

Impact blockchain technology on traditional electronic payment system

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ABSTRACT

Every moment there is a new idea and a new project that creates new technologies to make life easier and faster and to invest resources better. In this research, talk about a new technology that is considered a revolution in the age of the Internet, which in turn is the offspring of the new generation of the internet (5G), which is the blockchain technology, which began to be completed and appear to us from 2017, and it is not like other technologies, but in essence depends on changing many of the concepts that we are accustomed to in Communication, exchange and sharing via the Internet, it will change it in the same way as open-source software and in the same way as the Linux system, which, when it appeared, became the main focus for programmers and the development of software technologies, and this is the case with blockchain technology, this technology depends on the user and the customer only. There is no third party or responsible party. The user is responsible here.

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1. INTRODUCTION

This technology (blockchain) is a technology that allows storing information globally on many servers while allowing anyone to access the data of a second person in the process of exchange in real-time [1]. Everyone is responsible here, and as mentioned earlier, this technology appeared on the ground in 2017, that is, five years ago, and with that, it was exposed to security breaches that were reported by the media (penetration through cryptocurrency) and on the other hand, when hackers control most of the distributed units as they were few and limited [2].

Despite this, large companies still have confidence in this technology and hope that it is a promising technology that repairs its loopholes and ascends towards the maximum possible degree of perfection in the field of transactions and the establishment of safer and more reliable networks by dealing with customers scattered everywhere and all countries to support online payments, electronic payments, real estate transactions and data sharing In different fields [3], everyone is now rushing to know this technology more and more to save them a lot of effort and cost and give them what they need more powerful protection and many institutions have already started experimenting with it and launching beta software (experimental) in various fields of industry, health, real estate, banking, global shipping and others [4].

Blockchain technology will not erase the traditional rules of data but will introduce a new method in matters of storing and sharing information globally [5], and it is expected that this technology will secure

revenues of more than 10.5 billion until the end of 2023 [6]. The research will talk about this technology in a broader way, its advantages, its advantages, the level of security it provides, its various types, as well as the techniques associated with it, with comparisons between it and the traditional systems of online payment, and address the issue of blockchain technology in the economic field and online payment.

2. METHOD OF THE STUDY

2.1. Define blockchain technology

The blockchain system can be defined as a digital electronic system whose basic idea is the peer-to-peer relationship, or what is known as (P2P), which is a communication technology that enables users to share with each other and create records that do not accept the process of modification later [7], and with each new addition of data, this becomes another block that joins the chain becomes available to all subscribers of the blockchain, and the information of the block cannot be updated except with the consent of the subscribers and when entering certain data or information that becomes immutable and unalterable, it can be considered as a writing process for the first time [8], [9].

As another form of definition, it can be said that it is a large and distributed database that manages and organizes a large group of records that are constantly increasing (blocks) so that each block has a timestamp and what links it to its predecessor of blocks and information within these blocks is not adjustable [10].

Blockchain technology is still new and, in its infancy, and it is considered safe and simulates a distributed computing system [11], the future of electronic payments hinges on the decentralization of a worldwide online database designed to store purchase data [12], utilizing this technology allows for online trading without the need for a third party, enabling anyone, anywhere with an internet connection to participate [13]. Blockchains represent a contemporary network that facilitates the decentralization of trade by permanently storing data across a network of personal computers. This not only achieves decentralization but also ensures the distribution of information [14].

By employing data records known as blocks, millions of users collectively make it exceedingly challenging for a single individual to disrupt or corrupt the network. Each block contains a timestamp and a reference to the preceding block, forming a chronological chain. While one can access and append data to it, altering existing information is unfeasible. The blockchain enforces this through the application of cryptography, a mathematical discipline that plays a pivotal role [15].

The most renowned application of blockchain is Bitcoin, as it underpins this cryptocurrency. Furthermore, compared to conventional currency, Bitcoin and other tokens offer enhanced usability [16]. Bitcoin introduces a level of privacy that surpasses that of contemporary methods. This is attributable to the absence of intermediaries such as banks or financial institutions requesting personal information and residential addresses for transactions [17]. The future appears promising for consumers, marked by increased security, reduced costs, and improved overall experiences. IoT and blockchain share numerous similarities and differences, which are detailed in Table 1.

Table 1. A basic comparison between blockchain and the IoT [15]

Items	Blockchain	IoT
Privacy	Ensures the confidentiality of the participating nodes	Privacy is often lacking
Bandwidth	Consumes significant bandwidth	IoT devices typically have limited bandwidth and resources
System structure	Operates in a decentralized manner	Operates in a centralized structure
Scalability	Struggles to scale effectively with large networks	IoT often involves a multitude of devices
Resources usage	Demands substantial resources	Operates with constrained resources
Latency	Involves time-consuming block mining	Requires low latency for efficient operation
Security	Offers robust security measures	Faces security challenges

2.2. Fintech

Fintech, an abbreviation of financial technology, represents a substantial business prospect, comprising a diverse array of products, technologies, and business models that are reshaping the financial services sector. It encompasses a spectrum of innovations, from electronic payments to investment platforms, robo-advisors, and virtual currencies. Its innovation lies in its ability to seamlessly unite all stakeholders within the financial realm through an integrated platform, thus earning recognition for its innovative approach [18]. It is reshaping economies across the globe. This transformation is evident in everyday actions such as making purchases with a mobile phone, conducting money transfers through apps, or accessing bank statements online [19].

Compared to conventional approaches, fintech represents an innovative utilization of technology to create financial services and products that offer customers a user-friendly and convenient means to manage their finances. Fintech is also widely recognized as the future of the banking and finance industry, denoting companies that primarily provide technological solutions to financial service providers [20].

Close to two billion people worldwide lack access to traditional bank accounts, underscoring the vital role of financial technology in meeting the needs of those who are excluded from conventional banking services [21]. Businesses are actively challenging the traditional norms of the banking and finance sectors by revolutionizing the payment and lending processes for individuals.

However, the growing shift toward digital financial services has heightened concerns about data privacy, amplifying the risk of cyberattacks. In every commercial endeavor, licenses are a requisite component. Notably, the European Crowdfunding Network AISBL (ECN) plays a pivotal role in fostering entrepreneurship within Europe and stands as a prominent organization engaged in the formulation and execution of crowdfunding policies and activities. Furthermore, in the United Kingdom, regulatory oversight of crowdfunding platforms falls under the jurisdiction of the Financial Conduct Authority (FCA) [22].

Transactions are becoming increasingly important as global banking becomes more localized and accessible. Fintech companies could use blockchain as an economic framework to develop new products that address customer demands for security, trust, improved services, and privacy while also changing the competitive environment [23].

2.3. How does this technique work

The demand someone requests the operation. Diffusion the requested process propagates to a peer-to-peer network that is made up of nodes. Verification so that the network of published nodes of the process and user states using a certain algorithm. Contracts the operations verified by the system either contain an encrypted process, records, contracts, or other data. Merge after the verification process is completed, it is combined with other processes to form a block of information for the transaction log. Permanent installation the new block of information is added to the chain of nodes scattered in the network permanently without subsequent modification. The steps can be illustrated by the following Figure 1.

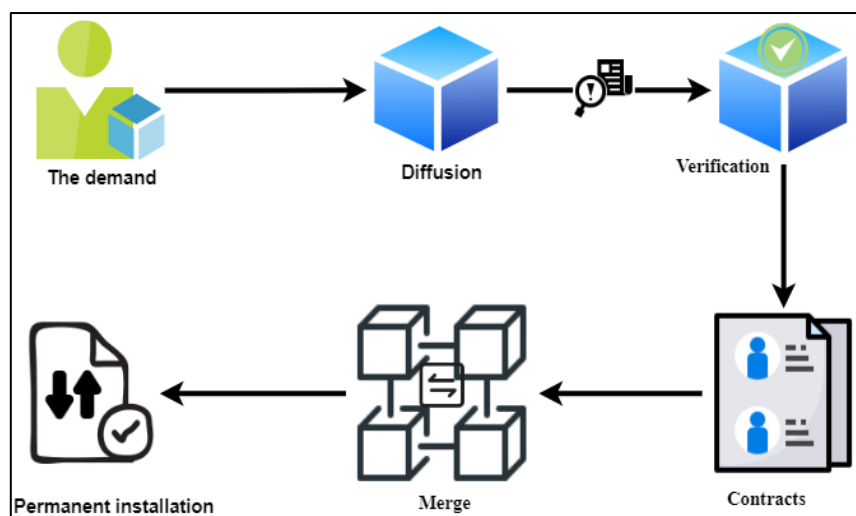


Figure 1. The blockchain work

2.4. The stages of work and registration in the blockchain system

The blockchain's work and registration stages are vital for transaction security, involving verification and cryptographic processes to ensure reliability, for a clear understanding of these stages, they can be listed as follows:

- We notice at the beginning the new user or subscriber sends a request to join (login to the network).
- Then the second box shows the process of creating the new block to form a new block in the electronic fabric (blockchain).
- An algorithm for the confirmation process that is used to verify the identity of the user, confirm the data and accept the user when they meet the standard conditions.

- d) Here it is checked whether the block is ready, complies with the conditions set, and is acceptable within the network as a new block.
- e) Here, in the event of a mismatch and acceptance of the new block, the process will be stopped and the user will be informed of the failure, the deficiency and the reason.
- f) Here, when the block is officially accepted and inserted into the fabric, the process is completed successfully and the last step is moved.
- g) The last block that indicates the successful completion of the process and the creation of a new block and linking it to the user account.

The steps can be represented by the Figure 2.

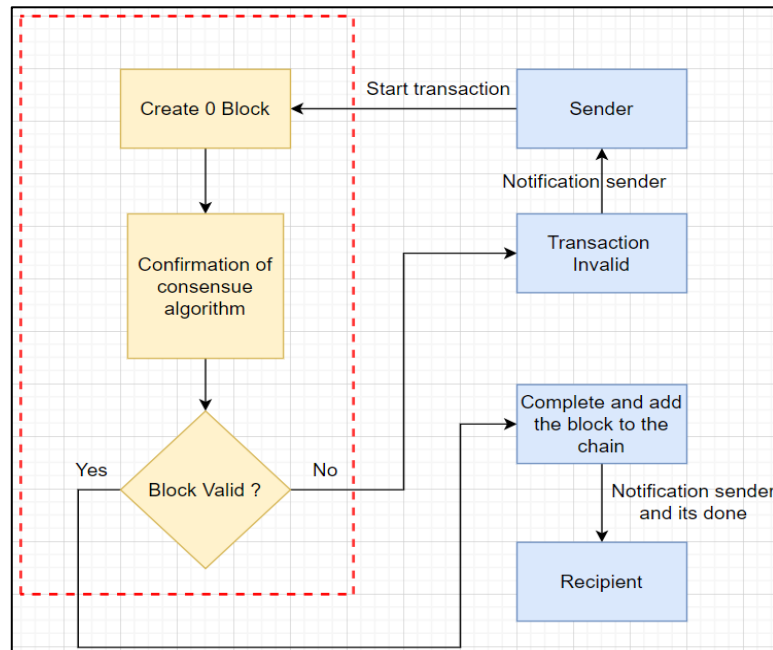


Figure 2. The stages of work and registration in the blockchain system

2.5. The benefits of blockchain technology

Need blockchain technology because of the many issues that have been resolved in this technology, and mention the most important:

a) Fewer brokers

Today, the market for financial services and payments has become very large and has many poles and competing companies (Pay pal, Visa, and others) [24], and each of them is free to set their own conditions. This is not the case in blockchain technology (only p2p) [25].

b) Outstanding high security

Each entry to the chain is not subject to forgery and manipulation, and it also uses two keys for security [26], a public key and a dedicated key for each person that can be used at the real-time of the transaction and does not allow revealing the identity of the account holder [27], and among the advantages is also reducing electronic attack and theft and reducing the cost of operations and transactions related to the proper functioning of the task, speed up the payment process [28].

c) Noticeable high speed

As a result of the lack of intermediaries in this case of payment systems, the transfers and transfers of funds will be fast [29], even from one country to another, it will be a few hours, but in the normal payment methods, it takes days [30].

d) Reduce costs

This system reduces the number of intermediaries, so the commission is deducted from the transaction amount and thus reduces costs by a large size that can be within (0.0001-0.1) of the amount [31].

e) Keep anonymity

This system is the source and the target itself, so there is no need for a third party to verify and control, and it is also open-source software that anyone can verify that there are no gaps in it. Thus, the transfer of funds

without revealing the explicit identification of the user and also not disclosing the transferred funds and transactions [32]. Therefore can be useful in large-scale voting election, where it becomes more difficult to falsify or manipulate [33].

2.6. The different types of blockchain technology

There are two main types of this new technology, the general type, and the private type, but there are differences between other types that we will summarize later [34]:

a) Blockchain (public)

The public type is a basic, unrestricted reseller technology, in which any user with access to the Internet can log in to any blockchain and make themselves an authorized node [35], become part of the fabric, become part of the public blockchain, and have access to current and past data in contracting and doing the mining process, verification, and transactions [36]. The main goal here is the mining process (bitcoin), and it can be said that the public blockchain is (bitcoin blockchain) and Litecoin [37].

b) Blockchain (private)

In this type of blockchain, it is restricted or only when permission is granted in a closed network. This type is used in institutions or organizations so that members are only participants in the network (blockchain) and here the level of security, permissions granted and access permissions are at the disposal of the managing organization [38], we can say that the private blockchain is similar to the public [39], but in the private, it is on a smaller and more restrictive scale. Examples of the private type (voting operations-identity) [40].

c) Consortium blockchain

This type of blockchain is the decentralized type, that is, there is no one party, a specific one, that manages the chain or network here [41], so that the network runs more than one organization and its institutions, unlike the technology of the private blockchain completely, which was managed by one side only [42], and here lies for more than one institution or company that It acts as a node, exchanges information and performs mining, used by banks [43].

d) Blockchain (hybrid)

This type is considered a mixture between the public and private types. In this technique, the features provided by the public and private systems can be used together [44]. Private and public permissions are given here to access the data and who has the authority to access the information can be controlled [45].

2.7. The main differences between blockchain and traditional payment systems

Exploring the key distinctions between blockchain and traditional payment systems sheds light on the transformative nature of blockchain technology in the financial landscape. These fundamental differences have significant implications for security, decentralization, and transaction processes but the most important ones can be clarified in Table 2.

Table 2. Differences between blockchain and traditional payment systems

Aspects	Blockchain system	Traditional payment systems
Multiple sponsors and intermediaries	There is no need for any middleman, the buyer deals directly with the seller from one peer to another.	Many sponsors (brokers), such as: Visa, PayPal, and Amex each has its own conditions.
Degree of safety	Financial operations are much faster and therefore fraudsters will have very little time for unauthorized entry and input becomes unmodifiable.	Hackable and vulnerable to attacks by fraudsters and data thieves, even if it is a small percentage.
Taken cost	By reducing the number of intermediaries, the cost will be from 0.001-0.1 of the amounts.	Because of the multiplicity of intermediaries, the cost is inside the state 1-3%, In case of payment 3-10%, digital (PayPal) 1.9-3.4%
Identity secrecy	The systems here are completely anonymous and very secure because it does not need a third party in addition to the feature of integrating the security protocol with only.	Confidentiality and privacy may be violated by hackers first or even by the state for surveillance purposes.
Transaction speed	It is characterized by a faster speed than the transactions that are carried out by traditional methods, even the transactions outside the country do not take more than a few hours (there are no intermediaries).	It is considered fast in the case that the transactions are within one country, but in the case of transferring money outside the country, it may take from one to five days because the money passes through many intermediaries and some data may be lost here.

3. THE PROPOSED SYSTEM AND IMPLEMENTATION

In this system, we propose to activate a principle similar to the blockchain technology, but while maintaining its centrality to achieve a balanced system that combines technologies. Therefore, use more than

one method to connect to different databases at the same time and store them in different places, but when a change occurs in one of the data, the system sends a warning to the user that there is a breaking and data tampering, a website has been designed that is connected to three different databases, as shown in the Figure 3.

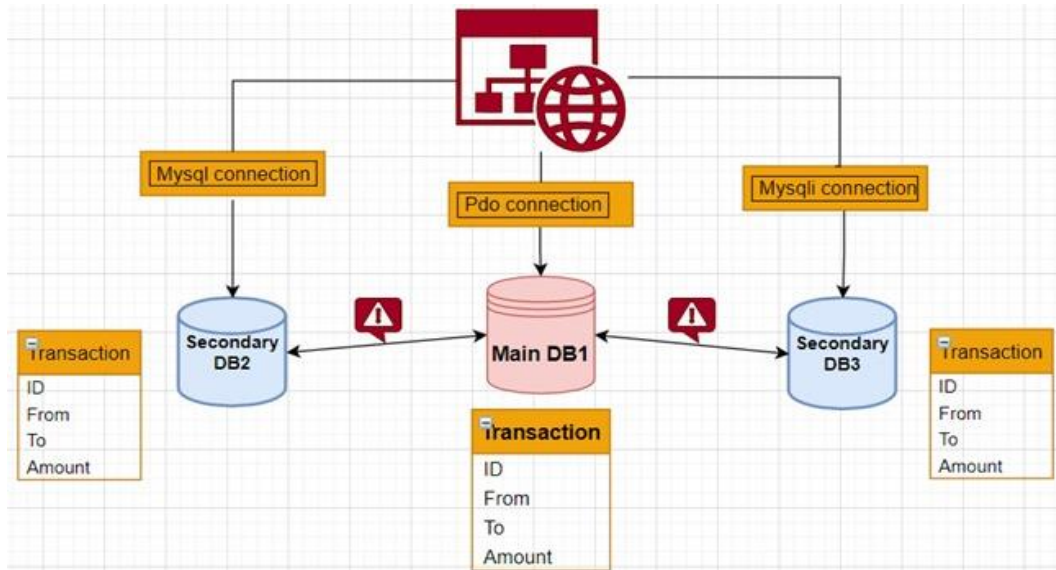


Figure 3. Connect the website to three different database

In my case, link the website to the database of raspberry, the local database of the internal computer, and the external Linux server while maintaining data centralization. And use three different connections MySQL, MySQLi, and PDO to provide more secure than use one method to connect, the structure of a website can be illustrated in Figure 4. Three databases are distributed in different servers and n different places, the struct of the database can be illustrated in Figure 5.

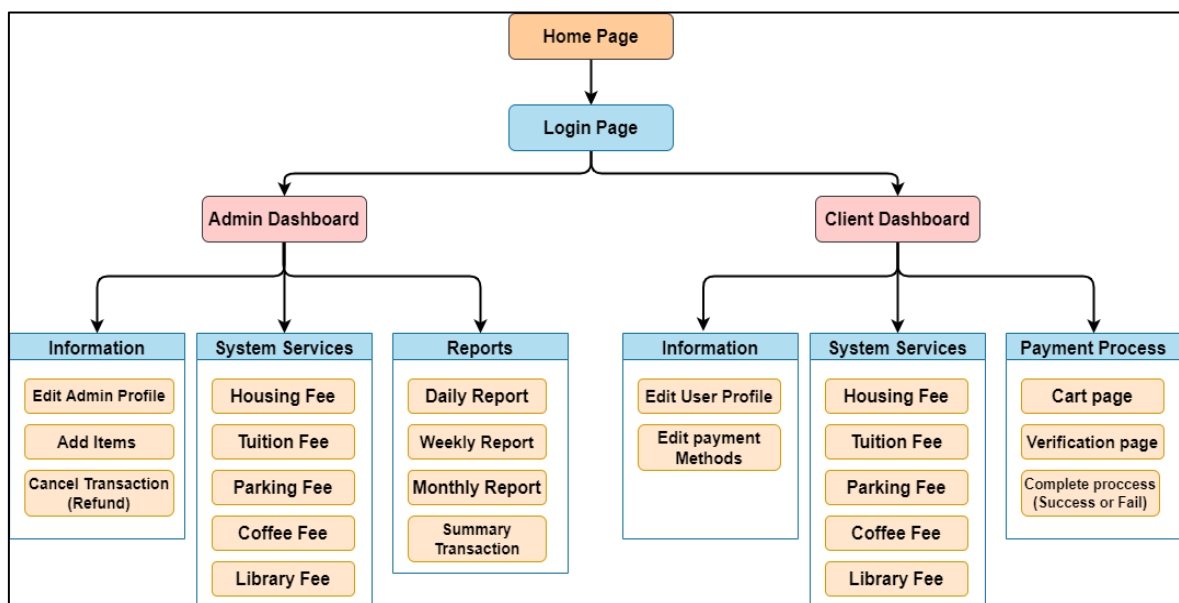


Figure 4. The structure of the website

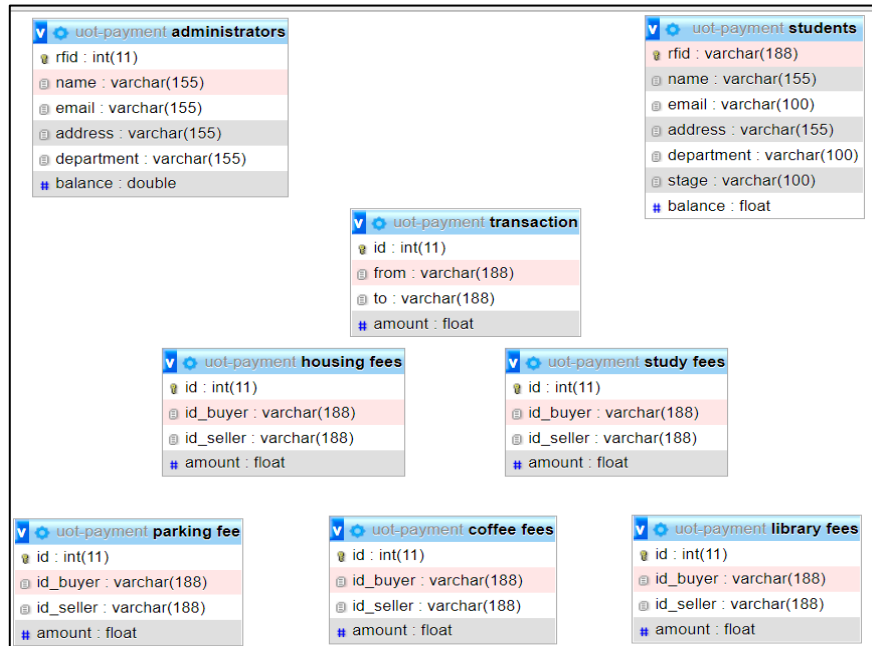


Figure 5. The struct of the database

4. CONCLUSIONS

In the present research noticed through some definitions and explanations about blockchain technology, especially in the field of electronic payment, we are now moving to another form of economy and payment methods in particular. Difficulties and obstacles at this stage, but it is considered promising and it is a very advanced technology and therefore will make a great revolution not only in the field of money, but in all other fields. Mutual trust in all financial transactions makes them more accurate, more transparent and simpler. Indeed, from point of view, see an increasing dependence by international companies on this technology (major shipping companies, for example), because when the blockchain is adopted for payment operations, subscribers will have new options of digital currencies such as: Bitcoin-Ethereum and others, and this will not allow payment companies, sales centers or stores even to know the information about currencies and subscribers, in addition to the speed in completing operations (many processing operations in real time), and all of this is offered by a very low price compared to other companies. therefore discussed its impact of blockchain on traditional electronic payment methods and their development by providing some protection features using its principles such as linking with several databases at the same time to keep records of transactions in safe places and not subject to tampering by hackers.

REFERENCES




- [1] M. C. Chang, "Storing information of stroke rehabilitation patients using blockchain technology," *Journal of Yeungnam Medical Science*, vol. 39, no. 2, pp. 98–107, Sep. 2022, doi: 10.12701/yujm.2021.01368.
- [2] T. Ahran, A. Sargolzaei, S. Sargolzaei, J. Daniels, and B. Amaba, "Blockchain technology innovations," *2017 IEEE Technology and Engineering Management Society Conference, TEMSCON 2017*, pp. 137–141, Jul. 2017, doi: 10.1109/TEMSCON.2017.7998367.
- [3] C. Saraf and S. Sabadra, "Blockchain platforms: A compendium," *2018 IEEE International Conference on Innovative Research and Development, ICIRD 2018*, pp. 1–6, Jun. 2018, doi: 10.1109/ICIRD.2018.8376323.
- [4] H. Ji and H. Xu, "A review of applying blockchain technology for privacy protection," *Advances in Intelligent Systems and Computing*, vol. 994, pp. 664–674, Jul. 2020, doi: 10.1007/978-3-030-22263-5_63.
- [5] A. Savelyev, "Copyright in the blockchain era: Promises and challenges," *Computer Law and Security Review*, vol. 34, no. 3, pp. 550–561, Jun. 2018, doi: 10.1016/j.clsr.2017.11.008.
- [6] "Blockchain Technology Market, June 2021 Report On Analysis 2021, Industry Size, share by Regions, Growth, Key Players with Product Profiles, Application, Impact of COVID-19, Forecast to 2030 - MarketWatch." <https://www.marketwatch.com/press-release/blockchain-technology-market-june-2021-report-on-analysis-2021-industry-size-share-by-regions-growth-key-players-with-product-profiles-application-impact-of-covid-19-forecast-to-2030-2021-10-29?tesla=y>.
- [7] M. Sajić, D. Bundalo, Z. Bundalo, and D. Pašalić, "Digital technologies in transformation of classical retail bank into digital bank," *2017 25th Telecommunications Forum, TELFOR 2017 - Proceedings*, vol. 2017-January, pp. 1–4, 2018, doi: 10.1109/TELFOR.2017.8249404.
- [8] E. S. Ross, "Nobody puts blockchain in a corner: The disruptive role of blockchain technology in the financial services industry and current regulatory issues," *Catholic University Journal of Law and Technology*, vol. 25, no. 2, p. 7, 2017, [Online]. Available: <https://scholarship.law.edu/jlt/vol25/iss2/7>.

- [9] I. A. Ridhawi, M. Aloqaily, A. Boukerche, and Y. Jaraweh, "A blockchain-based decentralized composition solution for IoT services," *IEEE International Conference on Communications*, vol. 2020-June, 2020, doi: 10.1109/ICC40277.2020.9149031.
- [10] J. Ma, S. Y. Lin, X. Chen, H. M. Sun, Y. C. Chen, and H. Wang, "A blockchain-based application system for product anti-counterfeiting," *IEEE Access*, vol. 8, pp. 77642–77652, 2020, doi: 10.1109/ACCESS.2020.2972026.
- [11] I. Marco and L. R. Karim, "The truth about blockchain," *Harvard Business Review*, 2017. https://enterpriseproject.com/sites/default/files/the_truth_about_blockchain.pdf%0Ahttps://hbr.org/2017/01/the-truth-about-blockchain.
- [12] B. Podgorelec, M. Turkanović, and M. Šestak, "A brief review of database solutions used within blockchain platforms," *Advances in Intelligent Systems and Computing*, vol. 1238 AISC, pp. 121–130, Jun. 2020, doi: 10.1007/978-3-030-52535-4_13.
- [13] I. Bashir, "Mastering blockchain: Distributed ledger technology, decentralization, and ... - Imran Bashir - Google Books," *Packt publications*, 2018. [https://books.google.co.in/books?hl=en&lr=&id=3ZIUDwAAQBAJ&oi=fnd&pg=PP1&dq=The+technology+came+into+existence+with+the+concept+of+cryptocurrencies+like+bit+coin+but+the+technology+has+moved+three+folds+and+now+the+technology+is+being+used+in+many+use+cas](https://books.google.co.in/books?hl=en&lr=&id=3ZIUDwAAQBAJ&oi=fnd&pg=PP1&dq=The+technology+came+into+existence+with+the+concept+of+cryptocurrencies+like+bit+coin+but+the+technology+has+moved+three+folds+and+now+the+technology+is+being+used+in+many+use+cases).
- [14] Y. Chen and C. Bellavitis, "Blockchain disruption and decentralized finance: The rise of decentralized business models," *Journal of Business Venturing Insights*, vol. 13, p. e00151, Jun. 2020, doi: 10.1016/j.jbvi.2019.e00151.
- [15] H. F. Atlam, M. A. Azad, A. G. Alzahrani, and G. Wills, "A review of blockchain in internet of things and Ai," *Big Data and Cognitive Computing*, vol. 4, no. 4, pp. 1–27, 2020, doi: 10.3390/bdcc4040028.
- [16] D. Vujičić, D. Jagodić, and S. Randić, "Blockchain technology, bitcoin, and Ethereum: A brief overview," *2018 17th International Symposium on INFOTEH-JAHORINA, INFOTEH 2018 - Proceedings*, vol. 2018-January, pp. 1–6, Apr. 2018, doi: 10.1109/INFOTEH.2018.8345547.
- [17] G. J. Larios-Hernández, "Blockchain entrepreneurship opportunity in the practices of the unbanked," *Business Horizons*, vol. 60, no. 6, pp. 865–874, 2017, doi: 10.1016/j.bushor.2017.07.012.
- [18] M. Anshari, M. N. Almunawar, M. Masri, and M. Hamdan, "Digital marketplace and FinTech to support agriculture sustainability," *Energy Procedia*, vol. 156, no. 2018, pp. 234–238, 2019, doi: 10.1016/j.egypro.2018.11.134.
- [19] W. Y. Moon and S. D. Kim, "A payment mediation platform for heterogeneous FinTech schemes," *Proceedings of 2016 IEEE Advanced Information Management, Communicates, Electronic and Automation Control Conference, IMCEC 2016*, pp. 511–516, 2017, doi: 10.1109/IMCEC.2016.7867264.
- [20] G. Dorfleiter, L. Hornuf, M. Schmitt, and M. Weber, "FinTech in Germany," *FinTech in Germany*, pp. 1–121, 2017, doi: 10.1007/978-3-319-54666-7.
- [21] G. B. Navaretti, G. Calzolari, J. M. Mansilla-Fernandez, and A. F. Pozzolo, "Fintech and banking. Friends or foes?," *SSRN Electronic Journal*, pp. 97–105, 2018, doi: 10.2139/ssrn.3099337.
- [22] J. Wonglimpiyarat, "Challenges and dynamics of FinTech crowd funding: An innovation system approach," *Journal of High Technology Management Research*, vol. 29, no. 1, pp. 98–108, 2018, doi: 10.1016/j.hitech.2018.04.009.
- [23] "Blockchain for Fintech(Financial technologies) | Scala Blockchain." <https://www.scalablockchain.com/fintech.html>.
- [24] "Marketing Financial Services - Jillian Farquhar, Arthur Meidan - Google Books." https://books.google.iq/books?hl=en&lr=&id=uJpMDwAAQBAJ&oi=fnd&pg=PP1&dq=financial+services+and+payments+has+become+very+large+&ots=hztvw6V0Ww&sig=0O-njNM85oCBmGoC8A6Fe-wM&redir_esc=y#v=onepage&q=financial+services+and+payments+has+become+very+large+&f=false.
- [25] R. A. Hussein, S. Al-Qaraawi, and M. Croock, "Role of data mining in E-government framework," *Iraqi Journal for Computers and Informatics*, vol. 44, no. 2, pp. 1–4, 2018, doi: 10.25195/ijci.v44i2.50.
- [26] N. D. Bhaskar and D. L. K. Chuen, *Bitcoin mining technology*. Elsevier Inc., 2015.
- [27] Y. Zhang, C. Xu, J. Ni, H. Li, and X. S. Shen, "Blockchain-assisted public-key encryption with keyword search against keyword guessing attacks for cloud storage," *IEEE Transactions on Cloud Computing*, vol. 9, no. 4, pp. 1335–1348, 2021, doi: 10.1109/TCC.2019.2923222.
- [28] J. Sengupta, S. Ruj, and S. D. Bit, "A comprehensive survey on attacks, security issues and blockchain solutions for IoT and IIoT," *Journal of Network and Computer Applications*, vol. 149, p. 102481, Jan. 2020, doi: 10.1016/j.jnca.2019.102481.
- [29] X. Ye, K. Sigalov, and M. König, "Integrating bim-A nd cost-included information container with blockchain for construction automated payment using billing model and smart contracts," *Proceedings of the 37th International Symposium on Automation and Robotics in Construction, ISARC 2020: From Demstration to Practical Use - To New Stage of Construction Robot*, vol. 2020, pp. 1388–1395, 2020, doi: 10.22260/isarc2020/0192.
- [30] J. Wang, S. Song, and P. Rao, "Comparison and choice of mainstream payment methods for small amount cross-border trade," 2019, doi: 10.25236/icssae.2019.040.
- [31] D. Tapscott and A. Tapscott, "How blockchain will change organizations," *MIT Sloan Management Review*, vol. 58, no. 2, pp. 10–13, 2017, doi: 10.7551/mitpress/11645.003.0010.
- [32] K. Huang, X. Zhang, Y. Mu, F. Rezaeibagha, and X. Du, "Scalable and redactable blockchain with update and anonymity," *Information Sciences*, vol. 546, pp. 25–41, Feb. 2021, doi: 10.1016/j.ins.2020.07.016.
- [33] B. Wang, J. Sun, Y. He, D. Pang, and N. Lu, "Large-scale election based on blockchain," *Procedia Computer Science*, vol. 129, pp. 234–237, Jan. 2018, doi: 10.1016/j.procs.2018.03.063.
- [34] V. J. Morkunas, J. Paschen, and E. Boon, "How blockchain technologies impact your business model," *Business Horizons*, vol. 62, no. 3, pp. 295–306, May 2019, doi: 10.1016/j.bushor.2019.01.009.
- [35] R. Almadhoun, M. Kadadha, M. Alhemeiri, M. Alshehhi, and K. Salah, "A user authentication scheme of IoT devices using blockchain-enabled fog nodes," *Proceedings of IEEE/ACS International Conference on Computer Systems and Applications, AICCSA*, vol. 2018-Novem, Jan. 2019, doi: 10.1109/AICCSA.2018.8612856.
- [36] D. Efanov and P. Roschin, "The all-pervasiveness of the blockchain technology," *Procedia Computer Science*, vol. 123, pp. 116–121, Jan. 2018, doi: 10.1016/j.procs.2018.01.019.
- [37] K. Fanning and D. P. Centers, "Blockchain and its coming impact on financial services," *Journal of Corporate Accounting and Finance*, vol. 27, no. 5, pp. 53–57, Jul. 2016, doi: 10.1002/jcaf.22179.
- [38] M. Cash and M. Bassiouni, "Two-tier permission-ed and permission-less blockchain for secure data sharing," *Proceedings - 3rd IEEE International Conference on Smart Cloud, SmartCloud 2018*, Oct. 2018, pp. 138–144, doi: 10.1109/SmartCloud.2018.00031.
- [39] M. Du, X. Ma, Z. Zhang, X. Wang, and Q. Chen, "A review on consensus algorithm of blockchain," *2017 IEEE International Conference on Systems, Man, and Cybernetics, SMC 2017*, vol. 2017-January, Nov. 2017, pp. 2567–2572, doi: 10.1109/SMC.2017.8123011.
- [40] W. Zhang *et al.*, "A privacy-preserving voting protocol on blockchain," *IEEE International Conference on Cloud Computing, CLOUD*, vol. 2018-July, pp. 401–408, Sep. 2018, doi: 10.1109/CLOUD.2018.00057.




- [41] O. Dib, A. Durand, K.-L. Brousmiche, E. Thea, and B. Hamida, "Scalable blockchain-based protocols for VANETs applications View project consortium blockchains: Overview, applications and challenges," *International Journal on Advances in Telecommunications*, no. 2, 2018, [Online]. Available: <http://www.ijarajournals.org/telecommunications/2018>.
- [42] K. Li, H. Li, H. Hou, K. Li, and Y. Chen, "Proof of vote: A high-performance consensus protocol based on vote mechanism and consortium blockchain," *Proceedings - 2017 IEEE 19th Intl Conference on High Performance Computing and Communications, HPCC 2017, 2017 IEEE 15th Intl Conference on Smart City, SmartCity 2017 and 2017 IEEE 3rd Intl Conference on Data Science and Systems, DSS 2017*, vol. 2018-Janua, pp. 466–473, Feb. 2018, doi: 10.1109/HPCC-SmartCity-DSS.2017.61.
- [43] Z. Li, J. Kang, R. Yu, D. Ye, Q. Deng, and Y. Zhang, "Consortium blockchain for secure energy trading in industrial internet of things," *IEEE Transactions on Industrial Informatics*, vol. 14, no. 8, pp. 3690–3700, Aug. 2018, doi: 10.1109/TII.2017.2786307.
- [44] P. K. Sharma and J. H. Park, "Blockchain based hybrid network architecture for the smart city," *Future Generation Computer Systems*, vol. 86, pp. 650–655, Sep. 2018, doi: 10.1016/j.future.2018.04.060.
- [45] J. Chen, "Hybrid blockchain and pseudonymous authentication for secure and trusted IoT networks," *ACM SIGBED Review*, vol. 15, no. 5, pp. 22–28, Nov. 2018, doi: 10.1145/3292384.3292388.

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