ReportOn

“Survey report on types of Blockchains and its real time use cases”

Acknowledgement

We would like to extend our sincere appreciation and indebtedness to the teacher of the Computer Department. for providing the technical, informative support, valuable guidance and constant inspiration and encouragement as a project guide which has brought this stage one project report in this form.

We would also like to express our gratitude for his constant source of encouragement and friendly guidance throughout the project work And at the end we would like to express our gratitude to all staff member who have directly or indirectly contributed in their own way and all my friends Computer Department for their suggestions and constructive criticism.

Submitted by,

Mr. Rahul Sampatrao Patil

Table of Contents

Blockchain Technology and its Applications Across Multiple Domains & Usescases : A Technology Survey

ABSTRACT

Blockchain technology has become an active area of research and a technological option for many businesses and industrial communities. With its distributed, decentralized, and trustless nature, blockchain can provide businesses with new opportunities and benefits through increased efficiency, reduced costs, enhanced integrity and transparency, better security, and improved traceability. Although blockchain's largest applications have been in the finance and banking sector, we now see experiments and proposed applications in different fields. This paper provides an overview of blockchain technology; it brings together all the key design features, characteristics, and benefits of blockchain that make it a superior and unique technology, and it presents the popular consensus protocols and taxonomy of blockchain systems. Additionally, the paper surveys blockchain-based applications across multiple domains such as in finance, insurance, supply chain management, energy, advertising and media, real estate and healthcare. It aims at examining the industries' key issues, blockchain solutions and use cases. The paper highlights three broad limitations that blockchain technology presents: scalability, security, and regulation, and shows how these challenges could impact blockchain application and adoption.

Keywords: Blockchain, Distributed Ledger, Cryptocurrency, Smart Contracts, DecentralizedApplications

INTRODUCTION

The concept of blockchain was initially introduced in November 2008 and was implemented in January 2009. A presumed pseudonymous person or persons named Satoshi Nakamoto developed the virtual currency, bitcoin, and published the bitcoin white paper. In this paper, a decentralized, publicly available, and cryptographically secure system based on a chain of blocks was proposed, allowing peer-to-peer digital currency trading and eliminating the need for centralized financial institutions to enable currency issuance or transaction settlement (Dai& Vasarhelyi, 2017; Murray, 2018; Nakamoto, 2008). Bitcoin and blockchain are not synonymous. Blockchain provides the infrastructure for recording and storing bitcoin transactions; it has many uses besides bitcoin. Bitcoin is the first application of blockchain (M.Gupta, 2017; V. Gupta, 2017). In *Blockchain for Dummies*, M. Gupta explains,

Bitcoin is actually built on the foundation of blockchain, which serves as bitcoin's shared ledger. Think of blockchain as an operating system, such as Microsoft Windows or MacOS, and bitcoin as only one of the many applicationsthat can run on that operating system.

Moreover, blockchain should be considered as an overarching idea that includes various technologies and applications. The concept of blockchain can be compared to the Internet, which has many technologies and applications. It is argued that blockchain is likely to transformbusiness in as great a manner as the Internet. Blockchain can disrupt in a positive manner centralbanking platforms and many business models and use cases, including trades, financialservices, supply chains, business process improvement, health information sharing, and logistics management (Woodside et al., 2017).

Dissimilar to a distributed database, users in a distributed ledger do not trust each other and verify transactions independently. A distributed ledger is a replicated, decentralized, synchronized, and cryptographically secured record of data and transactions shared between contracting parties. Distributed ledgers are broadly categorized into two groups: those seekingthe minimum role of trusted third parties and those who are still relying on those third parties to handle some of the systems' properties. Blockchain is usually grouped under distributed ledger technologies. These include all decentralized systems for recording transactions and sharing data across multiple servers, organizations, or countries.

Blockchain is a distributed ledger, but not all distributed ledgers are blockchains; not all distributed ledgers are based on a chain of blocks.Blockchain is an emerging technology; its underlying technical aspects are challenging to understand, particularly for non-specialists. Complex algorithms and computer protocolsunderpin this technology. However, according to early adopters of technology tools, becominga coding expert does not seem to be required to use this technology. Like any other advanced technologies, businesses and organizations do not need to master said technology's technical fundamentals to recognize its benefits.

- **Types of Blockchains :**

There are four types of blockchain structures:

1. Public Blockchains

Public blockchains are permissionless in nature, allow anyone to join, and are completely decentralized. Public blockchains allow all nodes of the blockchain to have equal rights to access the blockchain, create new blocks of data, and validate blocks of data.

To date, public blockchains are primarily used for exchanging and mining cryptocurrency. You may have heard of popular public blockchains such as Bitcoin, Ethereum, and Litecoin. On these public blockchains, the nodes "mine" for cryptocurrency by creating blocks for the transactions requested on the network by solving cryptographic equations. In return for this hard work, the miner nodes earn a small amount of cryptocurrency. The miners essentially act as new era bank tellers that formulate a transaction and receive (or "mine") a fee for their efforts.

2. Private (or Managed) Blockchains

Private blockchains, which may also be referred to as managed blockchains, are permissioned blockchains controlled by a single organization. In a private blockchain, the central authority determines who can be a node. The central authority also does not necessarily grant each node with equal rights to perform functions. Private blockchains are only partially decentralized because public access to these blockchains is restricted. Some examples of private blockchains are the business-to-business virtual currency exchange network Ripple and Hyperledger, an umbrella project of open-source blockchain applications.

Both private and public blockchains have drawbacks - public blockchains tend to have longer validation times for new data than private blockchains, and private blockchains are more vulnerable to fraud and bad actors. To address these drawbacks, consortium and hybrid blockchains were developed.

3. Consortium Blockchains

Consortium blockchains are permissioned blockchains governed by a group of organizations, rather than one entity, as in the case of the private blockchain. Consortium blockchains, therefore, enjoy more decentralization than private blockchains, resulting in higher levels of security. However, setting up consortiums can be a fraught process as it requires cooperation between a number of organizations, which presents logistical challenges as well as potential antitrust risk

(which we will examine in an upcoming article). Further, some members of supply chains may not have the needed technology nor the infrastructure to implement blockchain tools, and those that do may decide the upfront costs are too steep a price to pay to digitize their data and connect to other members of the supply chain.

A popular set of consortium blockchain solutions for the financial services industry and beyond has been developed by the enterprise software firm R3. In the supply chain sector, CargoSmart has developed the Global Shipping Business Network Consortium, a not-for-profit blockchain consortium which aims to digitalize the shipping industry and allow maritime industry operators to work more collaboratively.1

4. Hybrid blockchains

Hybrid blockchains are blockchains that are controlled by a single organization, but with a level of oversight performed by the public blockchain, which is required to perform certain transaction validations. An example of a hybrid blockchain is IBM Food Trust, which was developed to improve efficiency throughout the whole food supply chain. We will discuss IBM Food Trust in more detail in an upcoming article in this series.

Blockchain Types for Supply Chain Use

Because members of supply chains have important data privacy and competition considerations, blockchain for supply chain requires some extent of permissioned functionality, which exists in private, consortium and hybrid models of blockchain. It is therefore not surprising that Businesswire recently reported that consortium and hybrid blockchain types are expected to grow at the highest rate in the supply chain market from 2020-2026.2 Future articles in this “Blockchain in Supply Chain” series will explore some of the popular consortium and hybrid blockchains being implemented in the supply chain sector.

APPLICATIONS OF BLOCKCHAIN

Blockchain technology has the potential to disrupt and revolutionize many businesses and professions. Blockchain-based cryptocurrency applications have been widely recognized and used, but blockchain applications have expanded to other fields. Many businesses appreciate it and started to study its potentials. We can now see some blockchain use cases in different areas beyond finance and banking applications such as in supply chain management, advertising verification, energy-saving, and healthcare. In future, it is expected we will see more useful applications with the development of intuitive interfaces and more use cases. Access to information, data integrity, and operation resilience, among many other drivers, motivates businesses and industries to experiment and develop blockchain-based applications.

This survey paper discusses blockchain-based applications in the following sectors: finance, accounting, insurance, supply chain management, energy, advertising and media, legal, real estate, healthcare, and IOT. It focuses on key issues, blockchain solutions, and blockchain use cases. The main benefits of using blockchain in these different fields are summarized at the end.

Financial Applications

Many potential applications in different financial areas follow the success of blockchain-based cryptocurrency platforms. Generally, trusted intermediaries carry out financial activities between individuals and institutions. Through its enabled design features and characteristics, blockchain can replace the services provided by these trusted middlemen, particularly, avoidance of the duplications of financial transactions and registration and validation of financial activities. Some blockchain-enabled financial applications that disintermediate primary services provided by banks and financial institutions include the following examples.

Payments

When Nakamoto introduced the bitcoin, blockchain started as a peer-to-peer electronic cash system. The bitcoin payment system succeeded and gained increasing interest as an effective method of making cross-border

transfers and paying remittances at a lower transaction cost than that of the traditional financial system, with a much faster settlement speed.

Thus, blockchain has been experimenting as an alternative payment solution (Collomb & Sok,2016). Nowadays, hundreds of trillions of dollars flow worldwide through an old financial system of increased cost and slow payments. Public blockchain-based cryptocurrency systems,such as Bitcoin and Ethereum, allow anyone around the globe to transfer, pay, and receive money, eliminating the traditional role of trusted intermediaries for verifying and settling transactions. Almost all of the European Payments Council believed that blockchain technologywould transform the industry by 2025 (How Blockchain Could Disrupt Banking, 2018).

There are several companies now that use blockchain technology to revolutionize B2B payments. For example, Bitpay[1] is a bitcoin-payment service provider that helps merchants accept and store bitcoin payments and is currently the world's biggest bitcoin-payment processor. The company has more than 40 integrations and has a partnership with e-commerceplatforms like Shopify and LemonStand for facilitating bitcoin payments.

Financial Clearance and Settlements

Companies and institutions can use blockchain to record, validate, and process financial settlements without the need for a clearinghouse. Blockchain can facilitate clearing proceduresthat include adjusting financial obligations to authorize payments. Blockchain can enable the direct settlement of transactions and maintain track of thosetransactions more effectively than current systems such as SWIFT.

The Royal Bank of Canada, one of the first adopters of this application, started to use blockchain-based Hyperledger for its US–Canada interbank settlements .

Examples of companies that are working with traditional banks to improve transactions using blockchain include Ripple and R3. Ripple[3] is a company and a digital-payment processing.

Stock Trading

Stock trading is traditionally managed by a centralized authority like an exchange market. Thiscentralized management keeps track of all trading transactions and settlements. This kind of system is associated with increased fees and delayed settlements. Some blockchain-based solutions have been developed in this regard. For instance, Polymath[5], a blockchain technology company, is developing a marketplace and platform to facilitate digital security trading. The company is partnering with Blocktrade, Corl, and Ethereum Capital in launching security tokens on its platform

(How Blockchain Could Disrupt Banking, 2018). Another example is the trading platform ownedby Overstock. raised $134M in a private digital token offering in October 2018. These tokens became available for trading on January 2019.

Trade Finance

Traditional trade finance is associated with many issues such as loaded paper, increased errors,and slow method of processing transactions between counterparties. Blockchain has a lot to offer to the world of trade finance, ranging from removing papers, automating processes and payments, reducing fraud, and cutting costs to tracking and tracing shipments and allowing allparticipants to access the same information (The Banker, 2018; Monrat et al., 2019). Many companies and banks formed consortia with a commitment to finding solutions for improved trade finance. For example, IBM and the bank-led consortium R3 developed a blockchain project. This project involved 12 international banks, including BBVA, Mizuho, and U.S. Bank, and aimed at digitizing paper letters of credit (Macknight, 2018).

Accounting Application

Blockchain is a promising technology for the accounting profession. A self-auditing and immutable record can mean massive changes for not just how much time and effort is required to verify the financials of a company, but significant reductions in the difficulty and complexity of audits (Right networks, 2017). Blockchain offers a compelling new method of recording, processing, verifying, and storing financial transactions and information and can radically change the landscape of the accounting profession and reshape the business ecosystem (Liu et al., 2019).

Blockchain might be the next technology innovation in accounting. Instead of keeping separate records based on transaction receipts, companies can enter their transactions directly into a shared ledger, which creates an interlocking system of enduring accounting records. As these entries are distributed and cryptographically sealed, it becomes almost impossible to be falsified or destroyed to conceal an activity; this is like verifying transactions by a notary but in an electronic manner (Delloite, 2016). Besides, entries between two trading partners become easily comparable, while data privacy is maintained.

Insurance-Related Applications

The insurance industry is showing an ever-growing interest in blockchain technology and its implementation in many areas, including sales, underwriting, customer onboarding, claims processing, payments, asset transfers, and reinsurance (Cognizant, 2017). The use of blockchain can support the insurance marketplace transactions between different clients, policyholders, and insurance companies. Blockchain can be leveraged across many activities such as negotiating, buying and registering insurance policies, submitting and processing claims, and supporting insurance companies' reinsurance activities (Al-Jaroodi & Mohamed, 2019; Cohn et al., 2017). Moreover, blockchain can enhance the insurance value chain because it has the ability to offer long-term strategic benefits, including lower operational costs due to reduced duplication of processes, reduced counterparty risks, increased automation of processes, and secure and decentralized transactions.

Supply Chain Management Applications

Blockchain technology can enhance transparency and accountability in supply chain systems. Blockchain enables better quality, outcomes, and performance of effective supply chain management (SCM) processes. Once tracking data are entered onto a blockchain ledger, they become immutable. Blockchain increases trust between suppliers in the chain as all are enabled to track shipments, deliveries, and progress. Blockchain eliminates middleman auditors; thus, it increases efficiency and lowers cost, and suppliers can carry out their own checks and balances at any time. Blockchain can enhance the measurement of product quality while it is transported. For example, just by analyzing information on a product’s shipping pathand duration, supply chain stakeholders can determine if a product was not in the right place orwas stored for too long.

These issues are critical when it comes to refrigerated goods, which require more special and careful handling. In this manner, blockchain-based solutions can be used to ensure the genuineness and quality of products.

Blockchain can be used in logistics. Logistics management is associated with some complexity. For example, several companies are involved in the activities and synchronized sub-activities that various institutions carry out, including plants, storage firms, shipping companies, and regulatory entities. Thus, it is crucial to have logistics management applications with advanced embedded functions that

facilitate planning, scheduling, coordinating, monitoring, and validating these activities. Blockchain technology can effectively and securely support these functions.

Energy-Related Applications

The energy industry is working on new models and mechanisms to improve its service delivery to customers. Similarly, consumers favor having new methods to buy energy and understanding the origins of their energy purchased. Blockchain-based smart contracts can substantially accelerate a significant development in the energy industry, microgrids. A microgrid is defined as "the cluster of multiple distributed generators (DGs) that supply electrical energy to consumers without any shortage". Instead of the exclusive reliance on a power factory that supplies electricity for a district, a microgrid enables all electric power consumers to manage their usage and possibly produce and sell energy using solar panels or any other energy alternative methods.

Legal-Related Applications

The power the legal industry holds comes with a very specialized set of legal practicerequirements, including standards of behavior, trust accounting, and confidentiality. Trust is the mainstay of these requirements. Preceding technologies could not accommodate thesecurity and transparency necessary to create that trust. Therefore, the practiceof law has been bypassed for the most part by the technological revolution, remaining analog,whereas other services like banking and accounting continued to race into digital. Blockchain technology solves this issue. It adds the missing trust component to online services. This will allow anybody with a cell phone to engage in legal advice online confidently. It will enable contracts to run online, and it will allow users to perform legal identity verification. It will alsoallow fractional ownership of assets and many more.

The legal industry is well suited for applying blockchain. Key factors that drive its adoption include the high number of players; the high volume of documents, information, and transactions involved; a low level of trust; and significant friction related to legal fees. The two broad blockchain uses in legal services are maintaining records and conducting transactions.

Real Estate Applications

Real estate transactions are complex, opaque, and expensive because many parties are involvedin the process, including brokers, government property databases, title companies, escrow companies, inspectors, appraisers, and notaries public. Morrison mentioned that scammers are increasingly targeting real estate transactions, according to the FBI. For example, 9,645 victims of real estate fraud were reported in 2017. According to Openledger, blockchain in real estate delivers efficient and reliable workflows,enhancing transparency and visibility at all stages, and ultimately offering safer investments toeveryone. However, these scams are just a small part of the transactions that blockchain can touch upon and strengthen. Beyond addressing fraud, distributed ledger smart contracts simplify transaction processes, cut out unnecessary intermediaries, reduce costs for main parties, and accelerate the closing of deals.

Blockchain can process the registration and transfer of property ownership more efficiently, particularly in less-developed countries with legal systems in which public authorities dealingwith real estate registers lack the principle of trust and transparency or in which land registry systems are unreliable With blockchain's help, it becomes possible to gather all information about properties and give access to parties who need this information.

CONCLUSION

Blockchain is a promising technology and highly appreciated and accepted for its decentralizedinfrastructure and peer-to-peer nature. Blockchain has demonstrated its potential for facilitatingcomplex processes such as transaction verification, reconciliation and settlement, and dispute resolution through its design features. Besides, blockchain can transform traditional business with its vital characteristics, including distribution, anonymity, immutability, and audibility. As blockchain was designed to eliminate intermediaries' role, particularly in the financial transaction space, it employs a decentralized consensus protocol for transaction processing andvalidation. PoW, PoS, PBFT, and DPoS are the most commonly used consensus mechanisms by the existing blockchain systems. Blockchain was introduced as a decentralized public ledger,but there are now various types of blockchain systems.

A blockchain network can be public, private, or consortium. Blockchain systems' choice is guided by critical factors such asinvestment capacity, privacy needed, and goals. For instance, financial organizations value theprivacy element, so they are more interested in private blockchains. In contrast, companies withsimilar activities and goals are willing to share costs and data and may opt for consortium blockchain.