Blockchain Disruption in Finance: JPMorgan Chase's Success Story and the Transfer of Quorum to ConsenSys

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Abstract

Many of the world's leading financial institutions are steadily recognizing the potential of blockchain technology to reshape the structure of global payments in the twenty-first century (Bataev et al., 2020). Although blockchain ledger networks and modular solutions have yet to enter the financial industry in production mode, with nearly $3T of assets under management, for half a decade, JPMorgan Chase (Chase) has been considering the long-term opportunity for banks to streamline their cost structures by digitizing many of their difficult-to-automate processes (Demos, 2016). Chase's Online Corporate Finance Team and Blockchain Center of Excellence point to the strong vision of the industry and the ramifications of the fast-changing interplay between investment and blockchain technology. In 2017, Chase announced an approved version of the Ethereum blockchain, the Interbank Knowledge Network, operated by Quorum. It assists member banks in sharing real-time details as a method of confirming acceptance of payment. In February of 2019, Chase centered on blockchain technology by testing JPM Coin to allow for the simultaneous transmission of transactions among financial institutions. This case study will examine Chase's use of blockchain technology, seeking to identify the standardized methods adopted by other financial institutions and the transfer of Quorum to ConsenSys. The case study will evaluate the possibility of transactions being made with a fraction of the cost using blockchain technology, with the transaction process completed in hours as compared to the current process that takes days. The blockchain ledger will also ease the financial institutions' ability to comply with the regulations because of the standardization of the blockchain network's rules and regulations.

Keywords: ConsenSys**,** blockchain, cryptocurrency, decentralization, JP Morgan, financial institutions

Introduction

In 2019, Deborah Ginsberg, the Educational Technology Librarian at the Chicago Kent College of Law Library and a leading figure in defining blockchain technology and its potential uses, described a blockchain as "a chain of blocks, cool!" The lack of a workable definition that is both concise and precise is primarily what makes blockchain technology seem complicated. However, the basic principle of a blockchain is clear. A repository is a list of records processed electronically on a file server. Data, or details, are usually arranged in table format in these repositories to make scanning and filtering for relevant information easier. While this is not dissimilar to a spreadsheet, important differences distinguish blockchains and a common Excel spreadsheet.

Spreadsheets are structured to store and view restricted volumes of information for one person or a group of persons. On the other side, a repository is built to hold considerably larger volumes of information to be viewed, filtered, and manipulated efficiently and conveniently all at once. Massive repositories accomplish these functions by housing data on servers constructed of strong processors. To provide the processing resources and storage space required for multiple people to access the repository concurrently, these servers are often created utilizing hundreds or thousands of processors. Although any number of entities can access a spreadsheet or directory, it is mostly operated by a corporation and controlled by an appointed person who has full influence over how the details and operation run. As Ginsberg argues, "Blockchain and its related databases are known as distributed ledger technologies" that provide "decentralized, secure databases" (Ginsberg, 2019).

Unsurprisingly, the financial sector was the first to explore and then begin to adopt blockchain's technical efficiencies after the paradigm-altering emergence of Bitcoin in 2009. The curiosity for decentralized currencies primarily led the major financial corporations to cooperate on conceptual and test ventures with leading hardware providers and small fintech companies (Kokina et al., 2017). The Chase global investment firm has, in fact, had a cooperative partnership over the years with Bitcoin and other cryptocurrencies. However, blockchain technology has been tested, and Quorum, a licensed blockchain framework based on an Ethereum protocol, has been created as an alternative to the Bitcoin Blockchain. Chase is now a key partner of the Ethereum Partnership Corporation (EEA) (Guo & Liang, 2016).

Engineers are central to developing Blockchain and competing blockchains. Engineers have built diverse solutions for companies in numerous fields as various blockchains have emerged. On the other side, the initial blockchain technology has proved successful in the modern world and has become the basis of various cryptocurrency operations worldwide. In this regard, in the middle of 2010, bank managers and other financial services executives started to steer their internal IT teams to pursue creativity. In early 2016, according to the Multinational Data Community, Chase and Citigroup promoted credit default trading blockchain networks. These experiments were promising and contributed to the expanding technology-based ventures.

Chase's Digital Investment Banking Unit and Core of Excellence in Blockchain inform the business ramifications of the quickly emerging financial/blockchain interplay. Although blockchain usage in organizations appears to be in an experimental phase, CFOs and financial managers strive to regularly review the blockchain's new advances. Even in the early stages, it is not challenging to see how broader usage of distributed ledger technologies could affect corporate finances. Blockchain as the innovation in technology would need the complete C-suite to understand while business structures and industries adapt to a decentralized financial structure

(Guo & Liang, 2016; Unni & Rudresh, 2022). Developing and financing the structure now, however, is crucial if cryptocurrencies are to become a predominant means of exchange later.

To this end, Chase as a pioneer in blockchain technologies has a worldwide-focused team that investigates potential implementations around a business with an emphasis on delivering creative strategies for customers. The team was formed in 2016 as a result of the considerable involvement of internal teams, customers, and all counterparties in learning about the functionality, weaknesses, sophistication, and implementations of blockchain technology. Comprised of a rather diverse collection of subject-wise specialists in technologies, financial instruments, industries, and processes, the Butte County Office of Education (BCOE) works with Chase firms to identify strategic prospects, prototype technical innovations, and assess industry ROI and consumer penetration viability. They also manage internal and external criteria to involve optimization solutions (Salah et al., 2018).

Chase is banking on the scalability and unique functions of blockchain technologies to introduce them into real trading (Son, 2020). The company knows that blockchain technology helps manage the entity. There is also a high speed involved in processing transactions. In addition, governance is quickly adhered to in the consortium-based blockchain, especially if all consortium members agree to have the rules changed. Chase is further relying on the security features of the system. It is easy to maintain the organization's internal controls because of the increased ease of providing authentication services. Each transaction is authenticated by being assigned a security code, ensuring that no money in the organization is lost by duplicating transactions (Son, 2020; Unni & Rudresh, 2022).

Blockchain Technology at Quorum

Chase used the Ethereum network to build the Quorum project, its pioneer digital currency product. The company applied this project to run the inter-bank system used to facilitate the transfer of payments to over 300 banks (Irrera, 2020). The Interbank Information Network of Chase was created not as a standalone product but to provide service to over 300 banks. This interconnectedness ensures a swifter transfer of funds from one bank to another.

The Quorum project uses the JPM Coin to effect immediate payments. This instancy in payments means that once the payment has been made to another bank account belonging to an individual - in an instant - the money has already been reflected in that person's understanding (Irrera, 2020). This system creates flexibility, enhancing the speed at which most business transactions can now be carried out. Research on the Quorum project has been ongoing for the last few years, and there have been talks that the company wants to spin it off to create what it refers to as the open-source foundation (Irrera, 2020).

In October of 2020, Chase Bank implemented a transaction and system where one of its largest clients, a specialist in carrying out several international businesses, was using blockchain technology for an international money transfer. The specific digital currency used to affect these transactions is the JPM Coin, which has been in the development stage for quite some time (Irrera, 2020).

Blockchain Technology in the Financial Market

The pull of blockchain technology in the financial markets has been inspired by many financial institutions, and not only Chase. Financial institutions are looking at ways to develop

digital technologies that will enhance the security of their payments while being readily accepted by regulatory agencies (Liu et al., 2022; Ramamoorti et al., 2020). Compliance is key to the banks. In fact, most banks are heavily regulated by the central banks, which are financial government agencies.

An increased level of scrutiny happens because the banks, in most cases, are in business with the government (Ramamoorti et al., 2020). However, it has been discovered that blockchain technology is an enhancer of regulatory reporting, especially in dealing with the AML. The data found on the ledgers of the blockchain transaction file can be obtained with ease instead of going through many security protocols. This access can be granted to risk analysts and regulators; they will inspect and provide their go-ahead in real time so that the data can be accepted by wide-ranging users and applications (Patel, 2018).

A company's internal control system can monitor account opening and lending practices in real time. This is vital for businesses that seek more control of onboarding a new customer into the system. The ease of monitoring the system enables all the information to be uniquely verified during the KYC (Know Your Customer). The bank officer doing the registration process does not even have any room where he or she can make mistakes because of the real-time monitoring and reporting. Any errors made are not only reported in real-time, but they are also rectified as soon as possible (Liu et al., 2022; Patel, 2018).

Blockchain continues to be marketed in most financial institutions along the following lines: it is a system that enhances transparency in financial operations. It is an enabling trust system (Liu et al., 2022; Pfleeger, 2014). When the network is down in most organizations, it is hard for the banking functions to be carried out with ease. ATMs that are neither operational nor user friendly limit customer transactions. Further, banking utilities such as ATMs experience downtime, thereby discouraging future use. ATM outages due to repairs or refilling inconveniences customers and reduces the number of potential banking clients. However, a benefit of blockchain technology is that it is a reliable system (Alhassan & Adepoju, 2010; Yermack, & Fingerhut, 2019). The downturn or going down of a network node found on the blockchain does not affect the entire system's performance. Unlike the current methods that can only be accessed through one approach, blockchain technology can be accessed through multiple channels of a network whose strength and speed are independent of each other (Alhassan & Adepoju, 2010; Yermack, & Fingerhut, 2019).

Consumer Data in the Financial Industry and Implementation of Blockchain Technology

The industry is facing a lot of problems with how consumer data is stored. There have been accusations and counteraccusations in certain quarters, alleging that the current system does not ensure that the consumer's privacy is respected. However, blockchain technology has what we call the pseudo feature that allows individuals to store their knowledge in a cryptically protected component through their digital wallets (Taskinsoy, 2019; Yermack, & Fingerhut, 2019). They can choose to save their private data in the manner they deem fit, especially the risky pieces of information such as account numbers, birth dates, social security numbers, and place of residence (Reena & Stephen, 2018).

Industry-wide, a considerable number of banks have now begun to adopt blockchain technology. These include the ALFA bank, whose origin is in the Russian Federation, and the United Overseas Bank (Mappo, 2019). The United Overseas Bank is based in what has been described as one of the world's eminent financial technology cities: Singapore (Mappo, 2019).

The Standard Charter Bank has entered a partnership with Kotak bank to continue creating one of the world's most robust blockchain networks (Mappo, 2019).

Blockchain adoption is increasingly growing as more organizations and economic powerbrokers are researching its use in their ecosystems. Still, it is far from being considered popular. Kokina et al. (2017) also state that distributed ledger technology (DLT) would change conventional banks' business models by providing more efficient innovations, safer storage, and more secure transactions in the future. Nonetheless, all this advancement depends upon how the legal and regulatory obstacles are addressed, specifically when it comes to cross-platform incorporation. The initiative has captured the interest of the broader geopolitical world, including governments and central banks. Kokina et al. (2017) understand that private capital is more than able to take over the planet, much as some fiat money today. Despite the potential, a lack of widespread adoption has stifled such a takeover.

Organizational Structures, Encryption, and Blockchain Technology

Ginsberg's (2019) "The Building Blocks of Blockchain" asserts that Chase's Commercial Bank Intelligence Service is the first scalable, peer-to-peer network operated by blockchain technology. The service is structured to overcome the interbank exchange's longstanding complexities, minimizing uncertainty in the bridge transaction phase while allowing transfers to meet recipients more quickly. The network helps financial institutions to share the details required for the execution of transactions in virtual environments. More than 299 institutions have registered written agreements to engage in intelligence services. They are utilizing this quickly growing technology to promote global cross-border transactions in all major markets, including Western Europe, Korea, Germany, Africa, and the Middle East (Ginsberg, 2018). In many instances, these are positive developments, but challenges and issues have arisen.

This sharing of knowledge across the different platforms is just one example of how blockchain users take advantage of the cost-saving benefits and ensure shared infrastructure (Broome, 2019; Cocco et al., 2017; Unni & Rudresh, 2022). In an era when fraud in banks and other institutions had risen, the company wants to introduce a system into which it would be foolhardy to enter and commit the theft of millions of dollars.

The encryption that comes with blockchain technology is an attractive technology (Reena & Stephen, 2018; Unni & Rudresh, 2022). Enhanced security is possible because the blockchain encrypts all transactions currently being carried out in their database. Security is further enhanced because of the presence of the so-called electronic fingerprints, which must be verified because a transaction cannot be completed by one party.

The company has gone even further in its use of blockchain technology, as it is now being applied in financial investments and enhancement of shareholding. In 2020, Chase was reported as using its customized blockchain technology to ensure that it carries out the repurchase of its agreements. The shareholding expected to come back to the company in transactions would hit hundreds of millions of dollars (Leising, 2020).

Blockchain technology has created a new digital market that works in the same way as the conventional stock exchange. Chase anticipates that Goldman Sachs will find the technology useful enough to partner and bring this new market to the industry and the world (Leising, 2020). The company is also relying on the new system's acceptability by other existing banking institutions (Leising, 2020). Blockchain technology trading is intra-institutional. The bank carries out a trade between the broker, the dealers, and the existing banking units. The Bank of New

York Mellon has bought in as the third-party dealer, which has enhanced business with Goldman Sachs while testing the test trade transactions. Of note, enterprise blockchain remains a mostly untested and underdeveloped technology. However, not a single organization is equipped and ready to act as an industry leader and introduce the technology into the markets (Leising, 2020).

Quorum

According to Mazzoni, Corradi, and Di Nicola (2022), Quorum is a permissioned blockchain protocol based on Ethereum that supports transaction privacy. Quorum's main features include the ability to execute private transactions and smart contracts, support for multiple consensus mechanisms, and flexible network permissions management.

Quorum is built on the Go implementation of the Ethereum protocol and consists of two main services: the Quorum Client and the Privacy Manager. The Privacy Manager enables private transactions and smart contract operations through its Transaction Manager and Crypto Enclave components. Quorum's transaction privacy feature leverages cryptographic operations to encrypt private transaction payloads and restrict access to specified nodes. Quorum's default Privacy Manager is Tessera, which provides encryption, decryption, and distribution of private transactions. Consensus algorithms supported by Quorum include Raft, Clique Proof-of-Authority (PoA), and Istanbul Byzantine fault-tolerant (IBFT). Quorum's consensus protocols are evaluated based on their fault-tolerance degree, leader election sub-protocol, communication complexity, number of message rounds and block proposers, quorum size, consensus finality, and consistency guarantee with respect to the CAP Theorem (Mazzoni et al., 2022).

Quorum's segmentation of the state database allows each node to maintain a unique private state and a shared public state. Block validation includes a check of the global Transaction hash to ensure each node has the same set of transactions (Mazzoni et al., 2022).

Performance Evaluation of the Quorum Blockchain Platform

Baliga, Subhod, Kamat, and Chatterjee (2018), conducted a performance evaluation of the Quorum blockchain platform. In this study, the authors investigated the transaction throughput and transaction latency of the Quorum blockchain network using the RAFT and IBFT consensus algorithms. Transaction throughput refers to the number of successfully processed transactions per second, while transaction latency is the time elapsed between sending a request and receiving a response.

The authors set up a private blockchain network with three peers using the RAFT consensus algorithm and with four peers using the IBFT consensus algorithm. All peers and clients were run on hardware machines within their network with 8 vCPUs and 16 GB RAM. The clients used the Caliper benchmarking tool, which was extended with a Quorum plugin to send controlled workloads to the Quorum network and record its performance (Baliga et al., 2018).

To generate load on the network, the authors varied the send rate of transactions from 50 to 550 transactions per second, with each client sending transactions to a different peer. The experiment was repeated for three rounds, and the total load on the network ranged from 150 to 1650 transactions per second. The authors used three different workloads: write-only, null, and read-only. The write-only workload comprised of transactions that updated a value for a randomly selected key in the smart contract's key-value store, while the null workload comprised

of transactions that called a function within the smart contract that simply returned. The read-only workload comprised of transactions that read the values for randomly selected keys (Baliga et al., 2018).

The results showed that the IBFT consensus algorithm outperformed the RAFT consensus algorithm in terms of transaction throughput and latency for all workloads. The write-only workload had the lowest transaction throughput and highest transaction latency, while the null workload had the highest transaction throughput and lowest transaction latency. The read-only workload had the highest transaction throughput and moderate transaction latency. The authors also monitored CPU utilization and memory consumption on the peers throughout the experiment (Baliga et al., 2018).

The authors found that the IBFT consensus algorithm is more efficient than the RAFT consensus algorithm for transaction processing in the Quorum blockchain network. The study provides valuable insights into Quorum's performance and can help optimize the network for real-world applications (Baliga et al., 2018).

Technical Hurdles Preventing Mainstream Adoption

Although blockchain is advancing quickly, technical hurdles such as scalability, data privacy, and technological standardization are preventing, or at least stunting, widespread adoption (Banerjee, 2022). Moreover, blockchain requires a need for market-wide understanding of specialized applications within the current existing regulatory framework. Poor comprehension of cryptocurrencies contributes to the lack of trust in the market, which then slows down the adoption rate (Banerjee, 2022; Unni & Rudresh, 2022). Additionally, there are technical challenges related to security. To date, security breaches have been associated with user and human error rather than the core technology, and these vulnerabilities must be addressed (Banerjee, 2022). Developing the right tools and managing these limitations will take time. However, similar to previous technology revolutions, continued investment in blockchain technology will likely address many of the problems and burdens (Yadav et al., 2021). Possibly thirty years from now, much like the internet, blockchain will be a commonplace technology integral to daily life. The negative consequences of the past ten to fifteen years have conditioned the public financial institution's approach to the future (Yadav et al., 2021).

The government's regulatory power of blockchain technology remains limited. While this can be viewed as an advantage, putting a lot of trading power on the consumers could be risky (Banerjee, 2022; O'Dair & Owen, 2019). Risk happens when this power falls into the wrong hands. In the current system, the government plays a unique role in ensuring that people are following the set trading regulations (Banerjee, 2022; Unni & Rudresh, 2022). In all block applications, the issue of energy use poses another ongoing problem. Innovations that consume a lot of energy will always be problematic and not only to those involved in the conservation of the environment (Banerjee, 2022; Yermack & Fingerhut, 2019). Yermack and Fingerhut describe the mining of Bitcoin as an energy-intensive process. Even though the technology is touted as a completely secure system, evidence suggests that blockchain may not be as secure as its proponents claim (Banerjee, 2022; O'Dair & Owen, 2019; Yermack, & Fingerhut, 2019).

ConsenSys Acquires Quorum from J.P. Morgan

According to ConsenSys, in August 2020, the acquisition of Quorum developed by J.P. Morgan, was announced. With this acquisition, ConsenSys now offers a full range of products, services, and support for Quorum, accelerating the availability of features and capabilities such as digital asset functionality and document management. J.P. Morgan and ConsenSys have a long history of collaboration after leading the creation of the Enterprise Ethereum Alliance and working together on industry applications built on Quorum. ConsenSys will merge its existing protocol engineering roadmap with Quorum and leverage the best of both codebases. All Enterprise Ethereum protocol technology at ConsenSys will fall under the ConsenSys Quorum brand, and developers can choose their underlying technology stack. Quorum will remain open source and become interoperable with ConsenSys' other leading blockchain products, such as Codefi's finance and commerce application suite. J.P. Morgan will be a customer of ConsenSys' advanced features and services deployed on Quorum.

According to Umar Farooq, Global Head of Blockchain at J.P. Morgan, "The creation of Quorum was a first for J.P. Morgan, both in terms of developing its own blockchain protocol and open-sourcing software for the developer community. We're incredibly proud of the usage of Quorum over the past few years and are excited to have ConsenSys as a partner to take the vision forward" (Irrera, 2020).

According to Lubin, the Founder, and CEO of ConsenSys and Co-creator of Ethereum, the collaboration between ConsenSys and J.P. Morgan on Ethereum proofs of concept and production systems started even before the first block on Ethereum was mined, and ConsenSys was formed. He expressed his excitement for the acquisition of Quorum into the ConsenSys Enterprise Ethereum stack and the unification of the Hyperledger Besu-based Enterprise Ethereum client with Quorum. Lubin further stated that the collaboration will support all Quorum installations globally and continue the multifaceted partnership with J.P. Morgan for many years, ushering in an era of enterprise and mainnet compatibility (ConsenSys, 2020).

In addition to the acquisition of Quorum, J.P. Morgan made a strategic investment in ConsenSys to support its mission of helping developers build next-generation networks and enabling enterprises to launch more powerful financial infrastructure (ConsenSys, 2020).

Lessons Learned

Chase's latest study addressed the possibilities and threats surrounding cryptocurrency, digital currency, and blockchain technologies. Chase is a clearinghouse for the most prominent current digital currencies: cryptocurrency, DC/EP and Cashless Transfers, blockchain efforts, Facebook's Libra, and Stablecoins. Arguably, Chase is the most influential financial services firm currently seeking to embed blockchain innovations in the financial system. Over the last four years, they have cloned the Ethereum protocol as a company offering, named Quorum, and begun some of the major initiatives in this field, including the JPM Coin and Interbank Information Network (IIN) (Dimitrov, 2020).

In payment and commercial lending applications, Chase enjoys the most benefit from blockchain and DLT. This is a valuation of the efforts made in cross-border and wholesale transfers by the global central banks experimenting with digital currencies. Chase's Research Group has found this nuanced yet rational observation to be a potential shield from inventories and shares in cryptocurrencies like Bitcoin, Ethereum, and Ripple. Dimitrov has suggested that

the inference here is that even one percent of the exposure to cryptocurrencies is fascinating but an incredibly dangerous and inefficient attempt due to the lack of legal tender (Dimitrov, 2020). The initial slogan in the cryptocurrency ecosystem was that they are unconnected commodities and can even be mixed as haven assets with gold and Japanese yen. However, Chase argues that excessive uncertainty and the thin stocks usually vulnerable to single-player abuse can be bolstered by digital and cryptocurrencies such as JPM Coin.

Kimberly Foss, a certified financial planner and certified wealth manager, argues that investors should not try to outsmart the market. The systematic risk of the market is too large and uncontrollable to win against it; the only clear path is to have an investment plan and stick to it. Portfolio diversification is an unavoidable strategy to minimize the risk of investment. Foss argues that diversification is not simple as it requires studying not only the market segment but also the seasonality and age of stock to minimize concentration risk. A good financial advisor and wealth manager can get their clients to see the comparisons. Warren Buffett's "Long Bets," for example, can be used while teaching them knowledge of establishing a strategy, diversifying appropriately, and then letting the markets do what they do most effectively over an extended period of time (Foss, 2017).

Conclusion

The introduction of blockchain technology and its development has been rapid (Nofer et al., 2017). Chase is leading the financial industry with the introduction and implementation of the relevant technology. Research in technologies cannot go on forever and introduce commercialization; yet it is vital to the continued growth of the technology both for consumers and banks to exhibit transparency in banking institutions. Transparency in financial institutions is mandatory because of the longstanding susceptibility to potential theft and fraud. Equally crucial to the needed security is efficiency (Liu et al., 2022; Unni & Rudresh, 2022). Speed is everything in finance; it reveals why blockchain technologies are being touted as one of the best technologies to have reached the financial system in years (Nofer et al., 2017; Unni & Rudresh, 2022). Chase began implement this critical technology and is currently showcasing the revolutionary and transformational nature of blockchain technologies to the wider industry and world.

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