Blockchain and Banking

Blockchain - Elucidation:

Overview:

Blockchain is a distributed system to organize and store any kind of data through a series of chained blocks. The data or record entered is validated and added to a block which is then added to a chain of blocks forming the blockchain (Ariel, 2018). Each block contains a unique code called hash which was developed using cryptography method. Digital currencies such as bitcoin are using the blockchain technology however blockchain concepts can be used for various purposes across the industries (Ariel, 2018). In general, blockchain can be of two types namely. Public and private.

Public Blockchain	Private Blockchain
It is decentralized and permissionless, no restriction in participation.	It is more centralized and permissioned. Controlled by only one organization
Examples: Bitcoin and Ethereum	Examples: Corda, Hyperledger

Strengths:

Authenticity: Blockchain has the ability to permanently record a transaction on a database which is shared between the computers but without the need for third party to process or evaluate it. The immutability and security features of blockchain make no one can remove an entry or fiddle with it as no single authority controls the ledger (Financial Times, 2018). This eventually could boost the trust and therefore could bring the hesitant buyers and sellers over the line as in the case of art world which is an unclear marketplace (Financial Tines, 2018).

Transparency: Industries such as supply chain involves multiple participants and transactions and it is often difficult or time consuming to track and trace a product to its origin. Blockchain combined with Internet of things can benefit tracking a product and can render a real-time information about the products to improve the efficiency and transparency of the supply chain (Saurabh and Dey 2021). For instance, Walmart with its mango blockchain solution pilot reduced the tracking time of mango from the origin from 7 days to 2.2 days, second-leading to achieve more transparency and efficiency (Saurabh and Dey 2021).

Data Security: The distributed ledger of blockchain replaces single database system with the shared information system which eventually leads to high security and accessibility of data (Olnes, Ubacht, and Janssen, 2017). For example, keeping an overview of the authorities provided in a public organization and the ability to change the authority only if there is an agreement among the higher ranked nodes in the hierarchy (Olnes, Ubacht, and Janssen, 2017).

Immutability: It refers to the unaltered or permanent data of blockchain ledger. As each block contains the previous hash, changes in a block requires changes in every other blocks as well and it is almost impossible to alter the data in the blockchain. Unaltered information is a crucial advantage for organizations which needs to comply with regulations (CryptoNewsZ, 2020). Such unquestionable history of ledger permits an easy and efficient auditing process (CryptoNewsZ, 2020).

Disintermediation: Traditional centralized systems require humans or extra technology to ensure the trust, however with blockchain this facility is built in by default (Hughes, Dwivedi, Misra, Rana, Raghavan and Akella, 2019). This feature leads to the reduction in need of intermediaries in the transactions or processes which uses blockchain.

Limitations:

High Energy Consumer: Computationally intensive procedures which are required to create the block requires large amounts of computational power (Nick, Aljosja and Bhaskar 2019). Sometimes blockchain will have to work with other emerging technologies such as internet of things, etc. in supply chain traceability. This will only aggravate the energy consumption requirements. In 2017 alone, the average electricity used to mine bitcoin exceeded the annual energy usage of some 159 countries (Nick, Aljosja and Bhaskar 2019).

51 Per Cent Attack: Democratic governance model of blockchain is vulnerable to a ’51 per cent attack’. A group of miners with more than 50 per cent of mining hash rate have the possibility to cheat the system. Cryptocurrency networks got attacked during a single week in May 2018 and it resulted in the theft of coins of worth in millions (Nick, Aljosja and Bhaskar 2019).

Privacy Concerns: Every node in the blockchain network can maintain a complete history of transaction details and it raises concerns where privacy is required (Hughes, Dwivedi, Misra, Rana, Raghavan and Akella, 2019). For example, if the government wants to track illegal transactions and in order to achieve the same, it digitizes the currency system with help of blockchain. In this case, some genuine or common people might not want to get tracked of their financial activities by the government.

Other Limitations: The technology is not yet mature as it takes more time to mature and become standard in the market (Hughes, Dwivedi, Misra, Rana, Raghavan and Akella, 2019). Though immutability feature offers data integrity it may not suitable for use cases which require change in transactions. The overall control and governance by oversight-based organizations can act as a limitation to the technology (Hughes, Dwivedi, Misra, Rana, Raghavan and Akella, 2019).

Abuses:

Hiding Identity: People who do illegal activities such as drug and weapon dealing use dark web platform to sell their merchandise (LinkedIn 2020). To avoid getting tracked by the government, instead of opting to create a unique account

for them in a traditional way, they use blockchain technology for safe account creation and payment verification in dark web. The website behind blockchain architecture automatically sets the user to a unique bitcoin wallet address and its visible only once when the user creates an account (LinkedIn 2020). This method of account management and payment verification is almost impossible for the authorities to trace it out. The only exception would be that if the marketplace servers are seized and the addresses are extracted then there is a chance of traceability using the transaction logs in the blockchain (LinkedIn 2020).

Hiding Illegal Finance: Cryptocurrencies which uses blockchain technology are crucial to the burgeoning of the dark web. This is evident from the fact that the daily volume of transaction for six different drug markets in dark web was found to be about $650,000 (EasyChair, 2021). Even the largest merchant of Bitpay finds it difficult to bring in $500,000 in a day (EasyChair, 2021). Due to the privacy policies of the cryptocurrencies, the transactions in the dark web are untraceable which makes people to misuse of the blockchain technology.

Digital Currency Design:

Case of CBDC: The design requirements of central bank digital currency (CBDC) can be divided into two categories namely payment method and currency functions. Low-cost, safe and fast payments for both domestic and cross-border situations are key requirements for payment method while for currency functions, they are privacy, security like no double spending, scalability, controllable, user-friendliness and offline and instant payment. Private blockchain is more suitable to meet such currency requirements due to regulation, efficiency and scalability issues with public blockchain (Zhang and Huang, 2021).

Examples: The multi-blockchain based CBDC architecture consists of super chain, multiple local area blockchains and branch blockchains all of which are permissioned. Central bank holds responsibility of maintaining the super chain and analysing data in it and there by avoids double spending and protects user's privacy (Zhang and Huang, 2021). The creation and issuance of digital currency by central bank is assured by super chain while branch blockchain and local area blockchain provides improvement in scalability and performance (Zhang and Huang, 2021).

Case of RMB: Blockchain technology has been used to design the digital wallet infrastructure of China's digital currency RMB. However, it has been used by integrating with the centralized system and works only on the aspects of transaction mechanism, data storage and security (Feng, Liang and Barukcic, 2021). The unique key pair of blockchain called public key and private key used to provide asymmetric encryption algorithm for data encryption of digital currencies. Blockchain 3.0 with its strict access mechanism and authority control helps to form alliance chain structure for the currency in which only the alliance members are able to read and write according to the authorization (Feng, Liang and Barukcic, 2021). Blockchain provides bookkeeping of the generated blocks by the consensus node when a new transaction occurs

Smart Contract Design:

A smart contract is an algorithmic contract to determine the next actions in a transaction if the pre-defined conditions are met.

Case of Supply Chain: Smart contract design for 'Gasol flour' supply chain system starts with identifying the features involved in determining the selling price of flour (Kurnia, Djatna, and Udin, 2020). The selected features are then ranked using the relief method. The top ranked features are then locked into the smart contract and distributed to stakeholders. The selected features are then processed to get the decision rule using the M5P tree algorithm. Such rules are executed by smart contract system for each stakeholder involved in the supply chain to make the transparent contract and fair price (Kurnia, Djatna, and Udin, 2020). Each node in the blockchain network is used to distribute and verify the smart contract execution.

Case of Tendering: Fair bidding process can be enabled by blockchain based smart contracts. A tendering organization can create a tender (smart contract) with certified public key and bid evaluation code and store it in the blockchain. The bidder will then be able to download the tender from the blockchain and generates a bid with encrypted systemic key in response to the smart contract (Denis, Simon Maina and Nelson, 2021). While smart contract stops new bid submissions after the deadline, tendering organization can run the evaluation code to find the best bid and the results of the same can be stored in the blockchain. The evaluation information stored in the blockchain will help in independent auditing as the interested parties can access the tender information from the blockchain (Denis, Simon Maina and Nelson, 2021).

Impact in Banking:

Clearing and Settlement: The disintermediation aspect of blockchains can help clearing houses by facilitating settlement of payments without any intermediaries and decentralizing the complete process (Medici, 2022). Australian securities exchange, a clearing house which focuses to move much of its post trade clearing and settlement process on to a blockchain system (Financial Times, 2017).

Know Your Client (KYC): Validation of customers and counterparties play a crucial in banking business in gaining the trust of people. It is the responsibility of the banks to get the verification done properly else they could be fined by the regulators. However, banks are struggling to set up an appropriate shared digital base to keep and update the customer's data due to conflicting demands. Blockchain with its cryptographic protection and its ability to share a regularly updated data with many parties could offer the solution (Financial Times, 2017). A blockchain based KYC procedure can help banks in monitoring the creditworthiness of potential borrowers and in reducing the costs of data collection by credit agencies (Cucari, Lagasio, Lia, Torriero, 2022). Already greater number of start-ups such as Tradle, Credits, Blockstack, etc. are working on developing blockchain systems in customer identification (Financial Times, 2017).

Improved Transactions: Blockchain with smart contracts have the ability to automatically clear most interbank transactions, simplifying and speeding up the reconciliation process (Cucari, Lagasio, Lia, Torriero, 2022). Transactions can be reconciled daily instead of monthly. Smart contracts can also offer the option to track transactions in real time with feedback which could lead to decreased operational risks for banks (Cucari, Lagasio, Lia, Torriero, 2022). This is evident from the case study of distributed ledger technology based interbank spunta in the Italian banking sector (Cucari, Lagasio, Lia, Torriero, 2022).

New Practices: Blockchain with its disintermediation advantage is expected to make direct transactions possible without any trusted agent in between (Holotiuk, Pisani and Moormann, 2019). Thus, peer to peer execution of transactions can happen between two contractual parties. Today's international transactions such as cross-border payments are prone to errors, time-consuming and expensive. Blockchain with its common infrastructure can make such cross-border payments to be faster and cheaper by removing the intermediaries (Holotiuk, Pisani and Moormann, 2019).

Cost Savings: Banks are more focusing towards environmental performance and management as part of green financing. Blockchain with its ability to faster development of green technologies is being experimented by many banks with main attention on smart contracts and its benefits (Cocco, Pinna and Marchesi, 2017). Blockchain can bring significant cost savings to many banking processes such as central finance reporting due to its streamlined data quality and internal controls, compliance due to efficient auditability of financial transactions and centralized operations due to its robust digital identity of client data (Cocco, Pinna and Marchesi, 2017).

New Business Models: While blockchain can obsolete some of the current business models such as the middle men it can also bring new business models related to the payments in the market such as payments-extending services and products (Holotiuk, Pisani and Moormann, 2019). Fintech start-ups are expected to create a big impact in many payment applications using blockchain technology. It is evident from the fact of increasing number of fintech companies such as Ripple, etc.

Conclusion:

Though blockchain has certain crucial limitations such as high energy consumption it is still expected to take the banking sector to a different level and create a positive impact in the customers with its unique advantages.

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