Ilkogretim Online - Elementary Education Online, Year; Vol 20 (Issue 5): pp. 1845-1853
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2021.05.203

# The Effect of Smart Blockchain Contracts on the Financial Services Industry in the Banking Sector in Jordan

**Mohammad Salameh Zaid Almahirah,** Associate Professor, Business Faculty, lsra University, Amman, Jordan

**ABSTRACT-** The study aimed to identify the effect of smart blockchain contracts on the financial services industry in the banking sector in Jordan, through an empirical study on the Jordanian banking sector. The study population was represented by the banks in the Jordanian environment, (15) banks were selected with their various branches. As for the study sample, it consisted of (81) including (managers, deputy directors, heads of departments, major clients), representing approximately 67.5% of the total sent questionnaires. A questionnaire was used as an instrument of the study in order to collect data from the study population. The descriptive and analytical approach was used. The study concluded that there is a statistically significant relationship regarding the impact of smart blockchain contracts on the financial services industry in the banking sector in Jordan. It was found also that the smart blockchain contracts help to reduce the cost of Banking services and enhancing operational efficiency in Jordanian banks. Moreover, they enhance and develop banking services and upgrade them in Jordanian banks. In light of the results of the field study, the researcher recommended that Jordanian banks should rely on smart Blockchain contracts in the field of banking sector that will contribute to reducing costs related to remittances and raising the operational efficiency of these banks.

**Keywords: Blockchain Smart Contracts - Financial Services Industry - Banking Sector in Jordan**

## I. INTRODUCTION

Blockchain technology is one of the most powerful technologies that revolutionized the world of innovation within the banking sector; it has received a lot of attention and research in the recent period (Treleaven et al, 2017). Blockchain technology is one of the most important technologies affecting the features of the economy (Zhang et al, 2020). This foundational technology was created to upgrade the infrastructure of financial services so that the quality of banking services provided improves, which affects both domestic and international transfers, international finance and trade services, and other banking transactions (Chen & Bellavitis, 2020).

It should be noted that Blockchain technology consists of a set of operations, transactions, or tasks required to be executed, each of which is called a block (Zheng et al, 2018). On the other hand, Blockchain technology is a digital ledger that distributes the signed transactions in encrypted form that are grouped into blocks, and each block is cryptographically linked to the previous block, so it is difficult to tamper with after the validation of each transaction and approving it by consensus (Mohanta et al, 2019). However, when new blocks are added, the old blocks become more difficult to modify (tamper-resistant), so the new blocks are copied via copies of the ledger within the network, and any conflicts are resolved automatically using self-programmed policies (Khezr et al, 2019).

Blockchain technology is also a shared decentralized distributed database, and these databases are designed in a secure way that preserves the data and information stored in them and prevents tampering with them (Alnafrah et al, 2019). Blockchain technology has many uses in the financial services industry in the banking sector, but its use in the field of overcoming the challenges facing financial reporting or the so-called digital financial reporting and improving it is the most important use of all (Poniszewska et al, 2020).

Based on the previous considerations, the survey conducted by the Financial Reporting Council FRC in Europe in 2016 confirmed the technologies that will be important for the future of preparing and improving financial reports for banks, in which more than 75% of the respondents identified that Blockchain technology is the most important technology for preparing and improving reports in banks (Parra-Moyano et al, 2019).

The study of the impact of smart blockchain technology contracts on the financial services industry in the banking sector is of great importance, and this is due to the openness of the world's leading technology banks to the application of this technology in the field of banking, which made the rest of the countries that have not applied this technology in a continuous discussion about how to apply it following by that the steps of the countries that adopted it in the field of banking to benefit from the advantages achieved in the field of banking (Chen et al, 2020).

From this standpoint, this research came in order to shed light on the importance of the impact of smart Blockchain technology contracts on the financial services industry in the banking sector of Jordanian banks, to identify the most important applications of this technology in the field of banking and to present the practical reality of adopting Blockchain technology within the banking sector of banks in Jordan with the aim of measuring the impact of its adoption on improving financial performance, reducing costs associated with financial transactions, and adding more confidence, transparency and security in protecting its data, by eliminating corruption, money laundering and large transfers. Thus, we will have a transparent banking sector, and this goal will be achieved in light of conducting a field study on Jordanian banks.

**PROBLEM OF THE STUDY**

Financial reports are considered a mechanism to create confidence and transparency in the company's financial position and its performance through the financial services industry in the banking sector. The reporting process and methods of the banking services industry are shrouded in some challenges related to the characteristics of Blockchain, which are the increase in the cost and complexity of the registration and collection processes for financial transactions. In addition, financial reports may be ineffective and prone to error and manipulation (Singh & Selvakumar, 2020). In addition to the difficulty of identifying a single source through which internal and external users can obtain reliable, updated, and instant digital financial reports on banks. However, the challenges of applying Blockchain technology are evident in the inflexibility of banks' financial reports and the unattractiveness of the offer in light of the multiplicity of forms of supply and the multiplicity of stakeholders, so Blockchain technology is then one of the most important technologies that helps to overcome these challenges (Ferrag et al, 2020).

Based on the above, Holotescu (2018) study confirmed that Blockchain technology possesses the ability to revolutionize the production, distribution and use of these reports. As companies use this technology, it will help them to strengthen their current accounting systems and provide a decentralized system that prevents human intervention, which increases the processes efficiency, storage and review of financial data and information. Hassan (2020) study also indicated that Blockchain technology helps to improve financial reporting and contributes to the banking services industry in banks and reduces the risks of preparing them, as well as this technology allows for a more proactive approach to compliance with accounting standards and to ensure the transparency and reliability of financial reporting.

In order to keep pace with all the developments in the financial and economic arena in the world, the banking sector in Jordan is required to develop its structure in accordance with the technological developments taking place in the world. This will only happen through the development of the systems and programs of the banking sector in accordance with these developments, in addition to adopting Blockchain technology to contribute to reducing costs and thus enhancing the operational efficiency of banks. Moreover, there is a need to enhancing and developing banking services in Jordanian banks. Hence, the above motivated the researcher to consider the impact of smart blockchain contracts on the financial services industry in the banking sector in Jordan, and therefore the researcher identified the problem of his study with the following main question:

**What is the Effect of Smart Blockchain Contracts on the Financial Services Industry in the Banking Sector in Jordan?**

**HYPOTHESES OF THE STUDY**

1. There is no statistically significant relationship of the effect of smart Blockchain contracts on the financial services industry in the banking sector in Jordan, reducing the cost of banking services and enhancing operational efficiency in Jordanian banks.

2. There is no statistically significant relationship of the smart blockchain contracts on the financial services industry in the banking sector in Jordan, and the promotion and development of banking services and upgrading them in Jordanian banks.

**OBJECTIVES OF THE STUDY**

1. Identifying the nature and importance of smart Blockchain contracts, their characteristics and areas of application.

2. Identifying the reality of smart blockchain contracts and the extent of their application into the Jordanian banking sector.

3. Identifying the applications of Blockchain technology in the Jordanian banking sector and the positive effects of its application

4. Verifying the impact of smart blockchain contracts in Jordanian banks in enhancing operational efficiency and reducing costs.

**SIGNIFICANCE OF THE STUDY**

1. Shedding light on the contribution of smart blockchain contracts in enhancing banking services and attracting more customers in Jordanian banks.

2. Exposing the degree of confidence and acceptance of banks and their clients within the Jordanian environment for adopting smart Blockchain technology in the field of banking work.

3. Raising the awareness of the need to adopt Blockchain technology in the Jordanian banking sector compared to previous experiences of different countries of the world in the field of applying the latest technologies, because of its many uses in the banking sector that will contribute to enhancing the bank's efficiency, improving its financial performance, and reducing costs to bank and customers, and to improve the banking services provided to customers.

4. Directing the interest of some Jordanian banks towards studying the importance of directly adopting Blockchain technology in the field of banking in response to the needs of customers and in response to the requirements of the global banking industry in light of the current technological developments.

## II. BACKGROUND

Blockchain technology enables the creation of a decentralized environment, where transactions and data that have been validated and encrypted are not under the control of any third-party institution. Any transaction is recorded in the ledger in a verifiable, secure, transparent and permanent manner. Blockchain is characterized by stability, global ease of use and resistance to censorship. Moreover, it has a decentralized global network, in the sense that no one controls it, there is no central failure point for the infrastructure; this means that the customer needs not more than one computer so that he enjoys independence in accessing the Blockchain. Thus, this computer becomes his own contract, and modifications to the operations of this technology cannot be made, and the process of adding a new block to the blockchain contains thousands of previous transactions (Attaran & Gunasekaran, 2019).

It is worth noting that Blockchain technology represents a "decentralized" technology, meaning that no party interferes to amend its data or regulate its work, unlike central bank systems, which record and save all transactions on their own systems, and in return for that banks charge commissions from customers for the service provided to them. (Pilkington, 2016).

In the same context, Blockchain systems provide transparency and security with no manipulation or alteration of data (Nowiński & Kozma, 2017). It also provides the transfer service with free charges, with a high degree of stability, transparency and security, as this data is preserved in the blockchain on hundreds of thousands of computers, which guarantees a high level of security and privacy (Min, 2019).

### 1. The impact of Blockchain technology on the banking sector

It must be pointed out that there are implications for the application of Blockchain technology in the field of banking because of the multiple uses and goals within banks in the banking sector, and the ways in which the adoption of Blockchain technology will enhance banking services and promote them to attract more customers, in light of the following points: (Liu et al, 2019).

1. It helps banks to conduct financial transactions faster and more accurately.

2. No administrative effort is required to keep records or settle disputes related to financial transactions.

3. It contributes to increasing administrative efficiency and providing and exchanging data.

4. It contributes to reducing operational risks and improving the efficiency of banks.

5. Contribute to achieving more transparency for the bank and privacy for the customer.

Based on the previous considerations, the effect of Blockchain technology contributes to achieving more transparency and security to make financial transactions visible without the possibility of changing them. It also helps in achieving transparency in the bank's ability to follow up on customers 'financial transactions through the stability of financial operations and their lack of change over time (Peter & Moser, 2017). The impact of this technology is also evident through eliminating corruption, reducing fraud because of the transparency and stability of transactions, and achieving more transparency through the so-called smart contracts that aim to complete transactions without an intermediary (Collomb & Sok, 2016).

Thus, the previous studies in this field came to confirm this, as Guo & Liang (2016) study indicated that Blockchain technology is an essential and necessary technology within the banking business, as the banking sector in China requires an urgent shift and it seeks to find new growth methods, and the study found that major gaps in the basic technology of the payment clearance system, credit information systems in banks and financial transfers may happen, and thus the improvement of banking services and financial transactions, which will enhance the efficiency of banking services provided in the banking sector is crucial . The Cocco et al., (2017) study also dealt with measuring the impact of banks' use of blockchain technology on reducing costs, and the study concluded that blockchain technology can contribute to improving the global financial infrastructure, and achieving many achievements through the use of more efficient systems than today.

On the other hand, the Sahlin & Levenby (2018) study indicated that blockchain technology has attracted a lot of attention in the past few years because of its effective role in improving audit processes that will have major effects on accountants and auditors, and the study concluded that blockchain technology has a lot of the enormous potential in the field of auditing profession. While Swapan (2018) study attempted to determine the potential impact of blockchain technology on the accounting and auditing profession, it was concluded that although the technology aims to move from manual accounting to the computerized accounting process, this transition never threatened the existence of accountants, rather it was intended to provide accountants with knowledge of computer programs for conditioning in an environment based on modern technology. Moreover, Sanjeev & Roopali (2018) study sheds light on the impact of Blockchain on the accounting and auditing profession, and the study concluded that this technology will revolutionize the financial world by radically reshaping the profession of auditing and accounting.

Holotescu (2018) study also sought to measure the most important advantages achieved from the application of blockchain in the banking sector, as it found that this technology provides banks with many advantages, which are that users themselves maintain control over the storage and management of personal data, in addition to achieving confidence and transparency in performing transactions. In the same context, Aleksy (2019) study sought to measure the impact of implementing blockchain technology in the field of accounting, and concluded that blockchain technology in accounting achieves reliable and valid data. Hassan (2020) study also dealt with measuring the impact of using blockchain in enhancing the reliability of financial statements, and the study concluded that the response by accounting and auditing firms is towards relying on blockchain in accounting systems and facing its challenges.

## III. Designing and Analyzing the Field Study

**Population and sample of the study**

The study population represents the banks operating in the Jordanian environment, and (15) banks were selected with its various branches. As for the study sample, it consisted of (81) (managers, deputy directors, department heads, and major clients), representing approximately 67.5% of the total sent questionnaires.

**Instrument of the Study**

A questionnaire was developed as the instrument of the study to collect data from the study population, by surveying the opinions of the research sample regarding the items that aim to verify the research hypotheses, and the questionnaire questions were divided in light of two main dimensions to test the research hypotheses as follows:

**The First Dimension:** measuring the impact of smart blockchain contracts on the financial services industry in the banking sector in Jordan, reducing the cost of banking services and enhancing operational efficiency in Jordanian banks.

**The Second Dimension:** measuring the impact of smart blockchain contracts on the financial services industry in the banking sector in Jordan, and enhancing and developing banking services and upgrading them in Jordanian banks.

**The Reliability and Validity of the Study Instrument**

For the purpose of confirming the reliability of the study the reliability of the study instrument used was confirmed through the coronbachs-alpha equation, and the following table shows the reliability coefficients.

***Table (1) Coronbachs-Alpha***

| Dimension | Coronbachs-Alpha COFFEECIENT |
|---|---|
| Enhancing operational efficiency in Jordanian banks | 0.862 |
| Development of banking services in Jordanian banks | 0.731 |
| Total Reliability | 0.982 |

It is evident from the table that the Cronbach alpha coefficients are highly reliable, which means they are reliable in the field application of the study.

## IV. Results and Discussion

**The First Hypothesis:**

**H0:** There is no statistically significant relationship of the effect of smart Blockchain contracts on the financial services industry in the banking sector in Jordan, reducing the cost of banking services and enhancing operational efficiency in Jordanian banks.

To verify the first hypothesis, it was tested through a set of items in the questionnaire, which included (10) items, and the results of the statistical analysis were as shown in the following table:

***Table (2) the results of the statistical analysis of the first statistical hypothesis***

| The first dimension: The following results achieved from adopting blockchain technology in the banking sector contribute to reducing costs and thus enhancing operational efficiency: | | Arithmetic mean | standard deviation | T value |
|---|---|---|---|---|
| 1 | Reducing the cost of remittances resulting due to the absence of an intermediary. | 3.382 | 0.572 | 52.61 |
| 2 | Reducing the cost of foreign trade financing operations regarding the import and export operations. | 3.752 | 0.482 | 58.83 |
| 3 | Reducing infrastructure costs in remote areas resulting from making financial transfers. | 4.942 | 0.507 | 167.16 |
| 4 | Reducing costs for banks and enhancing the efficiency of banking infrastructure. | 4.603 | 0.599 | 83.42 |
| 5 | Meeting international trade needs super-fast. | 3.643 | 0.498 | 68.72 |
| 6 | Facilitating electronic payments for international trade operations. | 4.753 | 0.584 | 80.41 |
| 7 | Speeding up import and export processes resulting from the provision of real-time payments and fast transfers. | 4.843 | 0.602 | 52.80 |
| 8 | Facing competition with international banks that apply this | 4.321 | 0.485 | 52.64 |

| | | | | |
|---|---|---|---|---|
| | technology. | | | |
| 9 | The low cost of remittances gives banks a competitive advantage. | 4.755 | 0.501 | 83.37 |
| 10 | Reducing costs related to banks' administrative operations, including settlement transactions. | 4.756 | 0.485 | 80.24 |
| Total Mean | | 4.375 | 0.598 | |

The above table, related to the data analysis of the first hypothesis test, shows that the general arithmetic mean of the respondents 'answers was (4.375) and a standard deviation of (0.598). This result indicates the existence of a vital effect of the smart blockchain contract technology on the financial services industry in the banking sector in Jordan in addition to its role in reducing the cost of banking services and enhancing operational efficiency in Jordanian banks. (T) test was also used for the first statistical hypothesis questions, as shown in the following table:

***Table (3) T-test for the general mean of the first statistical hypothesis questions***

| Mean | Standard deviation | Level of significance | T value |
|---|---|---|---|
| 4.375 | 0.598 | 0.000 | 77.5925 |

In light of the previous table, it becomes clear that the value of T was (77.5925) with the level of significance (0.000), which is less than (0.05). This indicates that the opinions of the sample members tend to support the first statistical hypothesis, which is that relying on smart blockchain contract technology will contribute to reducing the costs and improving the operational efficiency of banks in the Jordanian environment. This means rejecting the null hypothesis and accepting the alternative hypothesis that states: There is a statistically significant relationship of the effect of smart Blockchain contracts on the financial services industry in the banking sector in Jordan, reducing the cost of banking services and enhancing operational efficiency in Jordanian banks.

**The Second Hypothesis:**

**H0:** There is no statistically significant relationship of the smart blockchain contracts on the financial services industry in the banking sector in Jordan, and the promotion and development of banking services and upgrading them in Jordanian banks.

To verify the second hypothesis, it was tested through a set of items in the questionnaire, (10) items, and the results of the statistical analysis were as shown in the following table:

***Table (4) results of the statistical analysis of the second hypothesis***

| The second dimension: The following results resulting from adopting blockchain technology contribute to enhancing and developing banking services: | | Arithmetic mean | standard deviation | T value |
|---|---|---|---|---|
| 1 | Completing financial transactions faster and more accurately | 4.623 | 0.637 | 52.613 |
| 3 | Increasing administrative efficiency resulting from the speed of provision and exchange of data. | 4.742 | 0.624 | 167.164 |
| 4 | Reducing operational risks and improving efficiency for banks. | 4.942 | 0.694 | 83.427 |
| 5 | Achieving more transparency for the bank and privacy for the customer. | 4.607 | 0.633 | 68.726 |
| 6 | Achieving security to make financial transactions visible without the possibility of changing them. | 4.904 | 0.599 | 80.412 |
| 7 | Achieving transparency in the bank's ability to follow up on financial transactions. | 4.753 | 0.683 | 56.296 |
| 8 | Achieving security for customers through the stability of financial operations. | 4.735 | 0.618 | 52.809 |
| 9 | Eliminating corruption and reducing fraud. | 4.664 | 0.593 | 77.602 |
| 10 | Achieving more transparency through the smart contracts. | 4.588 | 0.588 | 52.645 |
| 15 | Application of issued checks systems. | 4.439 | 0.587 | 80.394 |
| Total Mean | | 4.700 | 0.679 | |

The above table related to the data analysis of the second hypothesis test shows that the general arithmetic mean of the respondents' answers was (4,700) and a standard deviation of (0.679). This result indicates that there is a vital impact of the Blockchain smart contract technology on the financial services industry in the banking sector in Jordan in addition to its role in reducing the cost of banking services and enhancing operational efficiency in Jordanian banks. (T) Test was also used for the first statistical hypothesis questions, as shown in the following table:

***Table (5) T-test for the general mean of the second statistical hypothesis questions***

| Mean | Standard deviation | Level of significance | T value |
|---|---|---|---|
| 4.700 | 0.679 | 0.000 | 82.6428 |

In light of the previous table, it becomes clear that the value of T was (82.6428) with the level of significance (0.000), which is less than (0.05). This indicates that the opinions of the sample support the second statistical hypothesis, which is that relying on smart blockchain contract technology will contribute to strengthening and developing banking services in addition to upgrading them in Jordanian banks. This means rejecting the null hypothesis and accepting the alternative hypothesis that states: There is a statistically significant relationship of the smart blockchain contracts on the financial services industry in the banking sector in Jordan, and the promotion and development of banking services and upgrading them in Jordanian banks.

## V. RESULTS AND RECOMMENDATIONS

### Results

**The research reached the following results:**

- In light of the experiences of some banks that have adopted this technology, they have concluded that smart Blockchain contracts on the financial services industry in the banking sector represent the solution in developing and improving banking services provided to customers in terms of security, transparency, speed, cost reduction and decentralization.

- There are several applications and uses of Blockchain smart contracts in the banking sector, which are as follows:

1. It is used to reduce fraud and electronic crimes.
2. It is used in the process of storing and confirming customer data.
3. It is used to complete financial transactions with safety, transparency and lower cost.
4. It is used to complete payments and financial transfers very quickly.
5. It is used to provide smart contracts that add more transparency

- Smart Blockchain contracts in the field of banking in the Jordanian environment contribute to achieving the following goals:

1. Reducing time and material costs for banks and customers.
2. Meeting the needs of global trade.
3. Facing competition in light of transfers.
4. Enhancing and upgrading banking services.

### Recommendations

In light of the theoretical background, previous studies and the results of the field study, the most prominent recommendations reached by the current study were the necessity for Jordanian banks to adopt smart blockchain contracts in the field of banking work. This adoption will contribute to reducing costs related to transfers, raising the operational efficiency of these banks, and increasing customers' dependence on them without resorting to the international banks that have already started adopting this technology. Moreover, there is a critical need to take effective measures to support its application, especially in light of its positive

results in improving service quality according to both the international experiences of banking banks and the results of the field study in the Jordanian environment.

## REFERENCES


1. Aleksy, Kwilinski , (2019) , "Implementation of Blockchain Tecnologin Accounting Sphere" , *Academy of Accounting and Financial Studies Journal*, Volume 23, Issue 2.
2. Alnafrah, I., Bogdanova, E., & Maximova, T. (2019). Text mining as a facilitating tool for deploying blockchain technology in the intellectual property rights system. *International Journal of Intellectual Property Management*, *9*(2), 120-135.
3. Attaran, M., & Gunasekaran, A. (2019). Blockchain-enabled technology: the emerging technology set to reshape and decentralise many industries. *International Journal of Applied Decision Sciences*, *12*(4), 424-444.
4. Chen, W., Zhou, K., Fang, W., Wang, K., Bi, F., & Assefa, B. (2020). Review on blockchain technology and its application to the simple analysis of intellectual property protection. *International Journal of Computational Science and Engineering*, *22*(4), 437-444.
5. Chen, Y., & Bellavitis, C. (2020). Blockchain disruption and decentralized finance: The rise of decentralized business models. *Journal of Business Venturing Insights*, *13*, e00151.
6. Cocco, L., Pinna, A., & Marchesi, M. (2017). Banking on blockchain: Costs savings thanks to the blockchain technology. *Future internet*, *9*(3), 25.
7. Collomb, A., & Sok, K. (2016). Blockchain/distributed ledger technology (DLT): What impact on the financial sector?. *Digiworld Economic Journal*, (103).
8. Ferrag, M. A., Derdour, M., Mukherjee, M., Derhab, A., Maglaras, L., & Janicke, H. (2018). Blockchain technologies for the internet of things: Research issues and challenges. *IEEE Internet of Things Journal*, *6*(2), 2188-2204.
9. Guo, Y., & Liang, C. (2016). Blockchain application and outlook in the banking industry. *Financial Innovation*, *2*(1), 24.
10. Hassan, Mahmoud. (2020).The impact of using blockchains on the review Foreign ", *Journal of Financial and Business Research*, Volume 21, Issue 1, Jan.
11. Holotescu, C. (2018). Understanding blockchain technology and how to get involved. *The 14thInternational Scientific ConferenceeLearning and Software for EducationBucharest, April*, *19*, 20.
12. Khezr, S., Moniruzzaman, M., Yassine, A., & Benlamri, R. (2019). Blockchain technology in healthcare: A comprehensive review and directions for future research. *Applied sciences*, *9*(9), 1736.
13. Liu, M., Wu, K., & Xu, J. J. (2019). How Will Blockchain Technology Impact Auditing and Accounting: Permissionless versus Permissioned Blockchain. *Current Issues in Auditing*, *13*(2), A19-A29.
14. Min, H. (2019). Blockchain technology for enhancing supply chain resilience. *Business Horizons*, *62*(1), 35-45.
15. Mohanta, B. K., Jena, D., Panda, S. S., & Sobhanayak, S. (2019). Blockchain technology: A survey on applications and security privacy challenges. *Internet of Things*, *8*, 100107.
16. Nowiński, W., & Kozma, M. (2017). How can blockchain technology disrupt the existing business models?. *Entrepreneurial Business and Economics Review*, *5*(3), 173-188.
17. Parra-Moyano, J., Thoroddsen, T., & Ross, O. (2019). Optimised and dynamic KYC system based on blockchain technology. *International Journal of Blockchains and Cryptocurrencies*, *1*(1), 85-106.
18. Peter, H., & Moser, A. (2017). Blockchain-applications in banking & payment transactions: Results of a survey. *European financial systems*, *141*, 141.
19. Pilkington, M. (2016). Blockchain technology: principles and applications. In *Research handbook on digital transformations*. Edward Elgar Publishing.
20. Poniszewska-Marańda, A., Pawlak, M., & Guziur, J. (2020). Auditable blockchain voting system-the blockchain technology toward the electronic voting process. *International Journal of Web and Grid Services*, *16*(1), 1-21.
21. Sahlin, E., & Levenby, R. (2018). *Blockchain in audit trails*: An investigation of how blockchain can help auditors to implement audit trails.

22. Sanjeev, Bansal & Roopali, Batra. (2018).Blockchain and the future of accountancy, The Management Acountant, VOL 53, NO. 06.
23. Singh, R., & Selvakumar, R. (2020). Designing a secure positioning system using blockchain technology. *International Journal of Security and Networks*, *15*(2), 78-84.
24. Swapan Sarkar, (2018) , " Blockchain Accounting - The Disruption Ahead" , Behavioural Finance Explaining Irrational Investment Strategies, *The Management Accountant*, www.icmai.in.
25. Treleaven, P., Brown, R. G., & Yang, D. (2017). Blockchain technology in finance. *Computer*, *50*(9), 14-17.
26. Zhang, L., Xie, Y., Zheng, Y., Xue, W., Zheng, X., & Xu, X. (2020). The challenges and countermeasures of blockchain in finance and economics. *Systems Research and Behavioral Science*, *37*(4), 691-698.
27. Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H. (2018). Blockchain challenges and opportunities: A survey. *International Journal of Web and Grid Services*, *14*(4), 352-375.