Blockchain Technology: Features, Characteristics with a focus on its Types

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ABSTRACT
Blockchain Technology is the emerging component of IT and Computing and is a kind of encrypted record of data works on distributed database. This is furthermore dealt with the data related to the transaction, contract, independent record, etc. Digital ledger is important and also applicable in various platforms, not bounded in a particular place; and required in financial activities and services and hence it is worthy in healthy digital currency and transactions. Financial transaction is not associated with the third party and it keeps the data encryption and here participants no need to share personal data and thus Blockchain Technology is associated with the data breach. Insignificantly Blockchain not only reduces the data breach but also supports the multiple numbers of shared copies and it works on the same database. It helps in wage a data breach attack. Earlier it was known as Blockchain but gradually it is treated as a Technology and considered as important in Information Technology and impacting the financial sector rapidly. Blockchain Technology is required in various tangible and intangible asset management and required in tracking including recorded effectively within a network and ledger. Blockchain is therefore is a tool, a technique, as well as a procedure for sophisticated financial management. This paper is based on existing literature emphasizing Blockchain Technology with features, characteristics with a focus on its types.
Keywords: Blockchain Technology, Financial Technologies, Business Sector, Financial Engineering, IT Applications

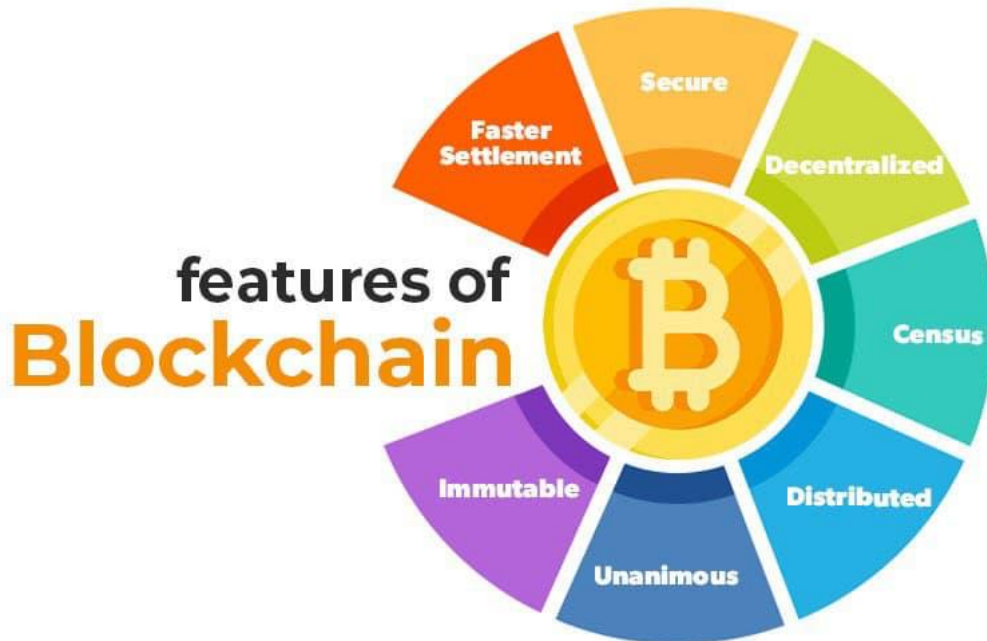**Introduction to Blockchain Technology**
Blockchain is an especially promising and revolutionary technology because it helps to reduce security risks, eliminate fraud, and bring transparency to a scale that has never been seen before. It was originally associated with cryptocurrency and **non-fungible tokens (NFTs)** in the 2010s, but blockchain technology has since evolved into a management solution for all types of global industries. With blockchain technology, you can provide transparency for food supply chains, secure healthcare data, innovate gaming, and generally change how we handle data and ownership. Using blockchain technology (also known as distributed ledger technology, or DLT), Using blockchain technology, multiple nodes on the network verify a transaction simultaneously. Anyone with a computer can join the network and participate in the transaction validation process. Multiple devices approve the transaction, which is stored as a code block across multiple devices. Every subsequent transaction is added to a chain (hence, blockchain) to maintain a historical record on the DLT. A wide range of industries are using blockchain technology. These include energy, logistics, education, and more.

Blockchain Evolution
Even though blockchain is a relatively new technology, it already has an extensive and fascinating history. The following section highlights blockchain development's most important and noteworthy events. Blockchain dates back to 1991, when Stuart Haber and Wakefield Scott Stornetta introduced the concept of a cryptographically protected chain of records. The technology gained traction in the

following two decades and became widely used. Blockchain entered its pivotal year in 2008 when Satoshi Nakamoto gave the technology an established model and applications. As a result of the first blockchain and cryptocurrency launch in 2009, blockchain's impact on the tech sector began to unfold.

Features of Blockchain

1. Immutable
Immutability means that the blockchain is a permanent and unalterable network. Blockchain technology functions through a collection of nodes. Once a transaction is recorded on the blockchain, it cannot be modified or deleted. This makes the blockchain an immutable and tamper-proof ledger that provides a high degree of security and trust.
• very node in the network has a copy of the digital ledger. To add a transaction every node checks the validity of the transaction and if the majority of the nodes think that it is a valid transaction then it is added to the network. This means that without the approval of a majority of nodes no one can add any transaction blocks to the ledger.
• Any validated records are irreversible and cannot be changed. This means that any user on the network won't be able to edit, change or delete it.
2. Distributed
All network participants have a copy of the ledger for complete transparency. A public ledger will provide complete information about all the participants on the network and transactions. The distributed computational power across the computers ensures a better outcome.

Distributed ledger is one of the important features of blockchains due to many reasons like:
• In distributed ledger tracking what's happening in the ledger is easy as changes propagate really fast in a distributed ledger.
• Every node on the blockchain network must maintain the ledger and participate in the validation.
• Any change in the ledger will be updated in seconds or minutes and due to no involvement of intermediaries in the blockchain, the validation for the change will be done quickly.

- If a user wants to add a new block then other participating nodes have to verify the transaction. For a new block to be added to the blockchain network it must be approved by a majority of the nodes on the network.
- In a blockchain network, no node will get any sort of special treatment or favors from the network. Everyone will have to follow the standard procedure to add a new block to the network.
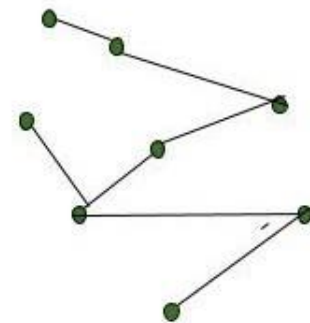
3. Decentralized

Blockchain technology is a decentralized system, which means that there is no central authority controlling the network. Instead, the network is made up of a large number of nodes that work together to verify and validate transactions. Each and every node in the blockchain network will have the same copy of the ledger.

Decentralization property offers many advantages in the blockchain network:

- As a blockchain network does not depend on human calculations it is fully organized and fault-tolerant.
- The blockchain network is less prone to failure due to the decentralized nature of the network. Attacking the system is more expensive for the hackers hence it is less likely to fail.
- There is no third-party involved hence no added risk in the system.
- The decentralized nature of blockchain facilitates creating a transparent profile for every participant on the network. Thus, every change is traceable, and more concreate.
- Users now have control over their properties and they don't have to rely on third-party to maintain and manage their assets.
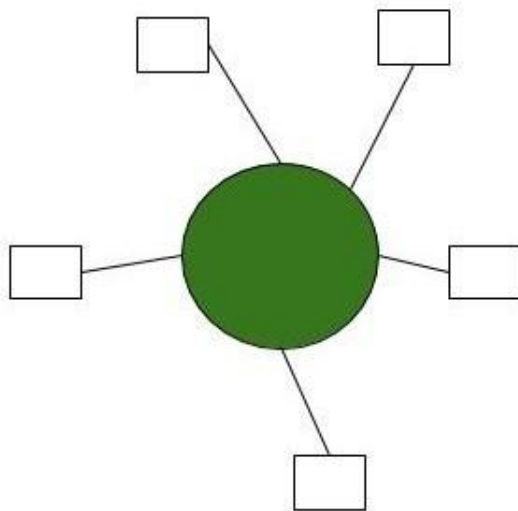
Centralised Network   Decentralised network

4. Secure

All the records in the blockchain are individually encrypted. Using encryption adds another layer of security to the entire process on the blockchain network. Since there is no central authority, it does not mean that one can simply add, update or delete data on the network. Every information on the blockchain is hashed cryptographically which means that every piece of data has a unique identity on the network. All the blocks contain a unique hash of their own and the hash of the previous block. Due to this property, the blocks are cryptographically linked with each other. Any attempt to modify the data means to change all the hash IDs which is quite impossible.

5. Consensus

Every blockchain has a consensus to help the network to make quick and unbiased decisions. Consensus is a decision-making algorithm for the group of nodes active on the network to reach an agreement quickly and faster and for the smooth functioning of the system. Nodes might not trust each other but they can trust the algorithm that runs at the core of the network to make decisions. There are many consensus algorithms available each with its pros and cons. Every blockchain must have a consensus algorithm otherwise it will lose its value.

6. Unanimous
All the network participants agree to the validity of the records before they can be added to the network. When a node wants to add a block to the network then it must get majority voting otherwise the block cannot be added to the network. A node cannot simply add, update, or delete information from the network. Every record is updated simultaneously and the updations propagate quickly in the network. So it is not possible to make any change without consent from the majority of nodes in the network.

7. Faster Settlement
Traditional banking systems are prone to many reasons for fallout like taking days to process a transaction after finalizing all settlements, which can be corrupted easily. On the other hand, blockchain offers a faster settlement compared to traditional banking systems. This blockchain feature helps make life easier.

More Features of Blockchain

Smart Contracts – Blockchain technology enables the creation and execution of smart contracts, which are self-executing contracts that automatically execute when certain conditions are met. Smart contracts have the potential to revolutionize various industries by providing a secure and transparent way to execute contracts.

Transparency – The blockchain ledger is public and transparent, which means that anyone can access and view the transactions on the network. This makes it a highly transparent system that is resistant to fraud and corruption.

Characteristics of Blockchain
Below are some of the characteristics of the blockchain that makes it a revolutionary technology:
Consensus:
All participating nodes in the network must agree on the validity of a transaction.
Provenance:
All the participants in the network can know the lineage of an asset recorded on the blockchain.
Immutability:
It is impossible to tamper with any transaction on the blockchain. If any transaction is wrongly executed, a new transaction must be issued to right the wrongs of the previous transaction.
Distributed:
The blockchain network is a peer-to-peer distributed network. There is no single point of failure. If some of the nodes fail to work, that will not affect the functioning of the network. No single authority can control the whole network.
Security:
The security of the transactions is achieved through public key cryptography. Every network participant has public and private keys to encrypt the data and issue digital signatures.
Coherence:
There will always exist a single value of truth in the blockchain. Every participant in the network sees the same copy of the distributed ledger.
Decentralization:
A conventional centralized transaction structure requires transactions to be approved by a trusted entity (e.g., the National Bank), causing cost and execution bottlenecks on central servers. The

blockchain eliminates the need for outsiders, contrary to the previously introduced centralized mode. In blockchain networks, agreement calculations are used to preserve details.

Persistency:

There is a quick way to check transactions, and fair miners will not admit to fraudulent transactions. As soon as a transaction is recorded in the blockchain, it is hard to reverse or erase. It is possible to instantly identify blocks that contain invalid transactions.

Anonymity:

There is a possibility that a client can sign up for a blockchain and use a generated address that does not reveal the client's real identity. We should be aware of blockchain technology.

Auditability:

A Bitcoin blockchain stores information about client adjustments based on the UTXO (Unused Transaction Performance): Every transaction applies to previously unused exchanges. If the present transaction is registered in the blockchain, the unspent transactions are changed from unspent to spent when the transaction is registered. There is also the possibility of effortlessly confirming transactions.

Types of Blockchain

There are 4 types of blockchain:

- Public Blockchain.
- Private Blockchain.
- Hybrid Blockchain.
- Consortium Blockchain.

1. Public Blockchain

These Blockchains are completely open to following the idea of decentralization. They don't have any restrictions, anyone having a computer and internet can participate in the network.

- As the name is public this blockchain is open to the public, which means it is not owned by anyone.
- Anyone having internet and a computer with good hardware can participate in this public blockchain.
- All the computer in the network hold the copy of other nodes or block present in the network
- In this public blockchain, we can also perform verification of transactions or records

Advantages:

- **Trustable:** There are algorithms to detect no fraud. Participants need not worry about the other nodes in the network
- **Secure:** This blockchain is large in size as it is open to the public. In a large size, there is greater distribution of records
- **Anonymous Nature:** It is a secure platform to make your transaction properly at the same time, you are not required to reveal your name and identity in order to participate.
- **Decentralized:** There is no single platform that maintains the network, instead every user has a copy of the ledger.

Disadvantages:

- **Processing:** The rate of the transaction process is very slow, due to its large size. Verification of each node is a very time-consuming process.
- **Energy Consumption:** Proof of work is high energy-consuming. It requires good computer hardware to participate in the network
- **Acceptance:** No central authority is there so governments are facing the issue to implement the technology faster.

Use Cases: Public Blockchain is secured with proof of work or proof of stake they can be used to displace traditional financial systems. The more advanced side of this blockchain is the smart contract that enabled this blockchain to support decentralization. Examples of public blockchain are Bitcoin, Ethereum.

2. Private Blockchain

These blockchains are not as decentralized as the public blockchain only selected nodes can participate in the process, making it more secure than the others.

- These are not as open as a public blockchain.
- They are open to some authorized users only.
- These blockchains are operated in a closed network.
- In this few people are allowed to participate in a network within a company/organization.

Advantages:
- **Speed:** The rate of the transaction is high, due to its small size. Verification of each node is less time-consuming.
- **Scalability:** We can modify the scalability. The size of the network can be decided manually.
- **Privacy:** It has increased the level of privacy for confidentiality reasons as the businesses required.
- **Balanced:** It is more balanced as only some user has the access to the transaction which improves the performance of the network.
- **Disadvantages:**
- Security- The number of nodes in this type is limited so chances of manipulation are there. These blockchains are more vulnerable.
- Centralized- Trust building is one of the main disadvantages due to its central nature. Organizations can use this for malpractices.
- Count- Since there are few nodes if nodes go offline the entire system of blockchain can be endangered.

Use Cases: With proper security and maintenance, this blockchain is a great asset to secure information without exposing it to the public eye. Therefore companies use them for internal auditing, voting, and asset management. An example of private blockchain is Hyperledger, Corda.

3. Hybrid Blockchain

It is the mixed content of the private and public blockchain, where some part is controlled by some organization and other makes are made visible as a public blockchain.
- It is a combination of both public and private blockchain.
- Permission-based and permissionless systems are used.
- User access information via smart contracts
- Even a primary entity owns a hybrid blockchain it cannot alter the transaction

Advantages:
- **Ecosystem:** Most advantageous thing about this blockchain is its hybrid nature. It cannot be hacked as 51% of users don't have access to the network
- **Cost:** Transactions are cheap as only a few nodes verify the transaction. All the nodes don't carry the verification hence less computational cost.
- **Architecture:** It is highly customizable and still maintains integrity, security, and transparency.
- **Operations:** It can choose the participants in the blockchain and decide which transaction can be made public.

Disadvantages:
- **Efficiency:** Not everyone is in the position to implement a hybrid Blockchain. The organization also faces some difficulty in terms of efficiency in maintenance.

- **Transparency:** There is a possibility that someone can hide information from the user. If someone wants to get access through a hybrid blockchain it depends on the organization whether they will give or not.
- **Ecosystem:** Due to its closed ecosystem this blockchain lacks the incentives for network participation.

Use Case: It provides a greater solution to the health care industry, government, real estate, and financial companies. It provides a remedy where data is to be accessed publicly but needs to be shielded privately. Examples of Hybrid Blockchain are Ripple network and XRP token.

4. Consortium Blockchain

It is a creative approach that solves the needs of the organization. This blockchain validates the transaction and also initiates or receives transactions.

- Also known as Federated Blockchain.
- This is an innovative method to solve the organization's needs.
- Some part is public and some part is private.
- In this type, more than one organization manages the blockchain.

Advantages:
- **Speed:** A limited number of users make verification fast. The high speed makes this more usable for organizations.
- **Authority:** Multiple organizations can take part and make it decentralized at every level. Decentralized authority, makes it more secure.
- **Privacy:** The information of the checked blocks is unknown to the public view. but any member belonging to the blockchain can access it.
- **Flexible:** There is much divergence in the flexibility of the blockchain. Since it is not a very large decision can be taken faster.

Disadvantages:
- **Approval:** All the members approve the protocol making it less flexible. Since one or more organizations are involved there can be differences in the vision of interest.
- **Transparency:** It can be hacked if the organization becomes corrupt. Organizations may hide information from the users.
- **Vulnerability:** If few nodes are getting compromised there is a greater chance of vulnerability in this blockchain

Conclusion

In this paper was introduced to several concepts of Blockchain by taking features, characteristics and Bitcoin as a case study. The Bitcoin is the first successful implementation of Blockchain. Today, the world has found applications of blockchain technology in several industries, where the trust without the involvement of a centralized authority is desired. So welcome to the world of Blockchain.

References

1. Bodó, Balázs. 2011. A Szerzői Jog Kalózai. Budapest: Typotex.
2. Bodó, Balázs. 2014a. "Hacktivism 1-2-3: How Privacy Enhancing Technologies Change the Face of Anonymous Hacktivism." Internet Policy Review 3(4).
3. Bodó, Balázs. 2014b. "Piracy vs Privacy–the Analysis of Piratebrowser." Popular Communication 12(3).
4. Bodó, Balázs. 2014c. "Set the Fox to Watch the Geese: Voluntary IP Regimes in Piratical File-Sharing Communities." Pp. 241–64 in Piracy: Leakages from Modernity, edited by Martin Fredriksson and James Arvanitakis. Sacramento, CA: Litwin Books.

5. Bush, Vannevar. 1945. "As We May Think." Atlantic Monthly.

6. Candy, Linda. 2006. "Practice Based Research: A Guide." CCS Report 1:1–19.

7. Cheema, G.Shabbir and Dennis A. Rondinelli. 2007. Decentralizing Governance: Emerging Concepts and Practices. Brookings Institution Press.

8. Christin, Nicolas. 2013. "Traveling the Silk Road: A Measurement Analysis of a Large Anonymous Online Marketplace." Proceedings of the 22nd international conference on World Wide Web 2012:213–24. Retrieved (http://bib-ezproxy.epfl.ch:2149/citation.cfm?id=2488388.2488408).

9. Condos, James, William H. Sorrell, and Susan L. Donegan. 2016. Blockchain Technology: Opportunities and Risks. Montpellier, Vermont.

10. Dalkey, Norman and Olaf Helmer. 1963. "An Experimental Application of the Delphi Method to the Use of Experts." Management Science 9(3):458–67. Retrieved (http://www.rand.org/content/dam/rand/pubs/research_memoranda/2009/RM727.1.pdf).

11. Davidson, Sinclair, Primavera De Filippi, and Jason Potts. 2016. "Disrupting Governance: The New Institutional Economics of Distributed Ledger Technology." Ssrn 1–27. Retrieved (http://ssrn.com/abstract=2811995).

12. Dong He et al. 2016. Virtual Currencies and Beyond : Initial Considerations. Washington D. C.: International Monetary Fund.

13. van Eeten, Michel J. G. and Milton Mueller. 2013. "Where Is the Governance in Internet Governance?" New Media & Society 15(5):720–36. Retrieved (http://nms.sagepub.com/content/15/5/720.abstract).

14. Epstein, Dmitry, Christian Katzenbach, and Francesca Musiani. 2016. "Doing Internet Governance: Practices, Controversies, Infrastructures, and Institutions." Internet Policy Review 5(3).

15. De Filippi, Primavera and Benjamin Loveluck. 2016. "The Invisible Politics of Bitcoin: Governance Crisis of a Decentralised Infrastructure." Internet Policy Review 5(3).

16. Geiger, Christophe. 2014. "The Social Function of Intellectual Property Rights, Or How Ethics Can Influence the Shape and Use of IP Law." in Intellectual Property Law: Methods and Perspectives, edited by G.B. Dinwoodie. Cheltenham, UK / Northampton, MA, Edward Elgar.

17. Giblin, Rebecca. 2011. Code Wars: 10 Years of P2P Software Litigation. Cheltenham, UK ; Northampton, MA: Edward Elgar Publishing.

18. Hileman, Garrick. 2016. "State of Blockchain Q1 2016." CoinDesk. Retrieved (http://www.coindesk.com/state-of-blockchain-q1-2016/).

19. Hofmann, Jeanette, Christian Katzenbach, and Kirsten Gollatz. 2016. "Between Coordination and Regulation: Finding the Governance in Internet Governance." New Media & Society 1461444816639975.

20. Ibbetson, David. 2005. "Historical Research in Law." Pp. 863–79 in Oxford Handbook of Legal Studies, edited by Mark Tushnet and Peter Cane. Oxford University Press.

21. Kitchin, Rob. 2014. "Thinking Critically about and Researching Algorithms." The Programmable City Working Paper.

22. Konieczny, Piotr. 2010. "Adhocratic Governance in the Internet Age: A Case of Wikipedia." Journal of Information Technology Politics 7(4):263–83. Retrieved August 9, 2012 (http://www.informaworld.com/10.1080/19331681.2010.489408).

23. Lessig, Lawrence. 1999. Code and Other Laws of Cyberspace. New York: Basic Books.

24. Levy, Steven. 1984. Hackers : Heroes of the Computer Revolution. 1st ed. Garden City, N.Y.: Anchor Press/Doubleday.

25. MacKenzie, Donald and Judy Wajcman. 1999. The Social Shaping of Technology. Open university press.