/Public BC, Private BC, and Federated (Consortium) BC.

2.4.1 General / Public blockchain

As the name suggests, the public BC is open to everyone. A public BC is completely decentralized and has no authority or entity that controls the network. Anyone with an internet connection can join such BCs and participate in reading, writing or controlling within the BC. Public BC allows any user to create a personal address and join the BC network i.e., become a 'node' of the network. Moreover, such BCs are transparent and secure as there are many nodes to verify transactions (Kuo, Kim, & Ohno-Machado, 2017).

With no restrictions, anyone can view and review all records. If they wish, participate in the consensus process to determine which blocks can be added to the chain. Each node has two keys, private and public. Therefore, it is secure and privacy is protected in an encrypted manner. In this way, who does not know who is doing what, but can examine the accounts with all their details. Thus, the transparency of the system is ensured. Anyone in the public BC can participate in the process of

verifying transactions, and everyone in the network is encouraged to act according to the contract. This decentralized system increases its security by increasing the number of participants (Zhang, et al. 2021).

2.4.2 Private blockchain

A private BC is a type of BC in which network participants control who has the right to be involved in the network and likewise who has the right to be involved in the consensus process. Access controls in the network differ for each participant, the regulatory agency or central organization decides on various activities within the network, starting from participation in the network until performing any of the functions in this closed network. In this type of platform, the digital identities of the participants should be managed and monitored by the regulatory agency. Therefore, it is a system that uses distributed ledger technology, not decentralized among its members (Kim, 2021). Its advantages are as follows (Bamakan, Motavali & Bondarti, 2020; Singh, 2020).

• In the case of public BC, the identity of the nodes is unknown; therefore, no one can figure out who the validators are, which increases the risk of malicious activity. In the case of a private BC, however, the credentials of the participating nodes reside on the blockchain; therefore, it is much easier to track where the scam is taking place.

• Because private BCs are generally smaller than public BCs and also act with far fewer participants, it takes much less time for the network to reach a common consensus. As a natural consequence of this, it is possible to have the potential to perform a large number of transactions. Special BCs can handle a large number of

transactions per second when we dig into the details. They also consume much less energy and power to verify transactions. In contrast, public BC networks, which often have thousands of computers to verify transactions, consume a lot of energy.

• Private BCs offer significant benefits for businesses; so that businesses can benefit from very reliable and transparent activities that can be used both among themselves and among each other. BCs because the parties involved are regulated entities that cannot operate on open protocols or public BCs without proper and regular due diligence, which is not possible to operate on open protocols or public BCs. In addition, with smart contracts starting to grow as the technology of the future, this new technology seems to be counting the days to replace centralized enterprises.

2.4.3 Federated (Consortium) blockchain

Federated (Consortium) BC has its own autonomy like private BC. However, consortium BC, unlike private blockchain, has multiple entities on the network. The decentralized structure persists, as there is no single authority governing control. There is a group of companies or representative individuals who make decisions for the benefit of the entire network. Such groups are called consortia or federations. As simulated in Figure 3, if it is assumed that there is a consortium of 20 financial institutions in the BC network, these 20 institutions preselect their nodes to make changes to the network and the authority approves it.

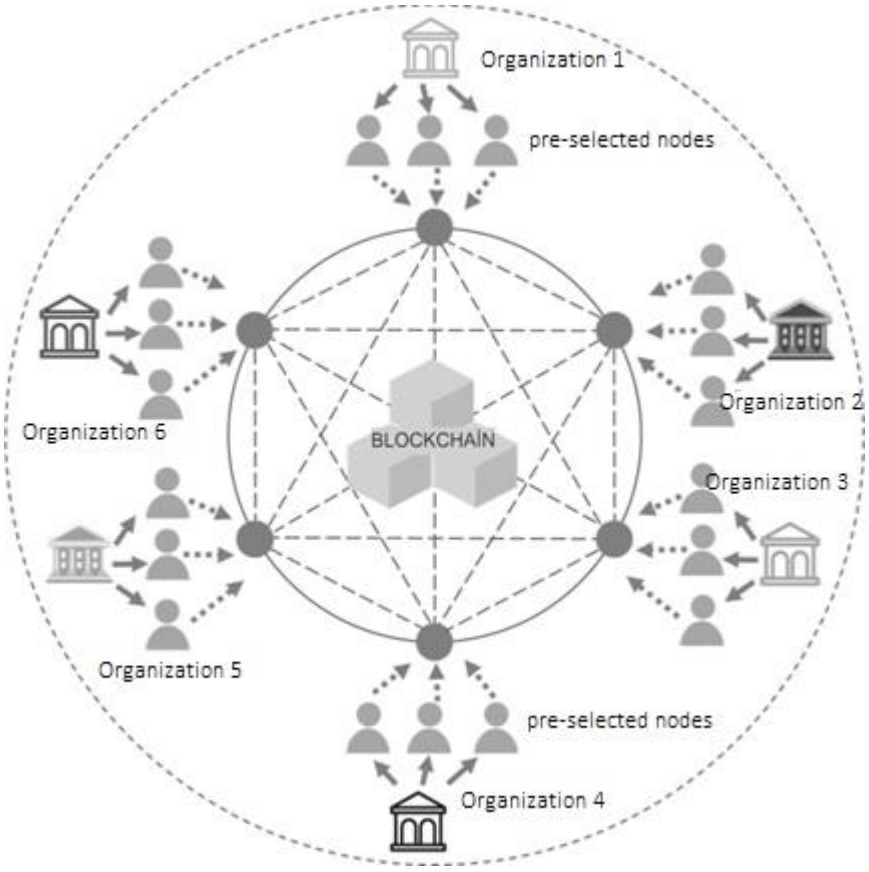

Figure 3. Federated blockchain

Source: (Government Chief Scientific, 2019)

The Federated (Consortium) BC in Figure 3 is the most used BC by institutions, the nodes that add nodes have the authority to read or write transactions, and they can also allow or restrict participants in the network.

2.4.4 Permitted blockchain

Permitted BC is a combination of both private and federal BC. The permitted BC has an access control layer, allowing certain actions to be performed only by identifiable participants with certain privileges. In such BC platforms, it is possible to read, access and write information, etc. Yet, it requires special permissions. The platform works to allow them to join the BC network after proper authentication, and then allocates special permissions to perform only certain activities on the network. For

example, a person can access nodes in the network, view or add with a certain level of authority, depending on the degree of authority granted to him.

2.4.5 Hybrid blockchain

A hybrid BC strain is both a special and a general BC combination. A hybrid BC provides controlled access and freedom at the same time. In other words, hybrid BC organizations allow users by setting a system-based subsystem-based private permission without the need for public permission. For example, keyword selection, location determination, filtering, etc. With such a system, organizations can control what data is stored, accessed, and viewed on the blockchain, as well as control who can access what and how much, and what data from records can be allowed to be opened, and keep the rest private on the private network. Through obtaining special permission, paid membership, etc. getting confidential or hidden information are available options.

2.5 Blockchain working principle

Acting as a decentralized verification system and a secure record store, BC acts in many different areas from registration of valuable assets, vehicles and real estate, to keeping documents such as birth, death, marriage, diploma, processing, storage and management of financial documents, and realization of all local and general elections that has made it a valuable technology that can be applied. BC technology, which can be described as a global open ledger, provides unprecedented control over digital identity (Houben & Snyers, 2018; NKB, 2018). The ability to access backwards between all blocks registered on the chain provides transparency. The need for an administration is eliminated with its system that prevents the change of valid records.

The disappearance of many documents, intermediaries and management mechanisms reduces the costs considerably (Tanriverdi, Uysal & Üstündağ, 2019).

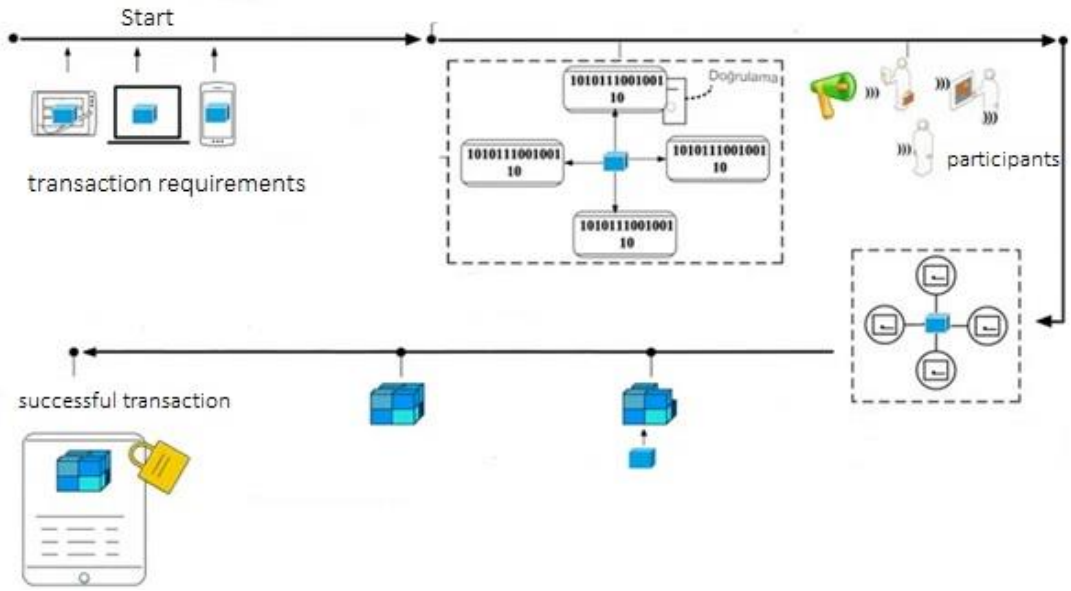

Figure 4. Blockchain working principle
Source: (Giacalone, et al., 2021)

As seen in Figure 4, the first block structure within the scope of the chain is called the "genesis" (initial) block. The first data of this start block is created by the user. It is followed by data and information that then adds other users to the chain on the same topic. For example, after an accounting record is opened, the following transactions and the users who add to this accounting record are added to each other as continuous blocks. This information can be viewed instantly, serving the tax office, creating information for managers, etc. It shows continuity for this purpose (Gupta & Sam, 2019). “By passing the information in the block header collectively through a secure hashing algorithm, the hashing information of that block (block hash) is reached. Each block is 1 MB long and at least one transaction is held in each. The header that holds the data for the block is 80 bytes in size. About 350-500

transaction data are kept in a block. When a transfer operation is performed, it is at least 250 Bytes in size" (Çarkacıoğlu, 2016).

2.5.1 PoW algorithm

The PoW algorithm or "Proof of Work" is the most used consensus mechanism. In the PoW algorithm, users in a network send digital tokens to each other. In this algorithm, all transactions are collected in blocks by a decentralized ledger. However, it is necessary to be sensitive about transaction confirmation and issuance of blocks. What is mentioned here is the operation done on the special nodes, and the operation that makes the miners is called mining. (Mingxiao, Xiaofeng, Zhe, Xiangwei, & Qijun, 2017).

Miners are the most basic building blocks of this system. Miners need to find a nonce value that is accepted as the result of the hash output. A nonce is a number such that the hash of the block meets a certain criterion. This criterion may be that the generated hash must have four leading digits to be zero. So, the generated hash looks like 000010101010xxx. Usually, the miner starts with a Nonce value of 0 and continues to increase the generated hash until it meets the specified criteria (Tutorials Point, 2020; Sheikh, Azmathullah, & Rizwan, 2018).

Miners independently and continuously compete to solve these mixed puzzles. The first miner to solve the puzzle is successful and is rewarded. The successful miner connects the block he created to the chain to receive his reward. PoW algorithm; It is used by Bitcoin, Ethereum, Litecoin and other public blockchain networks. Competition between miners creates high energy consumption on the network side (Yoo, 2019).

2.5.2 Proof of stake (PoS)

Proof-of-Stake (PoS) or Proof-of-Stake is the second most preferred and implemented consensus mechanism as an alternative to PoW. It is much more efficient than PoW because the energy used is less, the processing time is much shorter, the cost is lower and at the same time the power used for computation is lower. In this consensus algorithm, who will create the new block is chosen using a random method. This mechanism has validators instead of miners. Users create their tokens as validators. In other words, they provide the necessary conditions for the formation of a new block by blocking the money they have invested. The user with the most stakes is closest to the verification chance, and he or she has the chance to create a new block. By using this consensus within the network, other validators are provided to use less energy (Nguyen, 2019). This is because only selected validators have the right to create blocks. If the validator does something wrong during block creation, they lose their stake. The validator who created the block is rewarded. Other validators that verify and validate the block only charge transaction fees (Ganesh, Orlandi, & Tschudi, 2019).

In summary, PoS is similar to PoW, but the only difference is that there is no competition. The network itself uses the ghost protocol by choosing the validator node. “Persons who process the blockchain in the PoS consensus protocol are required to prove ownership of a currency amount. People with a large amount of assets in this protocol will be more likely to be used in verification processes. Because of this aspect, this protocol is weak in terms of justice. It is more energy efficient than the PoW consensus protocol. As a critical disadvantage, it is vulnerable to attacks on the network” (Tanriverdi, Uysal, & Üstündağ, 2019).

2.5.3 Authorized proof of stake (DPoS)

Thanks to Authorized proof of stake (DPoS) algorithms, it completely eliminates the inefficient mining process that requires high energy within PoW protocols and makes BC networks and the system more efficient. Ensuring security is promoted through PoS algorithms by verifying user network data. PoS algorithms power some of the most innovative and popular BCs today, which may be the most effective consensus mechanism in BC's advancement. (Saad & Radzi, 2020).

Based on DPoS, BC operates on a voting system where stakeholders delegate their work to third parties. To put it another way, these stakeholders have the right to choose others to protect their systems. Delegates are responsible for establishing consensus in the formation and verification of new blocks. In this system, the voting power of the user depends on the chains in his hand. Although voting varies from project to project, delegates act individually. In this system, the awards won by the shareholders or the delegates chosen by them are distributed proportionally according to the selected people. This is why the DPoS algorithm proceeds as a voting system that puts the reputation of the delegates to the fore. In this system, if a node selected is not working properly or is not active enough, it is dismissed and is quickly replaced by someone else (Hu, Yan, Han & Yu, 2021).

DPoS divides nodes in the BC system into three categories: witnesses/witnesses, delegates, and workers. Witnesses are the core of the entire system and are chosen by voting by all nodes (tokens). The winning nodes in the voting witness. As they are assigned, they create new blocks one by one and receive their rewards. Witnesses cannot be disqualified in conciliation processes unless there are special reasons and they retain the right to form a block for a long time. If the

witness cannot create the block allocated to him, the activity of this block is carried over to the next block. In this case, the witness is deemed unsuccessful in the block creation process and the stakeholders vote to select new witnesses (Hu, Yan, Han & Yu, 2021; Saad & Radzi, 2020). Delegates can initiate a request for the BZ to be updated. Workers could submit new projects and receive rewards from projects that have likewise been voted on and selected. DPoS makes the most of stakeholder votes to negotiate democratically and fairly. Compared to both PoW and PoS mechanisms, DPoS is a more efficient and less costly consensus mechanism than the other two (Hu, Yan, Han & Yu, 2021; Saad & Radzi, 2020).

2.5.4 Practical byzantine fault tolerance (PBFT)

Practical Byzantine Fault Tolerance (PBFT) is an optional unanimity protocol that can be used especially for consortium blockchain situations where strong consistency is required. The basis of Byzantine agreement methods is based on the problem of Byzantine generals. PBFT raises the problem of inefficiency due to high energy consumption and also the problem of not being scalable enough, so the reliability of the node is at risk and cannot be guaranteed (Zhang, Zhu & Fan, 2020). This problem is based on the assumption that some generals can be traitors and their attack strategies. In summary, N generals must decide, at a certain stage of the war, to either attack the other side or step back and withdraw. The goal is for the generals loyal to the army to agree on a common plan against the generals who are plotting treacherous action. Each general announces his decision to everyone. Some generals are treacherous and submit no or contradictory input to avoid the situation where trusted generals can make a unanimous decision (Zhu et al., 2020).

In general, the BC is the structure where the miners who process and validate the data in the blocks connect with the blocks (link in the form of a chain). Thanks to BC, the information is recorded in a secure and open registry and processed under the control of all users working with the encrypted computer database and participating in the system (Giacalone, et al., 2021). BC not only provides data flow, but also ensures that no intermediary is required for transfers, fast and reliable transactions, and low transaction costs. BC system maximizes transaction security with high technology (Çetiner, 2018). BC technology has potential implications for all industries. For this reason, BC technology has recently become a controversial concept in many sectors. Since this technology is still an area that continues to develop, its known effects at the enterprise level have not been fully revealed. In addition, many businesses have started to create their own prototype technologies in order to understand BC (Gupta & Sam, 2019; Çarkacıoğlu, 2016).

CHAPTER 3

DIGITAL ECONOMY, MARKETING AND BLOCK CHAIN

3.1 Digital economy

Digital economy includes but not restricted to blockchain, digital technologies-cloud computing, Internet of Things (IoT), advanced robotics, big data analytics, artificial intelligence and machine learning, social media, 3D printing, augmented reality, virtual reality, e-money and distributed ledgers etc. It is an ecosystem that consists of components that changes the way businesses operate (Bukht & Heeks, 2017). Considering these changes, it can be said that the digital economy is effective in five main points (D'souza & Williams, 2017):

• Data collection and analysis: Companies collect the preferences of current customers in order to predict customer behavior and increase the quality of service offered to customers as a result of this goal.

• Personalization and customization: Companies can offer customized products and services, provide and provide effective experiences to customers, interpret shopping preferences with artificial intelligence, make predictions and offer offers,

• Trial and continuous improvement: To be able to make more effective decisions in production and resource allocation by automating the systems of companies, to benefit from large data sets, thus to use powerful forecasting algorithms,

• Innovations in contracts: For companies and consumers to follow, monitor and verify the performance of other people with whom they trade, to facilitate economic activities,

• Coordination and communication: Gaining flexibility, sharing, in-depth knowledge of products and services, thanks to the high performance of communication tools (document-information sharing, video conferencing, wireless mobility devices eg.).

With the development of mobile technology, ubiquitous internet access, cloud storage, analysis, interpretation, sharing and new applications, the digital economy plays a powerful role in economic activities on both the production and consumption side. However, the digital economy has become a broad field that includes not only results but also background activities such as data, data management, data systems and artificial intelligence technologies (Van Ark, 2016).

As digital technologies increasingly permeate many aspects of society and the economy, it is difficult to define exactly what constitutes a digital economy. According to the general approach, the roots of the digital economy, which are interpreted around the concepts of "knowledge economies" and "network economies", are an ever-evolving economic system based on digital technologies, where information networks are used, information sharing is valuable, where people and companies act over information and networks. In this context, the knowledge economy is the combination of mobile and internet-based technologies and a series of economic and social activities where people and companies meet (OECD, 2016).

What is as important as the digital economy is its continuous growth and innovations in the life of humanity. Because the digital economy is growing,

production and consumption are also guiding along with social and economic changes. As a matter of fact, the world's five biggest technology giants Google, Apple, Facebook, Amazon and Microsoft (GAFAM) companies have created and pioneered a wide product, application, service, content and user ecosystem by operating with multilateral platforms. GAFAM, start-up, R&D, etc., with the steps that carry the digital economy to the future. They have also been pioneers in innovation, patents, engineering, talent and customer base in different fields. Although each of the GAFAM group has its own special expertise and area of interest, their main common point is BC technologies (Gautier & Lamesch, 2021).

For all players of the digital economy, BC technology, which is in the background of their actions, occupies the most important place among the driving forces for them. Under this new wave of technological change, the nature of intermediation is fundamentally changing as intermediaries continue to add value to transactions. Organizations and businesses that combine specialization to expand technological boundaries and BC technologies can bring together goals, ideas and solutions (Catalini, 2017). According to Ertz and Boily (2020), who describe the new structure created by digital economy and BC technologies as "collaborative economy". Collaborative economy which is a concept that complements concepts such as sharing economy, collaborative consumption, discretionary economy, discretionary services, group economy, independent economy, peer economy, digital economy and platform economy.

The collaborative economy is based on the idea of a socio-economic model and includes both redistribution and reciprocity, which are key features of the digital economy. While redistribution is a barter method aimed at the transfer of ownership,

reciprocity means the use of resources without the transfer of ownership rights. At this point, the digital economy allows mutuality through new traffic systems where BC technologies come into play. Information, data, flow, etc. Depending on the traffic, such as from the producer to the consumer, roles are transformed, and the nature of market changes also changes. In this context, the cooperative economy includes the redistribution of goods and services not only by barter using money, but also by resale, barter or transfer (Ertz & Boily, 2020).

If it is remembered that the basic feature of BC technologies is the successive addition of information and data blocks, it can be stated that BC and the digital economy interact at three points. The first is "Blockchain 1.0" as a digital currency, "Blockchain 2.0" as a digital economy, and "Blockchain 3.0" as a digital society.

• "Blockchain 1.0" - Digital Currency: "Blockchain 1.0" the first emerging generation of applications with BC technology. It represents the underlying technology platform (mining, hashing and public ledger), on-chain protocol (software that provides transactions), and digital currency (coins, tokens, etc.) that represents a store of value. Thanks to digital currencies or digital assets used as money substitutes, transaction fees for online purchases or transfers are reduced and procedures are almost completely eliminated. There are advantages in terms of time, speed and legal processes. Inflation, exchange rate change, convertibility, limitation, etc. in conventional currencies. such situations are eliminated. With a single unit, it is possible to exchange globally. (Moore, 2013).

• "Blockchain 2.0" - Digital Economy: Although the definition of digital economy was recommended to us years ago, it has only been realized today with a suitable technology platform such as BC. "Blockchain 2.0" not only covers payments

and money transfers, but also covers various applications in today's more important economic and financial fields. Applications in this area cover both core banking instruments such as banking loans, comprehensive financial market instruments such as stocks and derivatives, and legal instruments such as assets such as title deeds and contracts, and properties. Payment clearing system and bank credit information systems are typical scenarios of BC applications. “Blockchain 2.0”, the meeting point of the BC and the digital economy, is based on smart contracts. Smart contracts are the systems that enable the automatic fulfillment of the obligations set forth by a predetermined agreement through a computer program. When a condition in the contract made between the parties to the contract is fulfilled, it contractually offers security and transparency to the parties. For example, in 2015 Visa and DocuSign introduced smart contracts to rent a car without the need to fill out forms (Efanov & Roschin, 2018)

• “Blockchain 3.0” - Digital Society: “Blockchain 3.0” refers to a wide variety of applications that do not directly involve economic activities but serve human and community life. Such practices include the arts, health, science, education, identity, governance, public services, culture and communication. With BC technology, the urbanism of the future is created thanks to mobility, citizenship services, the use of existing resources and smart applications in economic matters, which are the elements that make up smart cities. The Internet of Things (IoT), on the other hand, is now a candidate to become the new platform of e-commerce thanks to BC technology and smart contracts in the new era, so that smart property and paid data transfer is also possible with the use of P2P commerce. With the machine-machine (M2M) interaction between service and service providers, the market mechanism can become more fluid. However, thanks to the centralization of BC

technology, it can be applied to large-scale data management in a wide range from electronic medical records to education background, from foreign trade to customs clearance, and comprehensive auditability, interoperability and accessibility can be achieved. Thanks to personalization and digital identity, which are the building blocks of the digital economy, people can store their own information in BC (Sikorski, Haughton, & Kraft, 2017; Sun, Yan & Zhang, 2016).

3.2 Transformation of marketing

Marketing is a discipline that covers a wide process from pre-production to post-production and to returns (Durmaz, 2013). Marketing, which serves the sole purpose of businesses to maintain their existence and ensure profitability, includes a variety of activities using both quantitative techniques and qualitative techniques (Odabaşı and Barış, 2007). Marketing establishes a connection between customers, businesses and society by using various tools and focuses on maintaining this (Barutçu, 2008). In this context, marketing is the essential element of business strategies and undertakes pricing, product distribution and promotional activities in order to achieve organizational goals. (Baysal & Aka, 2013). Therefore, the center of marketing is not a singular understanding such as sales, but creating values for the stakeholders. Among these values, there are many things from sales to market analysis, from consumer research to product development (Yükselen, 2014). When we evaluate marketing both in the context of its fields of activity and in the context of activity objectives and activity strategies, we can characterize it as both a science and a field of application. (Mucuk, 2016).

Marketing is a field of science and practice that is constantly changing, developing and renewing itself especially according to technical developments, both

business-oriented and human and society-oriented, and can also renew itself by changing itself according to the dynamics of the life cycle (Tek & Özgül, 2013). Marketing is described historically by dividing it into four main periods. The first period is the product-centered period, in which, according to the understanding of this period, products with features that can meet the needs can be easily sold and this is sufficient for the product (Kotler & Keller, 2006). In the second period, the basic logic was that the important thing was production and everything that could be produced could be sold thanks to the developing techniques (Yükselen, 2014). In the third period, the product or sales-oriented system has changed and a consumer-centered understanding has come to the forefront by taking the consumers to the center and making improvements for their preferences (Ödemiş & Hassan, 2019). The fourth period of marketing, on the other hand, is characterized as the social marketing period, which includes the correct use of resources, social responsibility projects and environmentally sensitive projects, and which is based on the general preferences and behaviors of consumers and emphasizes sustainability (Yükselen, 2014).

When we look at four different periods, we can easily see that there is the focus of each period and various factors behind this focus. For example, with the use of new techniques in production and the developments in production capability and capacity, product and sales-oriented periods have been experienced. As of today, marketing; social media, internet, digitalization, multiple access, mobilization etc. It has started to turn towards a new period among many inputs and factors such as This period is defined as “Marketing 4.0”, very different from the previous ones. The development from Marketing 1.0 to Marketing 4.0 is summarized below.

3.2.1 Marketing 1.0

Marketing 1.0 is shaped according to the policies and strategies determined by the enterprises of the production and the products obtained. It is based on the philosophy of "I sell what I produce" in conditions where the producer's low demand is high (Jara et al., 2012). During this period, consumers were not in focus and therefore did not have much impact on companies in terms of production (Nowacki, 2015).

Marketing 1.0 can actually be considered as the first step or cornerstone of the existence of modern marketing today. With the development of the economy and production, the number of companies in the market began to increase, and thus, alternative products emerged and competition began. In the emergence of competition, the cost of production, the quality of the product and the benefit to the consumer have been brought to the fore and new strategies have been formed (Kotler and Keller, 2006).

3.2.2 Marketing 2.0

Marketing 2.0 actually cannot be thought of independently from Web 2.0. Thanks to Web 2.0 technology, companies are now able to go beyond one-sided communication and establish mutual communication with consumers. The main reason for this situation has been the changes in people's business and social lives with the effect of globalization and strong developments in the economy (Tarabasz, 2013). During this period, both consumers and businesses experienced serious changes. Thanks to the developing technologies, consumers' access to information has become easier and they can compare similar products in the market. Realizing this situation, businesses have started to develop new completely customer-oriented strategies by following the consumers even more closely (Jara et al., 2012). Product,

price, promotion and place, known as the 4Ps of today's marketing, emerged in this period and began to be generally accepted (Kumar, Rahman, Kazmi, & Goyal, 2012).

3.2.3 Marketing 3.0

Marketing 3.0, shaped by the knowledge of the past, can be defined as a value-oriented marketing, and at the same time, consumers are also at the center of the subject (Varey & McKie, 2010: 330; Erragcha & Romdhane, 2014). In Marketing 1.0, companies are completely production-oriented and it is assumed that the product can be sold with the functionality of the product. A functional product is thought to satisfy customers. In Marketing 2.0, companies focused not only on the products' functions, but also on the consumers. It is aimed that consumers establish an emotional bond with the product or company. In Marketing 3.0, on the other hand, the focus is entirely on consumer satisfaction and the products are created entirely on consumer satisfaction (Varey & McKie, 2010; Erragcha & Romdhane, 2014). Since social and environmental problems have come to the fore along with economic problems, companies have included social projects. Projects that give importance to the environment in the marketing processes in this period started to play important roles.

3.2.4 Marketing 4.0

Marketing 4.0 is the new era marketing that emerged with rise of the technology and the globalization of competition. The consumers can be differentiated with types through the development of technology. Marketing 4.0 has been evolved by the transformation of existing marketing practices. Therefore, it is discussed whether it is modification or original (Jara et al., 2012; Tarabasz., 2013; Nowacki 2015).

Marketing 4.0 is similar to previous periods in that it is customer-oriented. The consumer is still at the center. Thanks to the differentiating market conditions and developing technology, both consumers and commercial transactions can be monitored instantly in Marketing 4.0 (Dholakia, Zwick & Denegri-Knott, 2010).

Marketing 4.0 uses today's high technology in production and marketing processes. As in previous generation marketing, it is customer-oriented. It keeps the customers in the foreground, it also carries the concern of creating value for the society and adopts social and environmental issues (Jara et al., 2012). Marketing 4.0 has the ability to predict the future preferences of consumers thanks to big data management. Thanks to the interaction of humanity and high technology, marketing has become digital in Marketing 4.0 (Vassileva, 2017). Thanks to high-level technologies such as the use of technology that started with barcode and RFID, the provision of communication between machines, the use of artificial intelligence, machine learning and augmented reality, Marketing 4.0, that is, a new generation marketing in the field of digital marketing has emerged (Durukal, 2019; Başyazıcıoğlu & Karamustafa, 2018). In order to present a general view, the changes and differences between marketing generations are presented in Table 1.

Table 1. Characteristics of Marketing Generations

	Marketing 1.0 (Product Oriented)	Marketing 2.0 (Customer Oriented)	Marketing 3.0 (Value Driven)	Marketing 4.0 (Digital Focused)
goal	sell products	satisfy the customer	Making the world a better place	Creating the future from today
causative factor	industrial Revolution	Information Technology	new wave technology	Cybernetic revolution and Web 4.0
Key Marketing Concept	Product development	Differentiation	Values	Production according to the customer and just-in-time production
Value propositions	Functional	functional and emotional	functional, emotional and spiritual	Functional, emotional, spiritual and self-creative
Interaction with Customers	One to Many operation	One to One relationship	Many-to-Many collaboration	Many-to-Many co-creation and collaboration

Source: (Ertuğrul and Deniz, 2018).

As can be seen in Table 1, marketing firstly experienced a change in the technical field and then changed in the social sense. Thus, the meaning content was shaped. Today, with the effective and intense use of technology as an integral part of life, the approaches of both companies and consumers have changed completely compared to the past.

Today, information technologies, digital technologies and mobile technologies have a comprehensive impact on people's daily lives, which is why definitions such as information age or information society are identified. It can be said that these developments in information technologies have opened a new era in

the field of marketing (Ntalkos, Kambourakis, & Damopoulos, 2015: 540). Mobile technologies allow consumers to constantly communicate and also facilitate access to information, thereby creating digital consumers (Ertuğrul & Deniz, 2018: 160). Marketing that includes new digital consumers is "Digital Marketing" as stated above, and explanations were made about this concept in the ongoing title.

3.3 Digital marketing

Digital marketing is a process based on using digital tools and channels in marketing activities to gain competitive advantage, increase sales and brand awareness, introduce products to consumers, motivate purchase, establish interactive relationships, and increase brand loyalty (Yasmin, Tasnee & Fatema, 2015). Digital marketing tools consist of internet, social media and mobile platforms.

Digital marketing as part of the knowledge economy; It is all of the marketing activities in which digital channels such as search engines, websites, social media and mobile applications are used (Yasmin, Tasnee & Fatema, 2015). Digital marketing is a technology-based and communication processes that mediate the right offer, which is the number one rule of marketing, at the right place and time. For this reason, digital marketing brings companies and brands together in the same, common channels with targeted consumer groups (Yasmin, Tasnee & Fatema, 2015; Aydın & Oğuz, 2007).

Digital marketing is a new technology-based marketing strategy that allows consumers to create profiles by offering new experiences online, thus enabling real-time targeting and personalization at the same time (Aiolfi, Bellini and Pellegrini, 2021). Today, the fact that the majority of consumers are mobile and also constantly

online has brought digital marketing to an even more important point (Gökşin, 2017). Today, with the developments in technology, the internet has become indispensable for people's lives. For example, 4.66 billion of the 7.81 billion people in the world population are internet users, which explains the reason why marketing has moved to digital channels (We Are Social, 2020).

Through the tools and channels, digital marketing aims to provide consumers with an experience, to arouse consumers' interest in the product, and to direct their purchasing behavior by attracting the attention of consumers (Çetintürk, 2019). Digital marketing aims to establish a link between companies and consumers by using tools and applications that provide experience and to make this sustainable (Çetintürk, 2019; Kemaloğlu, 2017; Konuk, 2014). In this respect, digital marketing creates personalized experiences thanks to the impressions provided by information technologies.In this respect, it provides a great advantage over traditional marketing (Tang, Zhang, & Wu, 2014). Digital marketing differentiates itself from traditional marketing due to its digital channels. It offers different and special opportunities to consumers. Digital marketing with tools such as augmented reality can affect the purchasing behavior of consumers (Bala & Verma, 2018).

It is possible to collect the effect and function of digital marketing on consumer behavior under four headings. These are as follows (Deloitte, 2019; Mckinsey, 2018; Mckinsey, 2015; Yasmin, Tasnee and Fatema, 2015).

• Automation: In this way, convenience is provided to the consumer in transactions. Although process automation is technical, it is extremely simple, convenient and provides an engaging experience for the consumer.

• Proactive Personalization: Customer-specific new experiences can be offered thanks to the knowledge used based on the customer's past interactions. The most basic example is to personalize the next steps in this journey for the consumer by remembering consumer preferences.

• Content Interaction: It allows the consumer to view the post-order status by taking the next step on the main page. For example, the mobile applications of some hotels provide their customers with a key feature when entering the hotel room.

• Innovation in the Consumer Journey: Companies try to predict which product consumers will prefer next, thanks to big data management. Augmented reality is a beautiful technology used for this.

Although blockchain technology has emerged as the infrastructure of a digital currency to transfer money over the internet and be used in shopping, it is understood that it is a structure designed to be used for many different purposes as time goes on. This structure has begun to penetrate more and more areas of life with the digital economy. In this context, in order to provide an overview, the areas where the relationship between digital economy and BC are are presented in Table 2.

Table 2. Sectors that Digital Economy and Blockchain Relationship is Concerned

Digital Economy Units	Blockchain Solutions
Banking	In the blockchain, which is a digitized, secure, and attack-resistant ledger, financial services operate accurately and transparently.
Voting	In the blockchain, it is possible to count the votes correctly, not to be exposed to any cheating or deception, and to carry out the elections in a transparent manner.
Authentication on the Internet	Thanks to the private key, which is unique to the person in the form of a fingerprint in the blockchain structure, there is no need for any authentication.
Education and Academy	Verification of primary/secondary education, university and academic credentials is a very laborious process with paper documentation and verification processes. Blockchain promises a solution to this problem.
Vehicle Sale and Rental	Vehicle sales and rental records are made accurately in the blockchain without the need for a notary public.
Cloud Storage	It usually secures customers' data on a central server, which raises the issue of network vulnerability from attacks. In the blockchain system, it allows the decentralization of storage and prevents system damage and widespread data loss.
Cloud Computing	Cloud services require large computational resources and data storage capacity, which can be inefficient when it comes to launching IoT products. It can help facilitate decentralized cloud services on the blockchain, increasing connectivity, security, and computing power.
Music and Entertainment Industry	Making content sharing fairer and especially the distribution of the revenues to producers without intermediaries encourages this sector to use blockchain.
Real Estate and Real Estate	In the blockchain structure, where the past ownership of the properties is recorded, a property is easily tracked.
Stock Transactions	This system is preferred because it is more efficient to facilitate stock buying and selling transactions and to record commercial transactions.
Insurance	The system is also used in insurance transactions by preventing time loss with bureaucracy and documentation processes.
Health Service	It can allow hospitals, payers, and other parties in the healthcare value chain to share access to their networks without compromising data security and integrity.
E-Commerce	Blockchain technology has the potential to transform by reducing transaction costs and tightening transaction security. For example, Alibaba filed a patent for a blockchain-based transaction in Brazil in March 2020.
Energy Management	In this structure, which reaches the consumer directly without the need for an intermediary, it is also possible to share about electricity generation from solar energy.
Will-Inheritance	The use of the blockchain system in terms of taking the will correctly with smart contracts and including the list of transactions that will take place after death prevents problems that may occur.
Photography	In our digital world, where image theft is usually done with two clicks, photographers may have to get paid royalties for their work.
Government Services and Public Records	Thanks to this structure, which allows the use of less paper for the realization of state affairs, it is possible to prevent counterfeiting and to prevent conflicts between state employees and citizens.
Internet Advertising	It is the structure that allows better targeted ads and advertisers better data on their spending, without malware.
Charities	It is a big problem whether the money given for charity actually goes where we give it. The transparency of the blockchain system eliminates this problem.
Critical Infrastructure Security	The security element, which will be provided by cryptography, is possible with the entry of certain people into the system today. It is a more protected structure against malicious third parties in the blockchain structure.
Retail	With the opportunity to shop without the need for any intermediary, the manufacturer, who reveals the product in the blockchain structure, receives a fairer share, while the consumer can have it for a lower fee.
Human Resources	A large number of documents required in the recruitment processes will be easily accessible thanks to this structure.
Libraries	Thanks to this structure, many works will be preserved and transferred to future generations. At the same time, it will be easier to establish intellectual property rights related to digital products.
Accounting	It works with a wide variety of documents that contain extensive personal or organizational information, from tax forms to bank statements to spreadsheets. This data processed on the blockchain becomes easy to track.

Source: (Carda, 2021).

3.4 Blockchain and marketing

The emergence of the internet, information technologies, social media, and social networks under BC has reshaped the way marketers interact with consumers and

manage their marketing campaigns in a digital world. With the integration of digital and real world for consumers, digital marketing has created a competitive and demanding environment for companies, brands and marketers. The adoption of BC technologies by consumers has also been instrumental in redesigning the marketing mix and strategies in particular, promotion in general. BC has created advantages in creating a unique and extremely valuable data set for companies, especially in the marketing communication process. Determining consumer preferences, designing the products and services to be offered/to be offered, establishing communication with the market, observing the mobility in the market, etc. BC has brought many advantages in vital processes such as very long and costly data for companies such as the product, age group, expectation, opinions, and recommending behavior of a consumer can be obtained in a very short time, even instantaneously. In this context, the marketing and social and economic benefits of BC in particular are presented in Table 3.

Table 3. Marketing, Social and Economic Benefits of Blockchain

Strategic Benefits	Transparency: Access to data is open to everyone and all users in the network have the opportunity to see all transactions made in blockchain technology at the same time. Avoiding fraud and manipulation: It is very difficult to implement any internet attacks or transactions made by unauthorized persons without being noticed. The distribution of information to many ledgers both protects data and prevents attacks. Reducing corruption: It prevents corruption and alteration of the information recorded in the ledgers and provides reliable storage.
Organizational benefits	Increases trust: Transactions made on the blockchain are recorded and cannot be changed. In the system, the data is verified by multiple nodes and the trust in the process and blockchain technology increases. Transparency and auditability: Checkability of transaction histories and access to multiple logbooks provide consistency in audits. It increases the estimation ability: Since the information of all historical transactions can be examined retrospectively, it provides support to increase the estimation ability. It provides increased control: All information in the blockchain technology is recorded in a controlled manner in the form of unanimous consent. This results in the accuracy and high quality of the data.
Economic benefits	It reduces costs: Since transactions can be made without being affiliated with an intermediary institution, there are no commission payments. This also reduces costs. It also provides great support for studies on data accuracy. Provides flexibility against Inappropriate Messages and prevention of cyber-attacks: The high security offered by blockchain technology reduces the cost of the work taken for the precautions taken for cyber-attacks.
Informational Benefits	Superior quality and integrity of data: Since the information stored in the blockchain is taken unanimously, it is in a quality integrity. It reduces human-induced errors: Transactions performed in the blockchain and controls for these transactions are carried out automatically. This reduces human-induced errors. Ease of access to information: In the blockchain, information is stored in more than one place for easy and fast access. People in the network can easily access this information. Provides privacy: People in the blockchain can become anonymous thanks to encryption keys. In this way, the identity information of individuals can be hidden. Provides reliability: Thanks to the feature of the blockchain, data is stored in multiple places and can only be changed if agreed and accepted among the people on the network. This ensures a high level of reliability.
Technological benefits	Provides flexibility: The system offers resilience against internet attacks. Security: It is impossible to capture the data because the data is stored in multiple databases in a distributed manner. Persistence and immutability: Data registered in the blockchain is difficult to change or delete, as the data is stored distributed in multiple databases. Reduces energy consumption: The energy consumption used in the blockchain is reduced by transaction mechanisms and increased efficiency.

Source: (Sağtaş, 2022).

Digital transaction tools and assets are at the core of the BC and marketing relationship; In the near future, traditional business models in more than 50 sectors may change drastically. Concepts such as real-time transactions, transparency, security, openness, diversity, comparison, intermediation, and 24/7 access on the part

of both businesses and customers are now at the center of the marketing process (Ayberkin & Özen, 2021; Antoniadis, Kontsas, & Spinthiropoulos, 2019). However, there is an erroneous and common tendency to treat the marketing relationship with BC specifically to cryptocurrencies. BC and marketing applications differ from cryptocurrencies in three ways. First, while monetary mobility is at the center of cryptocurrency fintech applications, product, place and time utility are prioritized in the BC and marketing relationship. In addition, in the relationship between BC and marketing, there is a combination of non-financial structures and tools (consumer preferences, competitive environment, strategies, etc.) as well as payment systems. Secondly, the BC and marketing relationship is a result of the processes "Blockchain 1.0, Blockchain 2.0 and Blockchain 3.0" and is changing, transforming and improving marketing in social and economic context. Cryptocurrencies, on the other hand, are mostly shaped around "Blockchain 1.0". Third, BC and marketing are making progress every day with constantly evolving features and tools. It is not dependent on financial and financial processes like cryptocurrencies. A wide area is spread by smart contracts from the activities of charities to promotion activities (Antoniadis, Kontsas & Spinthiropoulos, 2019; Casino, Dasaklis & Patsakis, 2016).

3.5 Blockchain applications in marketing

There is no consensus on blockchain applications in marketing. On the other hand, there are few academic studies on BC applications that support marketing activities. However, the benefits of BC are seen as indisputable in the practitioner-based literature (Ghose, 2018). Among the most important impacts of BC in marketing are processing and filtering of data streams and removal of costly intermediaries (Antoniadis, Kontsas, & Spinthiropoulos, 2019).

BC technology is also effective in securing immutable and shareable data and providing ease of access to data. From the consumer's perspective, BC technology has the potential to drastically change relationships with consumers by increasing the transparency of data and information, while ensuring privacy and security at the same time. BC technologies can also be characterized as innovative consumer loyalty programs, thus creating additional value. (Ghose, 2018). For example, the solutions offered by BC in the context of Influencer Marketing and Loyalty Programs can be examined as an example in terms of uncertainty and problem solving in marketing applications.

Influencer Marketing, marketing by phenomenon, is a marketing technique that is used extensively in the digital environment (Aybatmaz Kolcuoğlu, 2018: 48). Marketing by influence is the use of people who are admired, inspired and somehow related to the product on social media platforms to increase awareness and demand for a brand, product or service (Mert, 2018). However, despite the great importance and popularity of such activities, they also have some problems. There are, for example, the lack of clear rules in ROI tracking, the problem of false followers, a lack of transparency, and issues with engagement in the social media space (Deshpande 2019).

Thanks to BC, companies can provide solutions with BC technologies in the process of strengthening influencer ads, verifying that the influencer actually reaches his followers, and then receiving feedback after the right message reaches the target audience. Because BC technologies can be used to obtain data such as the number of views and views of influencer activities, the degree of interaction, and the direction of purchasing behavior (Deshpande 2019).

Another solution point is loyalty programs. Loyalty programs are used by many brands and are widely known and appreciated by customers. The downside, however, is that customers often have to keep track of program end dates and as a result cannot enjoy the ultimate benefit from a particular brand. Customers experience problems in the context of loyalty programs and thus a sense of disappointment in the context of a particular brand, which creates a negative brand experience. To solve such a challenge, a loyalty program based on the BC system can be implemented. For example, it is possible for BC to collaborate with more than one brand and create a common loyalty program where customers can use common points in a single loyalty program (Deshpande 2019). After the explanations, the effect of BC on marketing is shown in Figure 5.

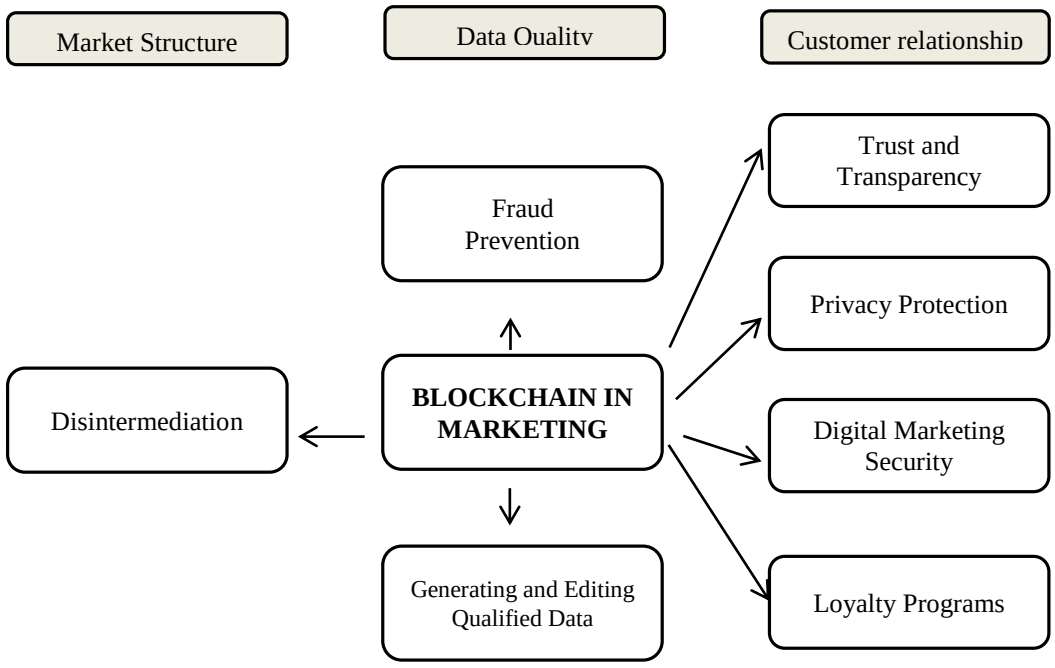

Figure 5. The impact of blockchain on marketing

Source: (Rejeb, Keogh and Treiblmaier, 2020)

BC technologies are driving marketing into uncharted territory. Although the scarcity of empirical studies in this area reveals some limitations, the effect of BC on

marketing is a known fact (Annalect, 2017). As shown comprehensively in Figure 6, BC reveals a new roadmap for marketing. The most obvious use is for digital payments. Cryptocurrencies can be used in conjunction with smart contracts to carry out transactions with both customers (B2C) and suppliers (B2B), to ensure the speed and security of transactions and establish trust between the participating parties (Nowiński & Kozma, 2017; Min, 2019; Antoniadis, et al., 2019). In addition, eliminating intermediaries can reduce operating and financial costs and increase profit margins for each transaction. For example, the use of cryptocurrencies by some companies in global tourism as a means of payment is an ideal example in terms of revealing the foundations of new bonds and relations between BC and marketing (Antoniadis, et al. 2019).

In general, it is possible to gather the benefits of BC technologies in marketing in four dimensions. (1) Cost reduction; Cost reduction begins with the elimination of third parties. Ad networks charge huge fees from brands as advertisers. With smart contracts, a direct relationship can be established between the brand and the customer. Brands pay publishers, freelancers, and third-party publishers directly, without intermediary service providers. (2) Precise targeting; By using the blockchain system, which means the decentralization of the advertising ecosystem, companies can more effectively target the right audience and connect directly with relevant publishers. That way, marketers won't lose all resources in the campaign even if some of them don't work perfectly because the ad campaign is decentralized. (3) Increased productivity; BC allows real-time transactions and releases specific, separate documents from need as both parties have access to transaction information. This also saves time needed to process additional documents (eg invoices). (4) Decentralized and ruleless applications; Steem, Ethereum, EOS,

NEO, Tron, Cardano are blockchain platforms that give brands the opportunity to build apps and communities. The important thing is that there is no regulation of decentralized applications, the target audience can be contacted directly (Minkiewicz, 2021).

3.6 Blockchain solutions in marketing

There are various difficulties and problems encountered in the marketing process. Passing of personal information to others, trust, transparency, etc. undesirable situations occur. Since the purpose and nature of BC technologies are such situations, it is possible to examine BC solutions in terms of marketing under four headings.

3.6.1 Removing uncertainties

It helps to overcome the problems in this field in marketing with transparency and confidence-building solutions based on BC technologies. As a matter of fact, the problem of trust is the biggest challenge in today's marketing environment and gains importance especially in the e-commerce environment. The reason for this is that when the other party is not fully trusted, it becomes difficult for e-commerce to develop and create the expected benefit, and even limits the adoption rate of e-commerce. Since trust is very important in the online environment, BC technology has the infrastructure to solve this problem by solving uncertainty (causing distrust) at different levels (Sihi, 2020).

3.6.2 Traceability

BC ensures that both consumers and brand promises are fully traceable. For example, in the Marketing 3.0 orientation, brands also have social responsibility. In this context, with BC, consumers can control the responsibility duties of brands towards

society and get information about how socially or environmentally responsible the brand is. For example, a person can easily learn the content of the brand's product and whether the product is truly organic as stated. In addition, consumers can see whether their preferred brand employs workers in acceptable conditions. Finally, among other transparent measures that consumers can see; customer complaint rates, customer satisfaction score, product defect rates, delivery rates (Sihi, 2020).

3.6.3 Providing transparency

The digital marketing environment has turned into a complex ecosystem consisting of a few intermediaries specialized in certain areas and functions. There are four different key actors in this ecosystem: users, businesses, advertisers and intermediaries. In particular, intermediaries have a more special position as they establish a connection between the other three factors (Parssinen, et al. 2018). The most important problem in digital marketing channels, where agents earn income per click, is to ensure transparency. On the other hand, does it really provide accurate data on clicks, views, or tracking, as seen in the advertising process, as the agents indicate? The question may be uncertain, especially for companies that allocate large budgets to these works. On the other hand, online advertising fraud activities with intermediaries continue to be a problem for both companies and customers (Parssinen et al. 2018). In this context, three types of advertising fraud or fraud can be mentioned in digital marketing. The first is related to the numbers in which the prices of the intermediaries per click from the companies are determined. The second is fraud or fraud with the intent of malicious data theft in addition to intermediaries. Thirdly, fraudulent or fraudulent advertisements (comments, criticisms, likes, etc.) made with false advertisements for or against the company. This can be in the form

of excessive admiration, praise or appreciation of the company, or it can be for the purpose of vilification by competitors. All three of these are important problems in digital marketing, and they are very difficult to overcome in an intermediary ecosystem (Kshetri & Voas, 2019).

In order to solve such problems mentioned in digital marketing, transparency and confirmability are required, and BC technologies offer solutions at this point. BC allows advertisers to examine their ads and whether target customers are reached or whether the ads are delivered (Ertemel, 2018). Due to the nature of the technology on which it is based, BC also allows advertisers to track who opens their ads, get more accurate conversion rates, and also where a possible customer can be found. Because of its immutability and transparency, BC provides advertisers with ways to audit and verify details about their advertising activities. Thus, technology also provides these actors with more insight and authority to identify fraudulent activities (Kshetri & Voas, 2019).

3.6.4 Assurance

One of the main reasons for having a trusted third party is to be able to deal with unexpected situations and events. Thanks to smart contracts, BC aims to manage the process in the healthiest way by securing the parties. It does this management by connecting it to a special program, that is, to a contract, which all parties accept and cannot refuse, namely smart contracts containing “if-then-else” statements provide assurance as basic data and information for all parties. Smart contracts are spawned, edited and self-executing as events occur. Thus, it coordinates and regulates all the possibilities that may occur in a commercial transaction and plays the role of assurance of evidence in legal disputes. For example, when one of the parties in a

commercial transaction does not deliver the product as declared, the payment of the other party is automatically withdrawn (Minkiewicz, 2021).

On the other hand, systems that provide control over personal information and transaction histories are offered in the BC system. Today, businesses can access information about consumers through the internet and web browsers and analyze this data by processing. There may be some violations in the access of businesses to consumer information. Access by businesses to consumer information through intermediary platforms can be proof that data is easily and without permission, purchased or sold. In BC, on the other hand, since a network structure built on approved signatures is offered, it is possible for the data to remain with the owner (Doğan, 2020).

3.6.5 Big data management

BC applications change the nature of online business by removing uncertainties and thus can increase data management business conducted online. Since there are many parameters in marketing and the processes developing depending on them, the data obtained should be made meaningful and usable according to the target (Ertemel, 2018). Managing the enormous amount of information collected from all kinds of sources, especially social media channels and the internet of things, has become one of the critical marketing strategies. The large amount of data has created the problem of processing. If big data is well managed, companies will be able to offer better offers to their customers.

BC has the potential to provide convenience at two points for companies in big data management. First of all, those who are between the company and the

consumer, which are expressed as intermediaries today (Google, Instagram, Facebook, etc.), first keep almost all kinds of information of people in themselves and then share them with the third party they serve. For example, in order to benefit from a shopping site, the transition to the relevant site is made via the internet service provided by the intermediary. In order for the relevant site to be visible, a fee must be paid to the intermediary or it is necessary to act in accordance with the rules of the intermediary. At this point, companies can manage the data coming from the market according to the conditions of the intermediary, not themselves. In other words, it is obliged to secondary data. Secondly, BC can store data coming from the field with cryptographic security facilities and various algorithms in the management of big data, as well as use its own strategies in processing them. Similarly, people like companies can make their own choices about whether to share their data and have full control over their personal data (Ertemel, 2018). Within the scope of this process and purpose, the Basic Attention Token (BAT), a cryptocurrency from BC applications, can be used. BAT is a system through which consumers can control the sharing of personal data with their organization or marketing department.

3.6.6 Attention economy

The current digital ecosystem can also be described as the attention economy. Although consumers have been using search engines and social media platforms intensively since the early days of the Internet revolution, they do not want to pay to use these digital platforms. However, on the other hand, despite avoiding payment, they continue to use these platforms and pay attention to these platforms. Unlike the explosion of data from everywhere, including data from social media platforms and IoT devices, consumers' time and attention are static and not increasing around the

clock. This makes it valuable as it leads to less attention from consumers. Big data obtained from consumers, using artificial intelligence, analyzes consumers one by one, and tailor-made offers are prepared, targeting specially adjusted offers that are highly likely to be accepted by the consumer. BC can be an effective tool and solution in managing the limited attention of consumers in such offers. Because in the attention economy, BC can help consumers overcome the fear that they will fall victim to technology platforms (Ertemel, 2018).

BC can serve as a solution to this risky cycle by giving consumers self-confidence about ownership and control. By using the alias feature on BC, consumers can store their own data in cryptographically secure wallets or smartphones, expose their credentials at the protocol level, and opt-in to third parties. With BC, consumers have full control over their data and can even keep track of who is doing what with their data. For example, if a third party needs to know whether a customer is of legal age to use their product, instead of disclosing the customer's birthday, only a yes/no answer is given to the third party whether this information is legitimate or not (Ertemel, 2018).

3.6.7 Accounting

Marketing communications made at BC increase the accountability of brands: BC supports consumers to verify products and services and product and service information provided, while providing a transparent system, thereby increasing brand trust. At this point, consumers' access to correct information and the information being unchangeable and transparent, this system can be viewed by people; It is also stated that digitized contracts can be created that can be used to ensure that businesses are held accountable (Doğan, 2020). In addition, with BC, production

activities, supply chain activities become more visible, allowing consumers to know more about products and services. This will ensure brand trust by providing transparency between the brand and consumers. Businesses that provide brand trust are also more preferred by consumers and gain financial profit (Sağtaş, 2022).

3.6.8 Payments and transactions

In the context of BC technology in payments and transactions (B2B and B2C), the meaning given to payment is different from the traditional banking system. In every decentralized transaction, the created block is verified and accepted by the parties without an intermediary. Thanks to applications of BC technology and smart contracts, the key features of decentralization and decentralization are revealed, accelerating the business process everywhere. In this context, it is seen that digital payment methods are accepted in retail and online services, albeit limited, regardless of the conventional currency value (Zamani & Giaglis, 2018).

For example, Microsoft uses blockchain technology to pay for various services, including Xbox Live and Skype. Such applications provide higher speed and security in transactions, are used in transactions with both customers (B2C) and suppliers (B2B), and build trust among all participating parties (Rijanto, 2021; Walsh, 2021).

Transactions contain hash blocks with public key stamps of all parties involved, cryptographically signed by the sender. Once the information used for the transaction is confirmed to be accurate and unique, this information becomes unchangeable, making BC one of the most secure infrastructures. Transactions cannot be blocked, banned or modified in a decentralized manner via the blockchain.

Thus, a robust economic system is formed, free from weaknesses, characterized by transparency and anonymity (Lemos, et al., 2022).

Within the scope of the issues listed above, at the center of the relationship between BC applications and marketing; Four important contexts can be mentioned: transparency, security, status of intermediaries and consumers. On the other hand, it is a known fact that the most important goals and difficulties of marketing are to determine what consumers prefer and how they react in the purchase action (Buvaneswari & Swetha, 2019). In this context, the options and opportunities offered by BC technology to the marketing sector are shown with the SWOT matrix presented in Table 4.

We could see the strengths, weaknesses and also opportunities and threats in our SWOT matrix model.

Table 4. SWOT Analysis of Blockchain in the Marketing Industry

Indoor env. / Outdoor env.	Strengths	Weaknesses
Opportunities	Build Trust Branding the Company as Innovative Marketing Automation Personalization	Customer privacy Eliminating the Agent Predictive Marketing Quality Influencers
Threats	Countering Ad Fraud Efficiency in data protection Correct definition of target audience Better Personal Data Protection	Heavy competition Technological change More expensive technology

Source: (Buvaneswari and Swetha, 2019).

3.7 Blockchain implementation barriers in marketing

Thanks to the use of BC technology in marketing activities, consumers' trust in the product and brand image can increase. On the other hand, the use of BC technology in marketing activities will also be beneficial in terms of improving communication between companies and consumers (Vovchenko, et al., 2017). Customer value is especially important for brands that want to benefit from BC-based information transparency (Kouhizadeh & Sarkis, 2018). However, there are some barriers in marketing that may result from the adoption of BC technology. Processing, automation, and storage of information in BC is expensive, processes are very complex for companies and network partners compared to single-source processes (Baldimtsi et al., 2017; Smith, 2017).

3.7.1 Lack of information

The first and most fundamental problem is the lack of knowledge about BC technology. Companies cannot take full advantage of BC due to lack of knowledge about BC technology and insufficient technical expertise. For this reason, it is extremely important for companies to be familiar with technology and its use (Niranjanamurthy, Nithya, & Jagannatha, 2019). Although the employees need to be trained on this technology, the full support of the top management is important for the successful implementation of BC technology within the company (Vovchenko, et al., 2017).

3.7.2 Scalability

There may be a scalability issue as BC streams large datasets. BC technology has a scalability issue that, being still a relatively new technology, makes it extremely difficult to manage large volumes of block transactions. For this reason, it takes time and effort to be implemented even in large-scale companies (Ertemel, 2018: 38). In addition, for the efficient implementation of BC technology, new approaches to storage management with further developed cloud computing-based technologies are needed.

3.7.3 High cost

BC technology is a costly choice to integrate in the current situation. Currently, several large companies have invested in this area and continue to develop it. Small companies, on the other hand, lag behind due to lack of resources and information (Rejeb, et al, 2020). As the BC technology infrastructure becomes more widespread, it will be possible for smaller companies to participate, although installation costs are

possible. For example, field tests have revealed that companies have to invest between one hundred thousand euros and two hundred thousand euros in order to use BC technology, and this can be a very large investment for some companies. In addition, it is not enough to invest, and there is a need for expert human resources in this field (Tian, 2016).

3.7.4 Lack of information sharing

Companies have a negative view of sharing their knowledge with their competitors because they use the knowledge they have as an advantage. In addition, companies may not be sharing in terms of privacy, as information about marketing is private. This can slow down the development of BC technologies, and it can also be time consuming to produce new solutions. This situation can also be seen as a paradox. Because while BC is a candidate for sharing information over blocks, privacy is tried to be specially protected in their integration with the market (Wang et al., 2020; Rejeb, et al, 2020).

3.7.5 Awareness problem

Customers do not have enough awareness about BC technologies. By making use of technology, consumers can act more consciously by accessing information specific to the supply chain, such as the origin of the product. Lack of information or reluctance to obtain information about the origin of the products they will buy and the continuity of the products prevent companies from seeing the use of BC technology as a necessity. For this reason, the lack of knowledge and low awareness of consumers on sustainability constitutes an obstacle to the implementation of what BC technology offers (Oymak & Kazançoğlu, 2021).

3.7.6 Lack of trust between companies

The transition from intermediaries to fully transparent processes with the help of BC technology is still a relatively new method of data sharing. There are more skeptical and hesitant companies than companies that are enthusiastic about the features of technology. This is considered a lack of confidence in the implementation of BC technology in companies (Oymak & Kazançoğlu, 2021). Despite the interest in the technology and its application, there may be real implementation challenges and resistances due to flexibility in sharing knowledge. Therefore, the lack of trust in blockchain technology among companies makes it very difficult to implement blockchain technology in companies with transparent data sharing (Rejeb et al., 2020). Another dimension of the lack of trust among the companies, as stated before, is that advertisers charge higher prices than they do by overestimating the ad metrics and video views of other companies whose services they use.

CHAPTER 4

METHODOLOGY, ANALYSIS AND RESULTS

4.1 Methodology and analysis

4.1.1 Purpose

Advances in technology also pave the way for significant changes and transformations in human, society and economic life. In today's world, which is characterized by the description of digital society, information age or information society, digitalization is effective in every aspect of business and public processes. In this context, blockchain, which is one of the new generation developments, refers to solutions in information flows that do not directly involve economic activities but serve human and social life. blockchain; consists of software-based automations that ensure the provision and maintenance of transparent, secure and low-cost information flow in art, health, science, education, identity, governance, public services and communication (Sikorski, Haughton & Kraft, 2017; Sun, Yan & Zhang, 2016). One of the areas affected by blockchain technologies has been marketing. The most important contribution of the blockchain to marketing through the knowledge economy; ensuring that information is personal, intermediary, continuity, transparency and reliability. Blockchain solutions enable communication between the company and the consumer without any other intermediary or regulator.

The aim of this thesis is to determine the usability and experience of the technologies used in the digital marketing process supported by BC by consumers. At the starting point of the determined purpose; as a digital marketing strategy, the

question of how BC affects marketing can be answered from the consumer perspective.

In the literature, on the use of augmented reality technology-based applications in the field of marketing, this technology focuses more on the business and also the supply side. For example, it is seen that they focus on the consumer on a business basis in education, touristic places, web page and graphic design. The consumer-oriented approach shows itself here as well. In this study, consumers' view is focused, who is the addressee and target of augmented reality technologies. In this way, inferences will be obtained according to the attitudes and intentions of consumers using augmented reality technologies, and it will be possible to shape marketing activities according to these attitudes and intentions, and at the same time, it will be ensured that consumer expectations are met.

4.1.2 Limitations and sample

Considering the size of the universe in testing the relationship between blockchain and marketing, a limitation has been made since there is a very large mass. The basic criterion in determining the limitations is the condition of the participants to have knowledge about blockchain technologies. In this context, the research was carried out with 109 white-collar participants selected by simple random method.

4.1.3 Obtaining data

Rese, Schreiber and Baier et al. (2014) and the validity and reliability study of Bilici & Özdemir (2019) will be used. The scale consists of 6 dimensions and 28 items.

There are 26 statements in the scale consisting of the dimensions of perceived ease of use, perceived fun, perceived usefulness, perceived informativeness, attitude

towards use and intention to use, and these statements are scaled with a 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 =Agree, 5=Strongly Agree).

4.1.4 Analysis of data

IBM SPSS 25.0 program was used for all statistical analyzes and statistical data analysis methods were used to examine the relationship between research variables. In the study, descriptive statistical methods to examine personal variables and the difference tests were used to examine the relationship between research variables and personal variables. Then, the scores obtained from data measurement tools with demographic variables are compared.

First of all, it was determined whether the Block Chain Based Marketing Applications Questionnaire complies with the normal distribution hypothesis by looking at the skewness and kurtosis coefficients, and parametric test methods were preferred (Table 5). Afterwards, it was examined whether there were any drawbacks in using the questionnaire prepared by performing an internal consistency analysis in this study.

After examining the socio-demographic profile of the participants, the descriptive analysis results for the Blockchain Based Marketing Practices Questionnaire were examined. While examining the differentiation status of the group scores of the variables according to their personal information, the "independent sample t test" was used in the comparisons of the variables that provided the normal distribution assumption, and "ANOVA" was used in the comparisons of three or more groups.

Table 5. Skewness and Kurtosis Values

Blockchain Based Marketing Practices Survey	N	Skewness	Kurtosis
Dimension of Uncertainty Removal	109	.213	.329
Being a Solution Tool and Reliability Dimension	109	-.079	-.186
Mediation, Creative and Innovation Dimension	109	.022	-.110
Data Management, Ecology and Digital Economy Dimension	109	.077	-.173

Seçer (2015) assumes normal distribution; He evaluated that the evaluation by looking at the 'skewness and kurtosis' values is a more accurate approach. Tabachnick and Fidell (2013) accept that normal distribution is achieved when skewness and kurtosis values are between +1.50 and -1.50. As a result of the analyzes carried out, it was determined that the variables showed normal distribution.

4.1.5 Explanatory factor analysis

Table 6. EFA Results for the Blockchain Based Marketing Practices Survey

	Items	Factor Load	Eigenvalue	Factors
Q1	BC is sufficient to remove ambiguities regarding the dealing party.	690	16.231	UNCERTAINTY REMOVAL variance % 62.427
Q2	BC is effective in removing potential uncertainties in the supply chain.	.545		
Q3	BC is effective in eliminating the uncertainties about the quality and possibilities promised by the brand.	.525		
Q4	BC smart contracts, it is effective in eliminating uncertainties that may arise from unexpected situations.	.811		
Q5	BC is useful as it provides traceability.	.647		
Q6	BC provides transparency for consumers.	.649		
Q7	BC provides transparency for companies.	721		
Q8	BC provides assurance for consumers.	703		
Q9	BC is an effective solution tool in big data management.	.681	1.507	BEING A SOLUTION TOOL AND RELIABILITY Variance: % 5.795
Q10	The products that use BC in the production or sales stages attract the attention of consumers more.	.695		
Q11	BC is a reliable solution tool in terms of accountability and control.	.604		
Q12	BC offers reliable solution tools for payments and transactions.	.534		
Q13	BC offers technologies that help protect consumers' property and control rights.	.520		
Q14	The use of BC protects personal information, reduces risks and creates the opportunity to try new brands.	.502		
Q15	BC provides flexibility as it allows for mediation (direct buyer-seller relationship)	.619	1.095	MEDIATION, CREATIVE AND INNOVATION Variance: % 4.213
Q16	BC paves the way for creative and innovative approaches for consumers	.650		
Q17	The use of BC increases as more people and institutions use these technologies.	.604		
Q18	I also use it because I have friends who use BC technologies.	.697		
Q19	BC is good at countering ad fraud.	.552	1.005	DATA MANAGEMENT, ECOLOGY AND DIGITAL ECONOMY Variance: % 3.826
Q20	BC should be used in the marketing process.	.627		
Q21	BC provides convenience for companies in big data management.	.675		
Q22	BC, marketing automation should be used.	.702		
Q23	BC creates an environmentally friendly digital economy.	.766		
Q24	BC is the pioneer of digital transformation.	.611		
Q25	BC contributes to green marketing efforts.	.848		
Q26	BC stabilizes the carbon footprint and supports sustainability.	.807		
	Toplam varyans: % 62.431; KMO: .940; x^2 :2960.500 s.d.:325, p<.001			

In the EFA analysis applied to the data of the questions in the Blockchain Based Marketing Applications Questionnaire, the factors with an eigenvalue above 1.00, the items with a common variance load above 0.50 and the factor loads of the items above 0.45 and one item more than once. Items with a difference of more than 0.1 in factor loadings on multiple sub-factors were included in the analysis. In this analysis, it was determined that there were no items with a common variance load below 0.50 and a factor load above 0.45. 26 items were grouped under 4 factors and explained 62.431% of the total variance.

According to the principal components analysis applied to the data obtained as a result of the answers given to the questions in the "Block Chain Based Marketing Applications Questionnaire", it was understood that the sample size was sufficient (KMO = 0.940) and the Barlett-Sphericity test was also significant (X2=2960.500; p < 0.001) (Çakır, 2014; S.5).

In line with these results, the results of the "EFA" applied to the Blockchain Based Marketing Practices Questionnaire are given in Table 6.

4.1.6 Research hypotheses

H1: Blockchain-based marketing practices of the participants show a significant difference according to age.

H2: Blockchain-based marketing practices of the participants show a significant difference according to gender.

H3: Blockchain-based marketing practices of the participants show a significant difference according to their education level.

H4: Blockchain-based marketing practices of the participants show a significant difference according to their seniority.

H5: Blockchain-based marketing practices of the participants show a significant difference according to their job position.

H6: Blockchain-based marketing practices of the participants show a significant difference according to their knowledge of blockchain.

4.1.7 Reliability analysis

In this section, an internal consistency analysis was conducted for the blockchain-based marketing practices questionnaire, which is preferred as a data collection tool. The criteria for Cronbach's Alpha values are as follows;

α value,	$0.00 \leq \alpha < 0.40$	test is	unreliable
	$0.40 \leq \alpha < 0.60$	test is	low reliability
	$0.60 \leq \alpha < 0.80$	test is	quite reliable
	$0.80 \leq \alpha \leq 1.00$	test is	highly reliable.

Table 7. Reliability Analysis Findings

Blockchain Based Marketing Practices Survey	Cronbach's Alpha	Number of items
Dimension of Uncertainty Removal	.938	8
Being a Solution Tool and Reliability Dimension	.929	6
Mediation, Creative and Innovation Dimension	.807	4
Data Management, Ecology and Digital Economy Dimension	.946	8

Cronbach Alpha values for the sub-dimensions of the blockchain-based marketing practices questionnaire used in the research; The Cronbach Alpha value for the dimension of eliminating uncertainties is 0.938, the Cronbach Alpha value for the solution tool and reliability dimension is 0.929, the Cronbach Alpha value for the intermediation, creativity and innovation dimension is 0.807, and the Cronbach Alpha value for data management, ecology and digital economy is 0.946. These values shows that the questionnaires are highly reliable and there is no obstacle to their use in the analysis.

4.2 Findings

The data transferred to the computer environment were checked for missing/wrong values and outliers, and the sample of the study consisted of 109 participants selected by simple random method from the universe. The data of the research was obtained by applying the personal information form together with the statements in the Blockchain Based Marketing Practices Questionnaire, and the analysis of the data was made in this section.

4.2.1 Demographic findings

The demographic findings of the participants who were surveyed in the study are presented below.

Table 8. Distribution of Participants by Age

	Personal characteristics	f	%
Age Status	20-30 year	21	19.3
	31-40	33	30.3
	41-50	40	36.7
	51 +	15	13.8

As seen in Table 8, 19.3% of the participants are 20-30 years old, 30.3% are 31-40 years old, 36.7% are 41-50 years old, 13.8% are 51 years old and over.

Table 9. Distribution of Participants by Gender

	Personal characteristics	f	%
Gender	Woman	70	64.2
	Man	39	35.8

As seen in Table 9, 64.2% of the participants were female and 35.8% were male.

Table 10. Distribution of Participants by Job Status

	Personal characteristics	f	%
Job Status	Entrepreneur	5	4.6
	Public Employee	90	82.6
	Private Sector Employee	6	5.5
	Self-employed	8	7.3

As seen in Table 10, 82.6% of the participants are public employees, 4.6% are entrepreneurs, 5.5% are private sector employees and 7.3% are self-employed.

Table 11. Distribution of Participants by Educational Status

	Personal characteristics	f	%
Educational Status	High School	6	5.5
	Associate Degree	2	1.8
	Bachelor's degree	74	67.9
	Master's degree	27	24.8

As seen in Table 11; 5.5% of the participants are high school graduates, 1.8% associate degree, 67.9% undergraduate and 24.8% graduate graduates.

Table 12. Distribution of Participants by Seniority

	Personal characteristics	f	%
Seniority	1-5 years	19	17.4
	6-10 years	24	22.0
	11-15 years	12	11.0
	16-20 years	12	11.0
	21 + years	42	38.5

As seen in Table 12; 17.4% of the participants have a seniority of 1-5 years, 22% of them 6-10 years, and 38.5% of them have a seniority of 21 years or more.

Table 13. Distribution of Participants by Blockchain Knowledge

	Personal characteristics	f	%
Blockchain Information	None	53	48.6
	Partial	27	24.8
	Medium	16	14.7
	Sufficient	8	7.3
	Good	5	4.6

As seen in Table 13; It was determined that 48.6% of the participants did not have knowledge about blockchain, while 24.8% had partial knowledge and 14.7% had knowledge.

4.2.2 Descriptive analysis findings for variables

Variables of the research; consists of blockchain-based marketing applications. In this part of the study, descriptive statistics about the variables are given.

Table 14. Descriptive Analysis Results for Variables

Blockchain Based Marketing Practices Survey	N	Min.	Max.	Avg.	SS
Dimension of Uncertainty Removal	109	1.13	5.00	3.51	.78
Being a Solution Tool and Reliability Dimension	109	1.00	5.00	3.58	.83
Mediation, Creative and Innovation Dimension	109	1.25	5.00	3.46	.85
Data Management, Ecology and Digital Economy Dimension	109	1.13	5.00	3.55	.84

The average of the answers of the participants included in the study to the uncertainty removal questionnaire was 3.51±0.78, the minimum score was 1.13 and the maximum score was 5.00, the total average of the answers to the solution tool and reliability questionnaire was 3.58±0.83, a minimum score of 1.00 and a maximum score of 5.00, the total average of the answers to the intermediation, creativity and innovation questionnaire 3.46±0.85, the minimum score 1.25 and the maximum score 5.00, data management, ecology and the total average of the responses to the digital economy questionnaire was determined as 3.55±0.84, with a minimum score of 1.13 and a maximum score of 5.00.

4.2.3 Difference test findings

In this part of the study, the differences between the average scores obtained from the variables will be discussed according to the gender, age, education, job status, seniority, and knowledge about blockchain distribution of the participants who constitute the research group.

Table 15. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Applications Questionnaire by Gender Variable

Variables	Gender	N	X̄	SS	t	p
Dimension of Uncertainty Removal	Woman	70	3.52	.80	.227	.821
	Man	39	3.48	.75		
Being a Solution Tool and Reliability Dimension	Woman	70	3.60	.86	.276	.783
	Man	39	3.55	.81		
Mediation, Creative and Innovation Dimension	Woman	70	3.39	.87	1.177	.242
	Man	39	3.59	.83		
Data Management, Ecology and Digital Economy Dimension	Woman	70	3.59	.83	.553	.582
	Man	39	3.49	.89		

As seen in Table 15, in terms of gender; no significant differentiation is observed at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creativity and innovation and data management, ecology and digital economy ($p>.05$). In other words, it was determined that the gender of the participants did not affect the level of uncertainty, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 16. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Practices Questionnaire by Age Variable

Variables	Age Status	N	$\bar{X}$	SS	F	p
Dimension of Uncertainty Removal	20-30 years	21	3.44	.44	.827	.482
	31-40	33	3.69	1.00		
	41-50	40	3.42	.67		
	51 +	15	3.44	.90		
Being a Solution Tool and Reliability Dimension	20-30 years	21	3.50	.58	1.176	.323
	31-40	33	3.80	.96		
	41-50	40	3.45	.78		
	51 +	15	3.56	.97		
Mediation, Creative and Innovation Dimension	20-30 years	21	3.32	.64	1.680	.176
	31-40	33	3.72	.89		
	41-50	40	3.41	.88		
	51 +	15	3.22	.92		
Data Management, Ecology and Digital Economy Dimension	20-30 years	21	3.51	.77	1.354	.261
	31-40	33	3.77	.94		
	41-50	40	3.51	.81		
	51 +	15	3.27	.81		

Age as seen in Table 16, in terms of variable; no significant differentiation is observed at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creativity and innovation and data management, ecology and digital economy ($p>.05$). In other words, it was determined that the age of the participants did not affect the level of uncertainty, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 17. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Applications Questionnaire by Educational Status Variable

Variables	Education Status	N	$\bar{X}$	SS	F	p
Dimension of Uncertainty Removal	High School	6	3.71	.72	.963	.413
	Associate Degree	2	4.31	.97		
	Bachelor's degree	74	3.46	.73		
	Master's degree	27	3.54	.91		
Being a Solution Tool and Reliability Dimension	High School	6	3.64	.79	.842	.474
	Associate Degree	2	4.42	.82		
	Bachelor's degree	74	3.53	.81		
	Master's degree	27	3.65	.94		
Mediation, Creative and Innovation Dimension	High School	6	3.71	.95	1.569	.201
	Associate Degree	2	4.38	.88		
	Bachelor's degree	74	3.36	.82		
	Master's degree	27	3.61	.90		
Data Management, Ecology and Digital Economy Dimension	High School	6	3.98	.94	1.021	.387
	Associate Degree	2	4.19	1.15		
	Bachelor's degree	74	3.49	.79		
	Master's degree	27	3.58	.96		

As seen in Table 17, in terms of educational status variable; no significant differentiation is observed at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creativity and innovation and data management, ecology and digital economy (p>.05). In other words, it was determined that the educational status of the participants did not affect the level of uncertainty, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 18. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Applications Survey According to the Variable of Seniority Status

Variables	Seniority	N	$\bar{X}$	SS	F	p
Dimension of Uncertainty Removal	1-5 years	19	3.72	.72	.968	.428
	6-10 years	24	3.61	.92		
	11-15 years	12	3.32	.75		
	16-20 years	12	3.61	.69		
	21 + years	42	3.38	.76		
Being a Solution Tool and Reliability Dimension	1-5 years	19	3.76	.79	.963	.431
	6-10 years	24	3.72	.95		
	11-15 years	12	3.43	.60		
	16-20 years	12	3.74	.80		
	21 + years	42	3.42	.86		
Mediation, Creative and Innovation Dimension	1-5 years	19	3.57	.79	.600	.664
	6-10 years	24	3.51	.87		
	11-15 years	12	3.48	.82		
	16-20 years	12	3.69	.81		
	21 + years	42	3.32	.91		
Data Management, Ecology and Digital Economy Dimension	1-5 years	19	3.84	.98	1.632	.172
	6-10 years	24	3.67	.92		
	11-15 years	12	3.25	.46		
	16-20 years	12	3.75	.82		
	21 + years	42	3.39	.80		

Seniority status as seen in Table 18. in terms of variable, no significant differentiation is observed at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creativity and innovation and data management, ecology and digital economy (p>.05). In other words, it was determined that the seniority of the participants did not affect the level of uncertainty, being a solution agent and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 19. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Applications Survey According to the Job position Variable

Variables	Job Status	N	$\bar{X}$	SS	F	p
Dimension of Uncertainty Removal	Entrepreneur	5	3.95	.36	2.964	.036
	Public Employee	90	3.41	.77		
	Private sector	6	3.81	.82		
	Self-employed	8	4.09	.81		
Being a Solution Tool and Reliability Dimension	Entrepreneur	5	3.97	.18	3.362	.022
	Public Employee	90	3.49	.84		
	Private sector	6	3.64	.78		
	Self-employed	8	4.38	.62		
Mediation, Creative and Innovation Dimension	Entrepreneur	5	4.40	.45	4.577	.005
	Public Employee	90	3.35	.82		
	Private sector	6	3.50	.85		
	Self-employed	8	4.13	.82		
Data Management, Ecology and Digital Economy Dimension	Entrepreneur	5	3.75	.74	4.239	.007
	Public Employee	90	3.46	.81		
	Private sector	6	3.50	1.02		
	Self-employed	8	4.52	.72		

As seen in Table 19, in terms of the job position variable; A significant differentiation was determined at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy ($p<.05$). In other words, it was determined that the participants affected the level of job position, eliminating ambiguities, being a solution agent and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 20. Differentiation Status of Scores Obtained from the Blockchain Based Marketing Applications Survey According to the Variable of Knowledge on Blockchain

Variables	Blockchain Information	N	$\bar{X}$	SS	F	p
Dimension of Uncertainty Removal	None	53	3.29	.71	3.079	.019
	Partial	27	3.52	.64		
	Medium	16	3.86	1.03		
	Sufficient	8	4.03	.78		
	Good	5	3.75	.70		
Being a Solution Tool and Reliability Dimension	None	53	3.33	.79	4.251	.003
	Partial	27	3.59	.73		
	Medium	16	4.04	.95		
	Sufficient	8	4.27	.75		
	Good	5	3.63	.66		
Mediation, Creative and Innovation Dimension	None	53	3.20	.84	3.949	.005
	Partial	27	3.46	.79		
	Medium	16	3.83	.85		
	Sufficient	8	4.00	.50		
	Good	5	4.15	.86		
Data Management, Ecology and Digital Economy Dimension	None	53	3.31	.79	5.366	.001
	Partial	27	3.55	.77		
	Medium	16	4.10	.86		
	Sufficient	8	4.31	.60		
	Good	5	3.15	.85		

As seen in Table 20, in terms of knowledge level variable; A significant differentiation was determined at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy ($p<.05$). In other words, it was

determined that the participants affected the level of job position, eliminating ambiguities, being a solution agent and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

Table 21. Hypothesis Evaluation (Difference Tests)

Variables	Dimension of Uncertainty Removal	Being a Solution Tool and Reliability Dimension	Mediation, Creative and Innovation Dimension	Data Management, Ecology and Digital Economy Dimension
H1: Blockchain-based marketing practices of the participants show a significant difference according to age.	✗	✗	✗	✗
H2: Blockchain-based marketing practices of the participants show a significant difference according to gender.	✗	✗	✗	✗
H3: Blockchain-based marketing practices of the participants show a significant difference according to their education level.	✗	✗	✗	✗
H4: Blockchain-based marketing practices of the participants show a significant difference according to their seniority.	✗	✗	✗	✗
H5: Blockchain-based marketing practices of the participants show a significant difference according to their job position.	√	√	√	√
H6: Blockchain-based marketing practices of the participants show a significant difference according to their knowledge of blockchain.	√	√	√	√

✗ : Reject, √: Accept

4.2.4 Analysis results

Of the participants participating in the blockchain-based marketing practices survey, 30.3% are 31-40 years old, 36.7% are in the age range, 64.2% are women, 82.6% are

public employees, 67.9% It has been determined that ten of them are undergraduate graduates, 38.5% have 21 years or more seniority, and 48.6% have no knowledge about blockchain.

In terms of gender, age, education and seniority variables of the participants in the blockchain-based marketing practices survey; no significant differentiation is observed at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creativity and innovation and data management, ecology and digital economy ($p>.05$). In other words, it has been determined that the gender, age, education and seniority of the participants do not affect the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy, which are the lower levels of the blockchain-based marketing practices survey.

On the other hand, in terms of the job position and knowledge level of the participants in the blockchain-based marketing practices survey; A significant differentiation was determined at the levels of eliminating uncertainties, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy ($p<.05$). In other words, the job position of the participants and their knowledge of the blockchain; It has been determined that the blockchain-based marketing practices survey affects the lower levels of uncertainty, being a solution tool and reliability, intermediation, creative and innovativeness and data management, ecology and digital economy.

CHAPTER 5

CONCLUSION

Today, cryptological (data, information, units, nodes, money, signs, etc.) units have become a popular field of study in almost every industry and academia. Blockchain can basically be considered as a public ledger and data units called nodes are stored in these ledgers. As information is added to the ledgers, it grows in the chain (Pierro, 2017). As the Blockchain (BC) is the ledger where interested parties add information to various levels of authority, asymmetric cryptography and distributed consensus algorithms are applied for user security and ledger consistency. Thus, the added information becomes permanent in the ledger, BC, and it becomes impossible to change, manipulate or cheat.

BC technology is a decentralized data storage method where transactions can be carried out in confidence without the need for any intermediary or an authority between the parties, and where it is not possible to delete, change or lose data. BC technology was not born all of a sudden, many technologies that developed by referencing each other over time formed the infrastructure of today's BC technology.

BC is the process of exchanging and adding data among “trusted” members directly on the network without an intermediary (P2P - Peer to Peer). P2P, on the other hand, is a peer-to-peer system and is a network protocol created to provide communication and data sharing between two or more “peer” clients. BC is actually a data system with information secured by cryptographic sealing. This system is basically; distributed ledger technology (DLT) and smart contracts. While DLT is a cryptographic record, contracts are a decentralized, shared, replicated and synchronized dataset of transactions. It is simply a situation where everyone adds a

record, or block, to a ledger. However, since this ledger is cryptographically protected, the added blocks form a chain by sequentially ordering them. A “Block Chain” is created when there is no break, addition, subtraction or change in the chain consisting of blocks.

BC is a software and automation-based solution model and application, and it is functional when used for a specific purpose. As stated above, BC is being used in new and different fields with each passing day, and it paves the way for changes in these fields. As a matter of fact, the discovery of BC in the marketing world has been quite rapid, and consumers and businesses have begun to benefit from its advantages. BC's position in marketing is central to the digital economy system. digital economy; blockchain, digital technologies-cloud computing, Internet of Things, advanced robotics, big data analytics, artificial intelligence and machine learning, social media, 3D printing, augmented reality, virtual reality, e-money and distributed ledgers etc. It is an ecosystem made up of components such as in this ecosystem, businesses can provide direct, transparent, secure and direct access to the target audience through BC technologies within the scope of their marketing strategies.

For all players of the digital economy, BC technology, which is in the background of their actions, occupies the most important place among the driving forces for them. Under this new wave of technological change, the nature of intermediation is fundamentally changing as intermediaries continue to add value to transactions. Organizations and businesses that combine BC technologies with specialization that will expand technological boundaries can bring together goals, ideas and solutions. The new structure created by digital economy and BC technologies is expressed as "collaborative economy". In this structure, there are

concepts such as sharing economy, collaborative consumption, optional economy, optional services, group economy, independent economy, peer economy, digital economy and platform economy. On the other hand, the collaborative economy is based on the idea of the socio-economic model and includes both redistribution and reciprocation, which are the key features of the digital economy. BC technology has a fundamental and central role in the operability, sustainability and use of digital economy and collaborative economy systems and structures in marketing. From another perspective, redistribution refers to barter involving transfer of ownership, while reciprocity refers to access to resources without transfer of ownership. At this point, the digital economy allows mutuality through new traffic systems where BC technologies come into play. Information, data, flow, etc. Depending on the traffic, such as from the producer to the consumer, roles are transformed and the nature of market changes also changes. In this context, the cooperative economy includes the redistribution of goods/services not only through monetized barter but also through resale, exchange or transfer.

Digital economy, BC, augmented reality etc. although many modern technological developments are seen as separate concepts, they come together under "Marketing 4.0" and carry customers and businesses to new and completely different areas. In this new process, one of the most important opportunities and advantages offered by BC technologies is the absence of other personnel between the consumer and the business. Concepts such as real-time transactions, transparency, security, openness, diversity, comparison, intermediation, 7/24 access are at the center of the marketing process, both on the part of businesses and customers. However, at this point, a situation that is often misunderstood needs to be explained. Because there is an erroneous and common tendency to consider the marketing relationship with BC

specifically for cryptocurrencies. BC and marketing applications differ from cryptocurrencies in three ways. First, while monetary mobility is at the center of cryptocurrency fintech applications, product, place and time utility are prioritized in the BC and marketing relationship. In addition, in the relationship between BC and marketing, there is a combination of non-financial structures and tools (consumer preferences, competitive environment, strategies, etc.) as well as payment systems. Secondly, the BC and marketing relationship is a result of the processes "Blockchain 1.0, Blockchain 2.0 and Blockchain 3.0" and is changing, transforming and improving marketing in social and economic context. Cryptocurrencies, on the other hand, are mostly shaped around "Blockchain 1.0". Third, BC and marketing are making progress every day with constantly evolving features and tools. It is not dependent on financial and financial processes like cryptocurrencies, and a wide area is spread with smart contracts from the activities of charities to their promotion activities.

Considering the main findings obtained in this study, which was prepared to determine the usability and experience of augmented reality technologies by consumers in the digital marketing process supported by BC, as stated in the studies by Niranjanamurthy, Nithya, and Jagannatha, (2019) and Vovchenko, et al., (2017), businesses. It is seen that consumers are not yet well-informed on this subject. As stated in the study by Ertemel (2018), it has been determined that business practices are in the development phase and more effective results may emerge in the future. Rejeb, et al. (2020) and Tian (2016), it has been determined that the establishment of BC systems with very high costs, the operation of these systems, the need for advanced expertise, is a question that needs to be overcome. Similar findings were also expressed by Wang et al., (2020) Rejeb, et al., (2020) as it was seen that BC

technologies developed over common information sharing, but businesses' reluctance to share information was a slowing factor in the development of BC.

BC technologies, automation, infrastructure, technical etc. It includes solutions offered by businesses in terms of marketing and offered to consumers in terms of marketing. For this reason, the development of BC depends on the acceptance of the offered processes and innovations by the consumers. In the study, it was observed that BC technologies were not sufficiently recognized by consumers and that the adaptation was delayed due to its technical and complex structure. Researchers and authors such as Kouhizadeh and Sarkis (2018), Baldimtsi, et al., (2017), Smith (2017), Vovchenko, et al., (2017) also drew attention to this issue.

It is a fact that BC technologies are relatively new. BC have a wide variety of and almost unlimited options. It can be applied in all areas of life makes it difficult to reach consensus in terms of interpretation and definition. In terms of the subject of this thesis, there is no consensus on blockchain applications in marketing. Besides, there are very few academic studies on BC applications that support marketing activities. However, the benefits of BC are seen as indisputable in the practitioner-based literature. Among the most important effects of BC in marketing are the processing and filtering of data streams and the removal of costly intermediaries. BC technology has the potential to significantly transform the relationship with customers, with a consumer-oriented perspective, increasing transparency in data and information issues, and also making serious contributions to privacy and security issues. In addition, BC technology offers new opportunities for consumer loyalty programs that can make a significant contribution to creating additional value. In short, BC technologies are driving marketing into uncharted territory. Since it is a

constantly expanding and developing field, it is not possible to answer the question of what the consequences of using BC in marketing might be, but basically it is possible to answer as follows; efficiency in eliminating uncertainties, ease of traceability, providing transparency, providing assurance, ease in big data management, developing attention economy, accountability, ease of payments and transactions.

This thesis has certain limitations such as the number of participants to the questionnaire. Moreover, the distribution of the participants is not properly homogenous so that it may be affecting some of the findings. Yet, being one of the first empirical research on the topic to our knowledge, it contributes to the literature by providing at least some preliminary results. It justifies an important result that the technology diffusion and getting used to the BC technologies will increase the use of BC. The companies should prepare themselves to use the BC technologies in marketing activities in a very near future.

BC technologies, first of all, spread the knowledge; It offers decentralized, secure, continuous, whole, anonymous, transparent, auditable, protected and efficient solutions. Such solutions, on the other hand, have the potential to be used unlimitedly in all areas of personal, social, public and business life. For example, it is possible to consider BC as paint kit and canvas. The painting to be done is left to the imagination of the painter, and there is an unlimited world. Therefore, it is necessary to focus on usability rather than defining BC.

APPENDIX

SURVEY QUESTIONS

Survey Form

Dear Participant,

The survey form presented to you below is within the scope of the research titled "The effects of the advantages of Blockchain Technology on the digital economy" conducted at Boğaziçi University Social Sciences Institute. Your correct and honest answers are very important and will not be used for any purpose other than research.

Thank you for your attention.

Advisor Student

Mehtap Işık Ali Mutlu

Gender : (___) Woman (___) Man

Age : (___) 20-30 (___) 31-40
(___) 41-50 (___) 51 +

Marital Status : (___) Married (___) Single

Education : (___) High School (___) Associate Degree

(___) Bachelor Degree (___) Postgraduate Degree

Seniority : (___) 1-5 Years (___) 6-10 Years
(___) 11-15 Years (___) 16-20 Years

(___) 21 + years

Job : (___) Public Employee (___) Private Sector Employe

Your Knowledge on Blockchain?
(___) None (___) Partial (___) Medium

(___) Sufficient (___) Good

Your thoughts on Blockchain (BC) based marketing applications;	strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
DIMENSION OF UNCERTAINTY REMOVAL					
BC is sufficient to remove ambiguities regarding the dealing party.					
BC is effective in removing potential uncertainties in the supply chain.					
BC is effective in eliminating the uncertainties about the quality and possibilities promised by the brand.					
BC smart contracts, it is effective in eliminating uncertainties that may arise from unexpected situations.					
BC is useful as it provides traceability.					
BC provides transparency for consumers.					
BC provides transparency for companies.					
BC provides assurance for consumers.					
BEING A SOLUTION TOOL AND RELIABILITY DIMENSION					
BC is an effective solution tool in big data management.					
The products that use BC in the production or sales stages attract the attention of consumers more.					
BC is a reliable solution tool in terms of accountability and control.					
BC offers reliable solution tools for payments and transactions.					
BC offers technologies that help protect consumers' property and control rights.					
The use of BC protects personal information, reduces risks and creates the opportunity to try new brands.					
MEDIATION, CREATIVE AND INNOVATION DIMENSION					
BC provides flexibility as it allows for mediation (direct buyer-seller relationship)					
BC paves the way for creative and innovative approaches for consumers					
The use of BC increases as more people and institutions use these technologies.					
I also use it because I have friends who use BC technologies.					
DATA MANAGEMENT, ECOLOGY AND DIGITAL ECONOMY DIMENSION					
BC is good at countering ad fraud.					
BC should be used in the marketing process.					
BC provides convenience for companies in big data management.					
BC, marketing automation should be used.					
BC creates an environmentally friendly digital economy.					
BC is the pioneer of digital transformation.					
BC contributes to green marketing efforts.					
BC stabilizes the carbon footprint and supports sustainability.					

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