

A Brief Study on the Advantages of Blockchain and Distributed Ledger in Financial Transaction Processing

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Abstract—General Ledger (GL) has formed the bedrock of financial accounting. For centuries, it remained unchanged as a fundamental unit of transaction processing and true to its original principles, and even at times when technology has changed its primitive form to accommodate the requirements of today's society, it did nothing to change its core. But now this trend could get overwhelmed by the emergence of decentralized ledger i.e. DLT and Blockchain Technology (BCT), of which Bitcoin, Ethereum and Ripple are the most common examples. Whereas ERP only worked prima-facie to automate and digitize the general ledger, changes incurred by Blockchain are targeting its very foundations. As per various researches conducted on the trends of financial market, it is revealed that while being relatively new technology, Blockchain and Distributed Ledger, are seeing interest from around 90% of banking sector executives. 40% of banks are still exploring the possibilities and various outcomes that can be achieved via this technological advancement, while about 30% are testing various scenarios of this technology through modelling proof of concepts. Recently Axis Bank, ICICI bank and Kotak Mahindra bank joined this list by working on a model for proof of concept of this tech in transaction processing. Intra-bank cross-border transactions are expected to be the most likely candidates of payment system to see the primacy of BCT and DLT first, followed by cross-border remittance, corporate and institutional payments. In this paper, we have discussed about the advantages and changes this technological transition will be bringing in the not so distant future and how individuals as well as corporations could get benefitted from it.

Keywords— General ledger, Distributed ledger, Blockchain, Banking, Finance, Security, Transaction processing, CIA Triad, Networks etc.

I. INTRODUCTION

Blockchain is a new technological innovation which some consider as the greatest invention since the origin of the internet. Some of its benefits include transparency, security, efficiency ease of processing and cost reduction of financial transactions. The World Economic Forum (WEF) also recognized Blockchain as an emerging technology pioneer in one of its reports. Recently Blockchain technology is

observing an increase in interest and investment from various national and international as well as inter-governmental economic and financial organisations. Sometimes also termed as distributed ledger technology or DLT, blockchain is a peer-to-peer web-based transaction processing system. All parties involved in a transaction provided with singular copy of the records of financial transactions performed. These copies of record exist on the nodes of blockchain in a secured network connection. This implies that the transaction completed does not have to be verified by any other party independently so there is no need of intermediaries. There is also no requirement of a overseeing authority to manage transactions since the records are decentralized and are stored in the nodes of a blockchain. This also protect data from tempering by a single party or by unauthorized user not involved in the transaction, which in turn provides us with an opportunity of cost-reduction and adds an extra layer of security to the financial transactions. Being a decentralized database, blockchain technology has huge potential of changing the scenery of financial transaction processing as well as capable of saving billions of dollars per year in costs associated with financial transactions which gets lost due to the inefficiency of the pre-existing system which is also more to frauds because the records are controlled by entities. Inherent security features and cost effectiveness offered by this technology is why banks want to implement blockchain.

A. General Ledger—

According to Investopedia, a general ledger is an organization's database of numbered accounts for its accounting records. This general ledger provides organization with a complete set of information of all financial transactions processed over the period of its inception. The ledger simply stores information related to company's account that is required to prepare financial statements and includes records of credits, debits, accounts for assets, liabilities, owners' equity, revenues and expenses. The General Ledger is governed by 3 golden principles of accounting – First is to Debit the giver, Credit the receiver; Second to Debit profit

and gain, Credit loss and expense; and Third is to Debit outflow and Credit inflow. These principles can't be violated.

A primary feature of the General Ledger is that only two parties are involved in a transaction, then this transaction is recorded as debit and credit in their respective ledger entries. But this is not the case in a transaction managed by Distributed Ledger. In a decentralized ledger mechanism, the transaction processed can be identified through individual copies of transaction records of all the participants, which gets updated almost instantaneously throughout the network and then gets validated through the consensus in real-time.

B. Blockchain Technology—

The blockchain is a general example of distributed ledger. The underlying technology works on a peer-to-peer network wherein verified transactions join sequential into blocks of data, with those blocks merging into a chain of data. Each block is cryptographically verified and maintained, creating a visible and verifiable transaction history. The transaction history, or ledger, is distributed among the network for all to see and verify. As the data is widely distributed, making changes or alterations would require changing all the copies of the ledger spread throughout the network, which is difficult. Blockchain was one of the underlying technologies that inspired distributed ledgers, but not all DLT use or rely upon the blockchain structure. The two are related but not synonymous. Blockchain is commonly associated with cryptocurrencies, such as Bitcoin, though its application extends well beyond cryptocurrencies. A blockchain is only a single example of distributed ledger. The market has yet to determine if blockchain itself is the best or most enduring version of DLT.

C. Distributed Ledger Technology—

While maintaining ledgers is not a new practice, the DLT adds a new dimension in an archaic procedure. In its simplest definition, a distributed ledger is a shared database that records the properties and history of an asset. A DLT can operate on a public (permissionless) or a private (permissioned) platform, each offering varying levels of distribution, consensus and verification methods, and trust. Participants on the network receive real-time updates and data dissemination. Each participant maintains a separate copy of the ledger based on the allowed permissions within a particular network. The technology presents benefits as well as the potential for increased challenges and disruptions. These changes are happening on a global scale, further magnifying its affects. Different sources provide various definitions for DLT, and many sources use the term "blockchain" interchangeably.

For the purposes of this paper, the following definition may suffice: distributed ledger technology is a decentralized digital asset transaction database accessible across various users, sites, geographies, or institutions whose users

algorithmically verify all transactions). The technology stems from the blockchain innovation set forth in Satoshi Nakamoto's 2008 Bitcoin whitepaper, though the concept is decades older. Blockchain is a verified record of ownership. Furthermore, participants on a network help creating the transaction history through sequentially adding verified transactions into a block of data. The blocks of data subsequently join to form chains of data, creating a history spread among participants.

II. ADVANTAGE OF BCT AND DLT OVER GL

A study conducted by IBM identified many issues with the current systems used by banking and financial institutions. One of them is the intermediaries involved in these transactions normally charged a steep price, and all the participants in a transaction have no access to the updated information since simultaneous updation of data is required. This makes financial transactions less robust and introduce cost-inefficiency which in turn makes whole process more complex. By the implementation of blockchain and distributed ledger, the overall efficiency of transactions is definitely going to increase. The blockchain technology reduces impacts of these problems, and allows for a relatively smoother, transparent transactions with reduced risk.

The potential benefits of DLT arise from its decentralized nature and the fact that participants hold identical copies of a shared ledger that is updated algorithmically.⁵ A shared ledger reduces the need for third parties to reconcile individual ledgers, thereby reducing complexity and increasing the speed with which transactions can be processed. Moreover, a shared ledger improves network resiliency: where every participant has a copy of the ledger, the surface for single point of attack minimizes significantly. Finally, a shared ledger increases accuracy and transparency, because updation is done throughout the network which is performed using consensus over the network and single point change in the record is usually prohibited.

In banking, one of DLT's most promising potential benefits is strengthening and streamlining cross-border payments. Under the existing correspondent banking system, cross-border payments can encounter multiple points of friction (Rosner and Kang). In this way, DLT may provide faster, cheaper remittances for consumers (Brainard 2016).

DLT's real-time value transfer ability could also improve check processing, drawing unbanked consumers to banks in the process. Although check processing speeds have increased, check clearing times are still an obstacle for some unbanked consumers who need quick access to funds to pay bills or purchase household goods. Currently, these consumers rely on check cashing services.

DLT could streamline the check clearing process for banks by minimizing the number of previously required intermediaries

in the transaction processing environment. Similar to cross-border payments, check clearing often relies on the correspondent banking system, with multiple banks debiting and crediting multiple parties. Under a shared ledger, however, third-party intermediaries are unnecessary, allowing check processing and settlement to be time efficient.

Blockchain reduces number of intermediary requirements as described earlier, while also lessening transaction lead time to near real-time. What's more, parties involved can track the progress of transaction throughout its journey. Financial institutions can also leverage from these in intra-bank transactions. Overall cost can also be brought down by the ability of blockchain of routing financial transactions as well as related information and documents, so that besides reducing transaction costs, logistical expense of transporting hard copies of documents back and forth can also be minimized by banks. Institutions can also entice their customers by making them an active party and giving them the benefits by digitizing all their transaction record and documents on to a distributed ledger which will grant the ease of access and more flexibility to the customers. Further, by storing data and records on decentralized database banks can put a client's entire line of credit on Blockchain, this allows the customer to make efficient use of their line of credit and it can also be used to fund any operation in need in real-time. Because distributed ledger transactions provide anonymity, Central Banks around the world are insisting to conduct proper KYC of their clients' before creating their digital identities and recording them on ledger, so that security aspect of transactions can be assured and interests of customers as well as institutions can be safeguarded.

Blockchain platforms have the capacity to solve various flaws in existing technology employed by financial institutions, but there are important concerns around scalability, privacy and security that must be considered beforehand. To understand these issues and concerns surrounding the technology, we need to probe several aspects of its architecture, such as: Acceptable level of security considering numerous components, entry and exit points as well as node-points that are present in BCT systems, Consensus Mechanisms, Data Encryption Standards, Network Configuration, and Component configurations for scalability at all levels. Different applications of BCT may have differing architectural requirements. The design of platform is required to be carefully scrutinized in order to balance mitigate concerns. Quite often there may be a need for trade-offs between scalability, privacy and security requirements based on the business context and use case.

III. SECURITY ASPECTS OF BLOCKCHAIN AND DISTRIBUTED LEDGER

Financial institutions depend heavily on security procedures and technology to ensure the integrity and safety of their data.

BCT presents us with a more flexible, secure as well as decentralized option for transaction processing. Since Blockchain leverages cryptographic functions, confidentiality of data associated with transactions can be preserved. This makes blockchain systems more resilient from the point of view of Information Security. However, while considering security in blockchain systems, a holistic view is essential.

One needs to look beyond traditional endpoint protection and adopt a holistic approach that includes authentication and authorization of entities accessing the blockchain, infrastructure level security of communication and transaction entities, security of business by means of transparency and audit, and security from insider threats, singular node modifications or server failures. Security in general needs to be multi-level and one that encompasses all components and entry points in the system.

Moreover, by integrating BCT in processing, security and consistency of transaction can be enforced through the use of proper protocol. Blockchain systems can be public (or permission-less) or permissioned in nature. Participants in permission-less blockchain are unsigned by default so their anonymity can be ensured. Anybody with a valid version of the software can be a party in the transaction transactions. Due to many technical and legal concerns surrounding permissionless blockchain, institutions involved in the operations of financial ledgers or registries conceivably more inclined to employ permissioned blockchains since they are capable of forming a more predictable and controlled environment for operations.

Blockchain has the prospective to address the bedrock primitives of Info Security – the CIA triad (Confidentiality, Availability and Integrity). Being a fundamentally distributed system, blockchain ensures integrity and availability paradigm of the transaction data. As all nodes are involved (Consensus Mechanism) in the concurring of change in the records of transactions – integrity of the data is maintained.

Let us also take a glimpse at the different levels of security which can be addressed by blockchain. Blockchain systems typically need to look at security from the following perspectives these are: Ledger level security Network level security Transaction level security Associated surround system security Smart Contract security.

IV. FUTURE DEVELOPEMENTS

A number of tech companies and startups are delivering blockchain based products. A study found that nearly two-third of global financial services providers and operators sees blockchain as the most important technological advancement since the internet. Paul Taylor an ex Google engineer is working on Vault OS, a blockchain based operating system for banks. Bank of America Merrill Lynch and Microsoft Corps. are also teaming up to create a blockchain based

framework that can attract the interests of other organisations. Microsoft's Project Bletchley is a modular blockchain fabric based on Microsoft's Azure. Recently a cloud based blockchain service for organizations is launched by IBM that claims to fulfill the need of a secure space for blockchain based transactions. Citibank has also invested recently in a Blockchain startup called Cobalt.

While blockchain technology has galvanized the interest of many first world countries, who are looking to for a new technology to replace the centuries old centralized ledger by a new and much more promising new technology, blockchain will prove to be most advantageous in developing nations since it will also enhance the delivery mechanism of funds to back important policies decisions much more efficiently.

Furthermore, distributed ledger and blockchain helps reducing the institutionalized corruption, owing to its transparent nature in transaction processing as well as service delivery sphere. Additionally, auditors can now gain access to financial data in real time which make the process of auditing more efficient and result oriented. Transparency also ensures that government officials cannot abuse their power. By this blockchain technology can amount to considerable decline in the incidences of graft.

V. CONCLUSION

In this paper, we have visited many topics ranging from the introduction of the blockchain and distributed ledger to the changes these technologies are bringing on the table. In few years, we are going to witness drastic change in transaction processing. It has started already with non-banking firms and are soon going to affect our everyday interaction with financial services in a more productive and positive manner. With transparent, secure, scalable and decentralized blockchain in place, it is affirmative that soon we are going to witness a major upheaval in banking and financial technology sphere. In the financial sector, there is an increasing influence of technology. Examples of companies providing blockchain and distributed ledger services to the financial sector are Microsoft, IBM, Accenture and Cognizant. More and more service providers are thriving to make these services accessible to their customer and client base by transforming legacy IT infrastructure. It can be easily ascertained that the demand for these services in a blockchain ecosystem is only going to rise.

Many tech. companies are working on their own blockchain solutions, but we think it is wise to consider the consequences for the suppliers of 'old' technology as well as for the financial companies themselves. The advent of decentralised ledger and blockchain are the symbols of long awaited changes in the financial sphere. Banking and finance sector in India and world is taking the technological advancement introduced by blockchain and distributed ledger is the future of financial transactions processing. This technology has the

potential of bringing the much needed transformation in the banking and finance industries. Possibilities of advancements through blockchain and distributed ledger in various fields like supply chain management, smart contracts and record collaboration etc. are limitless.

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