

## RESEARCH ARTICLE

## Improved Particle Swarm Optimization Based on Blockchain Mechanism for Flexible Job Shop Problem and Revolutionize Online Gambling

Amit Mishra<sup>1</sup>, A. Adamu<sup>2</sup>

<sup>1</sup>Department of Computer Science, Baze University, Abuja, Nigeria, <sup>2</sup>Department of Computer Sciences, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria

Received on: 12/01/2022; Revised on: 30/03/2022; Accepted on: 25/04/2022

**ABSTRACT**

Blockchain has broad development potential and application prospects. Since its start, cryptocurrencies have sparked curiosity and scepticism in equal measure. It served as a substitute form of money that anyone could use and that did not need any regulatory backing. Because of this, users could buy things anonymously, which encouraged actions that most people would consider unethical and ultimately damaged the reputation of cryptocurrencies. However, certain societal tendencies have aided in the continued expansion of cryptocurrencies. Two such trends include the decline in public confidence in the existing banking system and the favorable perception of blockchain technology, a peer-to-peer network that underlies cryptocurrencies like Bitcoin. Furthermore, the cost of cryptocurrencies like Bitcoin has increased exponentially in recent years. Betting has always been an inherently human activity that does not seem likely to stop anytime soon despite the possible disappointments and dangers it poses. This paper presents block chain betting application system as a possible solution to the conventional method of betting. The system was developed using Node.js & NPM, Web3 API, and online remix ide available at <https://remix.ethereum.org>. The artificial intelligence-based blockchain works by collecting data from different sources such as smart devices, sensors, and internet of things devices. The data collected from smart devices, sensors, and internet of things devices are processed as an integral part of the blockchain application. The machine leaning can then be applied to the collected data from these devises for real-time analysis, prediction, and storage of the dataset on the blockchain network.

**Key words:** Betting, Block chain, Cryptocurrency, Machine learning

**INTRODUCTION**

A block chain is a distributed shared database that completely differs from a typical database for its ability to stores information such as blockchains data in blocks that are later link to together to through cryptocurrency. The functionality of the blockchain works on five basic principles; distributed database in which the database has access to its entire history and no party has complete control over the data.<sup>[1]</sup> Second, it has a peer-to-peer transmission in which communication in the database is directly between peers and no central authority. Transparency with Pseudonymity in very transaction visible to all who have access to the system. Each user, on a blockchain has a unique address which identifies them. The

users have the option to remain anonymous or provide proof of identity.<sup>[2]</sup> Moreover, it has irreversibility of records; once a transaction is confirmed, reversing it will be virtually impossible because the identifying hash code of each block is linked to the previous; therefore, changing the hash code of a block will cause the hash code of the previous block to change and that of the block before to change and so on. Achieving this is hopeless.<sup>[2]</sup> Finally, the computational logic trigger transactions between nodes/peers; the fact that the blockchain is digital this allows users to set up algorithms and rules that automatically trigger transactions between nodes/peers. The blockchain is a database accessible by anyone with access to the network and it is not controlled by any central authority; instead it is controlled and managed by the general public. Cryptocurrency was the first widely successful implementation of blockchain.<sup>[3]</sup> A cryptocurrency is a digital asset designed to work

**Address for correspondence:**

Amit Mishra,  
E-mail: [amit.mishra@bazeuniversity.edu.ng](mailto:amit.mishra@bazeuniversity.edu.ng)

as a medium of exchange that uses cryptography to secure its transactions, to control creation of additional units, and to verify the transfer of assets.<sup>[4]</sup> Consider a regular currency such as the dollar (\$) but completely decentralized and digital with no physical notes or coins and all transactions being made with the dollar will be done online through a network with secure cryptography. If the dollar operated in such a way, the dollar would be a cryptocurrency.

Artificial intelligence plays so many roles in human life, one of the areas of its application includes blockchain. Machine learning (ML) as an area of artificial intelligence has capability of learning human activities. The learning capabilities of ML can be applied to ML to blockchain application for efficient and smart and smart used. The security and efficiency of the blockchain distributed ledger can be improved by integrating ML. Another advantage of using ML is to enhance the time taken in reaching consensus through the building of better data sharing routes. This enable building of a better model using the centralized architecture of blockchain technology (BT).

The remaining sections of the paper are divided into four. Section 2 discusses about literature, Section 3 describes the methodology used in development of the blockchain application system. Section 4 discusses the result obtained and Section 5 concludes and gives recommendations for the future works.

## REVIEW OF RELATED WORK

Various literature exists on blockchain; the innovation of blockchain made its first public debut in the form of bitcoin in the year 2008.<sup>[5]</sup> It was introduced as a digital currency experiment which aimed at accomplishing a purely peer-to-peer electronic cash system and shortly after it was realized around 2014.<sup>[5]</sup> It was also asserted that the underlying technology that operated bitcoin could be separated from the currency and used for all kinds of other interorganizational cooperation.<sup>[6]</sup> In 2016, IBM released a report predicting that by the end of 2017, about 15% of financial institutions will have implemented the use of blockchain and up to 66% will be using BT by the end of 2020.<sup>[7]</sup> More recently, altcoins (including ethereum) had the problem of entering the market because of a problem with the perception of value of the altcoin. The problem here was a traditional financing issue where the value of an item is dependent on an

individual's perception of it, that is, for something to have value, it has to be perceived to have value and because of the existence of bitcoin, creating new currency with value was a difficult task so a proposed solution was to turn to already existing assets which already had value and digitize them.<sup>[8]</sup> Eventually it was apparent that "Valuing digitized assets poses many of the same problems as valuing digital assets".<sup>[8]</sup> This led to tokens which are assets to hold value in terms of products or services provided from the inception of the altcoin blockchain network. The example provided by Carlson was file storage provided by applications which are in essence decentralized versions of Dropbox.<sup>[8]</sup> The initial generation blockchains operated on "proof of work" for adding block to the blockchain and most of them still do. A proof of work in a blockchain is a situation where a miner has to solve a complex mathematical problem with high computational demands and power consumption for the block to be added to the blockchain and the miner gets rewarded. Due to the expensive nature of the proof of work system, other methods were innovated. This puts the idea of decentralization in the blockchain at risk because it means that the group with the highest computational power will make the decisions controlling the blockchain.<sup>[6]</sup> To do away with this potential threat to decentralization, proof of stake was introduced. Unlike the proof of work where the assembler of the block is decided by "who gets there first" being rewarded, in the proof of stake, there is no reward for creating the new block. Instead the miners receive the transaction fee for their work. This implicitly means that no new digital currency units created in the proof of stake systems. For this reason, the miners are actually called forgers instead.<sup>[3]</sup> Another innovation which will likely to have significant impact on blockchains is known as "blockchain scaling". Basically, it is intended to improve the speed of the blockchain network. At present, every computer on the network processes every transaction on the network and this makes the network slow.<sup>[6]</sup> Blockchain scaling aims to speed up the process without compromising security by figuring out how many computers are needed to process a transaction and efficiently dividing the work. According to Steemit user "candide", Wagerr "...uses ASSCs (application specific smart contracts) and oracle master nodes that update game results (an oracle tells the blockchain facts about the world we live in) and execute the smart contracts".

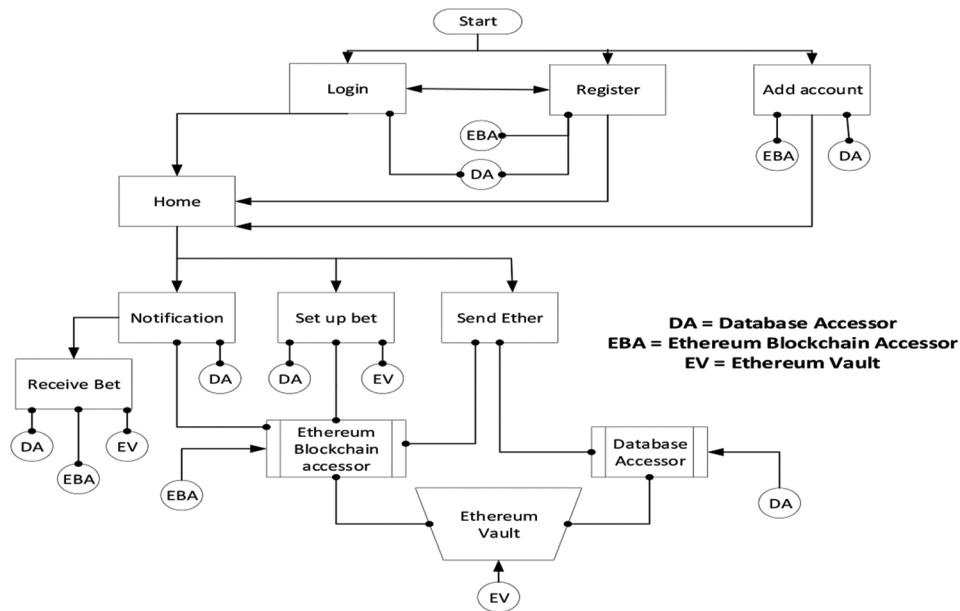


Figure 1: Frame work diagram of the blockchain application

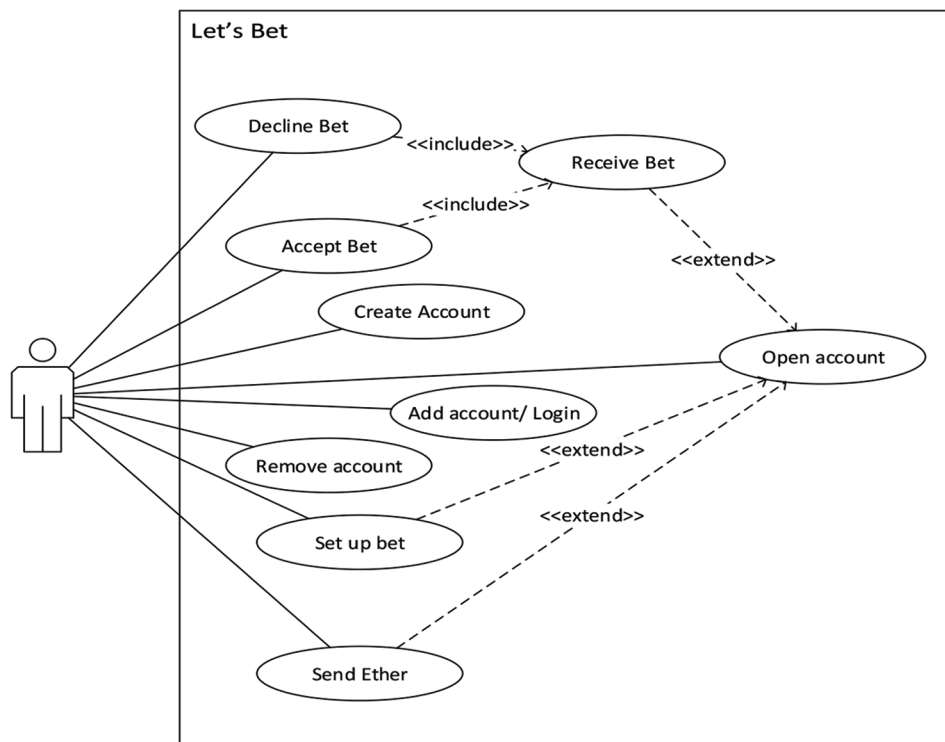


Figure 2: Use case diagram of the blockchain application

[9] Unlike bookie, wagerr is independent of any cryptocurrency (needless to say this is because it is a crypto currency itself) but operates with its own tokens (WGR) and it is created for the sole purpose of betting. It provides head-to-head betting, multi-user betting, and direct on chain betting.

**METHODOLOGY**

The artificial intelligence-based blockchain works by collecting data from different sources such

as smart devices, sensors, and internet of things devices. The data collected from smart devices, sensors and internet of things devices are processed as an integral part of the blockchain application. The machine leaning can then be applied to the collected data from these devises for real-time analysis, prediction and storage of the dataset on the blockchain network. The architecture of the blocchchain system is shown in Figure 1.

Figure 1 contains models which will aid and describe the system to be designed. These models will show the

organization of the system, the way the components of the system are arranged and how they function. Figure 2 shows that the use case diagram shown above simply shows the interaction between the user and the app. It shows what actions the user is able to do on the app and what actions require other actions

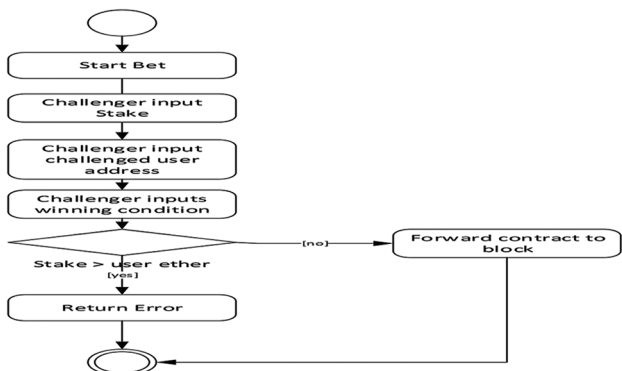


Figure 3: Activity diagram for making bet

to be done first such as a user not being able to accept or decline a bet if they have not received any bets.

Figure 3 shows the activity diagram for a user making a bet with another user. As shown in the diagram, the challenger has to initiate the process by clicking on the start bet option and then moving forward will have to provide a number of input before the bet can be forwarded to the block.

Figure 4 shows the activity diagram, the process of a user receiving a bet from a challenger. If the user's balance is less than the stake, the bet will automatically be declined but if the user has enough ether, they are free to accept or decline the bet.

Figure 5 shows the storyboard for the web app how the pages are related and what kind of input is taken in the pages.

Figure 6 shows the entity relationship diagram. In the diagram, the relationships between the various

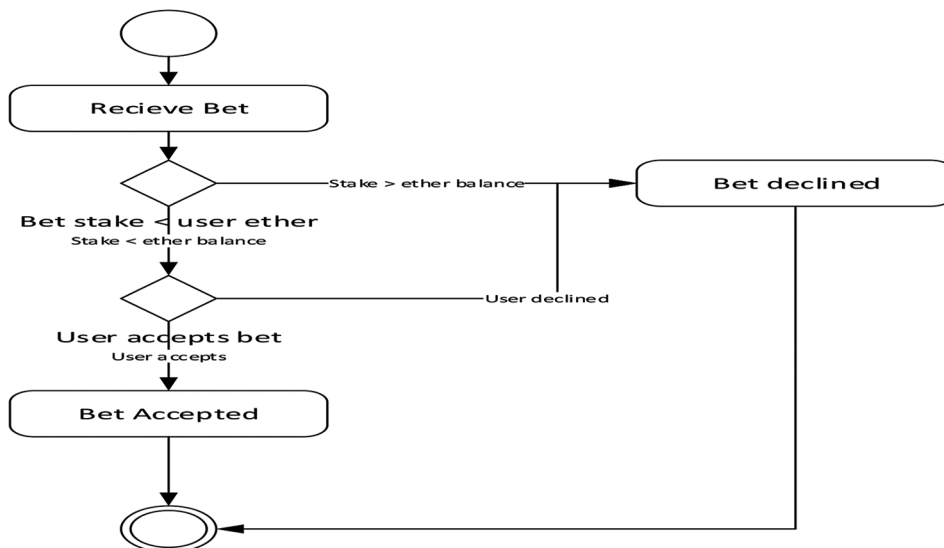


Figure 4: Activity diagram for receiving bet

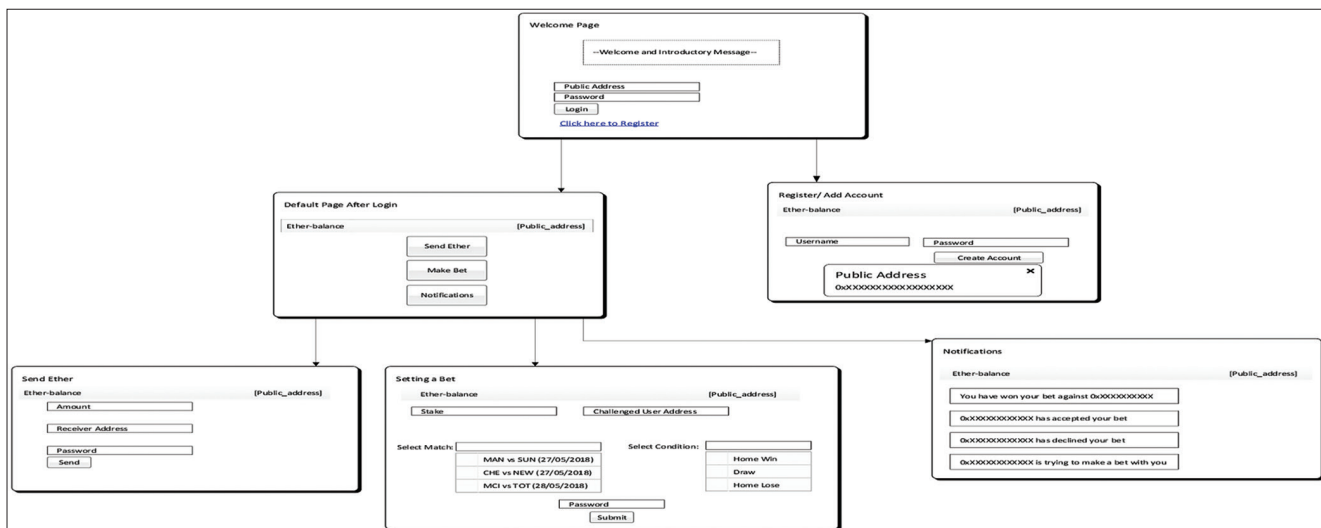


Figure 5: Storyboard/wireframe for general activities



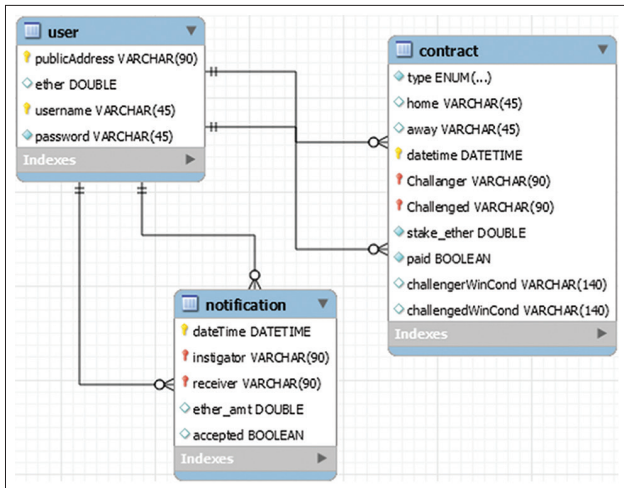


Figure 6: Entity relationship diagram

```

//create connection to database
var con = createSqlCon();
//sql query
var sql = "select * from user where username = ?";
//connect to database
con.connect(function (err)
{
    if (err) throw err;
    console.log("Connected!");
    //execute query
    con.query(sql,[usr], function (err, result)
    {
        if (err) throw err;
        if (!result[0]) //check if username exists
        {
            session.err = "Username does not exist"; //error is if does not exist
            res.writeHead(301,...
            )
            res.end();
        }
        else //else statement if it exists
        {
            session.err = null;
            if (pwd == result[0].password) //compare user input password to password in database
            {
                session.user = usr;
                session.pubAddr = result[0].publicAddress;
                updateEtherBal();
                res.writeHead(301,
                {
                    location: "/betting"
                });
                res.end();
            }
            else
            {
                session.err = "Password does not match";
                res.writeHead(301,
                {
                    location: "/login"
                });
                res.end();
            }
        }
    });
});

```

Figure 9: Login

```

//Create new account on blockchain
web3.eth.personal.newAccount(pwd, function (err, pubAddr)
{
    //assign retrieved public address (stored in variable 'b')
    req.body.newPubAddr = b
    console.log(web3.eth.accounts);
    newPubAddr = req.body.newPubAddr;
    if (usr || pwd || newPubAddr)
    {
        //insert into database
        con.query("INSERT INTO user (publicAddress, username, password, ether) VALUES (?, ?, ?, ?)",
        [newPubAddr, usr, pwd, session.userEthBal], function (err, result)
        {
            if (err) throw err;
            console.log("Account created!");
            //get ether balance
            web3.eth.getBalance(newPubAddr).then(function (balance)
            {
                session.userEthBal = balance;
                updateEtherBal();
            });
        });
    }
    else
    {
        console.log(req.body);
        session.user = usr;
        session.pubAddr = newPubAddr;
        //getting user ether balance from blockchain and updating it in database
        web3.eth.getBalance(newPubAddr).then(function (balance)
        {
            session.userEthBal = balance;
            updateEtherBal();
        });
    }
}
//sql statement
var sql = "INSERT INTO user (publicAddress, username, password, ether) VALUES (?, ?, ?, ?)";
var con = createSqlCon();
//connect to database
con.connect(function (err)
{
    if (err) throw err;
    console.log("Connected!");
    //execute query with sql statement above
    con.query(sql, [newPubAddr, usr, pwd, session.userEthBal], function (err, result)
    {
        if (err) throw err;
        console.log("Account created!");
        //get ether balance
        web3.eth.getBalance(newPubAddr).then(function (balance)
        {
            session.userEthBal = balance;
            updateEtherBal();
        });
    });
}

```

Figure 7: Registration Process

```

if (web3.utils.isAddress(pubAddr))
{
    //console.log(web3.eth.getAccounts().then(function(a,b){console.log(a)}))
    if (usr || pwd || pubAddr)
    {
        fs.readFile(__dirname + "/addAccount.html", function (err, data)
        {
            html = b.toString();
            console.log(req.body);
            res.end(html);
        });
    }
    else
    {
        console.log(req.body);
        //get ether balance
        web3.eth.getBalance(pubAddr).then(function (balance)
        {
            //sql statement
            var sql = "INSERT INTO user (publicAddress, username, password, ether) VALUES (?, ?, ?, ?)";
            var con = createSqlCon();
            //connect to database
            con.connect(function (err)
            {
                if (err) throw err;
                console.log("Connected!");
                //get ether balance
                web3.eth.getBalance(pubAddr).then(function (balance)
                {
                    session.userEthBal = balance;
                    updateEtherBal();
                });
            });
            con.query(sql, [pubAddr, usr, pwd, session.userEthBal], function (err, result)
            {
                if (err) throw err;
                console.log("Account created!");
                //get ether balance
                web3.eth.getBalance(pubAddr).then(function (balance)
                {
                    session.userEthBal = balance;
                    updateEtherBal();
                });
            });
        });
    }
}

```

Figure 8: Add user

entities in the app are clearly outlined including the attributes expected of each entity included in the app.

## RESULTS AND DISCUSSION

The development of the application was carried out Node.js & NPM, Web3 API and online remix ide available at <https://remix.ethereum.org> on a HP Notebook 15 of x64bit architecture running Windows 10 Pro (Version 1803 Build 17134.228).

The hardware specifications include an Intel Core i5 processor, 4<sup>th</sup> Generation processor, i5-4210U with a speed of 2.4GHz. RAM capacity of 8GB and storage capacity of 2TB HDD. User register by creating a new ethereum accounts on the blockchain with a brand-new public address and then inputs the public address gotten from the blockchain into the database along with the user’s username and ether balance as shown in the Figure 7.

Figure 7 shows the chain of events from creating the account on the blockchain to storing the information in the database. To add account, user used the add account feature to checks if the given public address parameter is actually a public address on the blockchain and if it is, it gets the ether balance of the user and stores it along with the username the user has selected in the database as depicted in Figure 8.

The login feature just checks the database to confirm that the username given as an input actually exists and then checks the password from the database and compares it with the password the user has given as shown in Figure 9.

## CONCLUSION AND RECOMMENDATION

An artificial intelligence (AI)-based blockchain-driven betting application system for individuals who bet among one another has been developed. The system has ability to overcome the challenges of duplication of and missing of data, identity thief, noise, and fraud exhibited by other system. The developed system aids individuals who wish to bet among each other to do so in a secure environment where their stake would be safe and repudiation

would not be possible. Although not all functional requirements of the system was implemented, more features such as bet types and live scores can be included. Another enhancement which could be really beneficial would be to migrate the whole application to the blockchain. This way, there can be no single point of failure and even if the server goes down, users' information and digital assets stay safely stored on the blockchain. It would be also very beneficial if there was some sort of platform where a user would be able to buy or acquire ether from regular currencies such as dollar.

## REFERENCES

1. Acosta MA. Machine learning core inflation. *Econ Lett* 2018;169:47-50.
2. Iansiti M, Lakhani KR. *The Truth About Blockchain*; 2017. Available from: [https://www.enterpriseproject.com/sites/default/files/the\\_truth\\_about\\_blockchain.pdf](https://www.enterpriseproject.com/sites/default/files/the_truth_about_blockchain.pdf) [Last accessed on 2022 Mar 18].
3. Rosic A. 17 Blockchain Applications That Are Transforming Society; 2017. Retrieved from Blockgeeks: Available from: <https://www.blockgeeks.com/guides/blockchain-applications> [Last accessed on 2022 Apr 24].
4. Garg R. What is Cryptocurrency?; 2017. Available from: <https://www.cryptotradingfinance.wordpress.com/2017/09/20/cryptocurrency> [Last accessed on 2022 Mar 17].
5. Marr B. A Very Brief History of Blockchain Technology Everyone Should Read; 2018. Available from: <https://www.forbes.com/sites/bernardmarr/2018/02/16/a-very-brief-history-of-blockchain-technology-everyone-should-read/#7e9711cc7bc4> [Last accessed on 2022 Apr 23].
6. Gupta V. A Brief History of Blockchain; 2017. Available from: <https://www.hbr.org/2017/02/a-brief-history-of-blockchain> [Last accessed on 2022 Mar 18].
7. IBM. *Leading the Pack in Blockchain Banking: Trailblazers Set the Pace*. New York: IBM Press; 2016.
8. Carlson J. A Brief History of Blockchains; 2017. Available from: <https://www.medium.com/@jillcarlson/a-brief-history-of-blockchain-b674dc6f97c> [Last accessed on 2022 Feb 14].
9. Candide. Should you Invest in Wagerr?-ICO City #3; 2017. Available from: <https://www.steemit.com/cryptocurrency/@candide/should-you-invest-in-wagerr-ico-city-3> [Last accessed on 2022 Feb 14].