CFA Institute

BLOCKCHAIN TECHNOLOGY FOR CORPORATE REPORTING: AN INVESTOR PERSPECTIVE

By Mohini Singh, ACA

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Abstract

CFA Institute has supported the use of the XBRL standard and has researched what it would cost companies to produce XBRL filings; how auditors, regulators, and analysts currently use XBRL data; and how we at CFA Institute use XBRL data to support our policy positions. Finally, we have shared our vision of expanding the use of XBRL to all forms of reporting not just the financial statements. We believe this could truly transform the financial reporting landscape. Furthermore, this would benefit all parties in the financial reporting chain, including companies, if using the XBRL standard was seen as a form of communication, and not just as a compliance exercise.

We now move on to explore how the XBRL standard (a taxonomy) can be used with technologies, such as AI, blockchain, the cloud, and virtual reality and augmentation, to best improve the production, audit, distribution, and — from our perspective, most important —consumption of information for users, including analysts and investors.

When many parties think about the impact of digitalization on corporate reporting, they think about the production of information. We are also interested in how this information becomes easier for our members and analysts to consume. We are the consumers of information.

This paper focuses on one technology — blockchain. The paper discusses what a blockchain is and how it could be used in financial reporting, more specifically, in the production, audit, distribution, and consumption of data by users. It assesses whether blockchain technology could result in information being more efficiently and effectively consumed by analysts and investors.

What Is a Blockchain?

A blockchain (also called a distributed ledger) is a type of shared database that creates a permanent record of transactions. The "blocks" in blockchain contain records of information:

- transactions (e.g., the date, time, and amount of a purchase),
- the digital signature of the buyer and seller of the transaction, and
- a unique identifier (called a "hash") that allows us to tell it apart from every other block.

Each block is linked to the previous block by the hash or piece of cryptographic code that verifies it has not been changed since it was created and sets its position in the chain. The "chain" in blockchain includes the links between all the blocks. Each time a new transaction occurs, it is added as a permanent block to the chain.

The purpose of the blockchain is to establish trust (that a transaction has occurred and the amount has been paid) among untrusted parties (when you don't know the identity of the parties to a transaction). In the absence of blockchain, trusted third parties like banks, brokers, or big retail distributors, like Amazon, facilitate transactions between two parties who don't know each other. The intermediary serves an important role because it can verify and check identities, confirm that the transaction actually occurred, and ensure that it was conducted for the amount that both parties agreed upon. The blockchain eliminates the need for such centralized authorities because it contains all the data about the transaction and is viewable by, but masks the identities of, all parties.

To sum up, the blockchain is distributed across a number of participants in a network and not under the control of a single participant. Any changes made to the data are clear to all participants. It is different from a traditional database because of the way it creates trust among the parties. Provided it has been designed and implemented correctly,[1] the blockchain also ensures that both the data and the network are resilient as it cannot be tampered with. This is because any attempt to manipulate a prior transaction requires a reprocessing of all the following blocks in the chain. This reprocessing would need to

[1]Companies need to understand the design of the blockchain and ensure that sufficient controls are in place. Just because something is called a blockchain, it doesn't mean that it is automatically secure and has sufficient controls in place to be suitable for business transactions.

outpace the rate at which new blocks are added to the chain. As a result, many view the blockchain as immutable or immune to manipulation.

Currently, interest in blockchain has focused on the application of the following:

- Bitcoin (a cryptocurrency): a decentralized digital currency without a central bank or single administrator that can be sent from user to user on the peer-to-peer bitcoin network without the need for intermediaries
- Supply-chain and provenance: guarantees the identity and provenance of high-value items such as diamonds
- Securities settlement: uses blockchain to speed up clearing and settlement processes[2]
- Health care: provides decentralized patient records
- Real estate: tracks the complicated legal process in a real estate transfer
- Payments processing: blockchain could transform invoicing, payment processing, contracts, and documentation
- Online voting

Basically, blockchain can be used for a host of purposes that involve transmitting data securely.

The question we pose is this: Can blockchain technology not only be used to transfer digital currency between a buyer and a seller or to transfer the ownership of any other asset between two parties in an efficient and trustworthy way but also be used in financial reporting?

[2]UK Financial Reporting Council, *Blockchain and the Future of Corporate Reporting: How Does It Measure Up?* (June 2018).

Can Blockchain Make Financial Reporting More Efficient?

Given that it is a distributed ledger, blockchain allows every transaction in a company's ledger to be instantaneously available to all participants in the network. When used as such, you basically have a ledger that theoretically can never be altered and whose records can never be destroyed.

A change made by a participant in this network would be validated and reflected in everyone's view of the ledger in one shared record. As a result, the information does not have to be entered and reconciled in multiple databases. This not only increases the speed of transactions but also reduces human error and fraud.[3]

Such a trustworthy network ensures data security, thus improving the quality of information. Intercompany transactions also become more transparent. Information is more timely, transparent, and accurate. It even possibly could result in real-time updates of accounting information.[4] A distributed ledger that uses blockchain technology allows each participant to store and access data simultaneously, pushing any updates to participants in near-real time.

The current system of corporate reporting includes several elements:[5]

- Production: recording and aggregating transactions and consolidating the information
- Audit: auditing the information
- Distribution: distributing multiple forms of reporting
- Consumption: using the information by users, including analysts

[3]Julia Kokina, Ruben Mancha, and Dessislava Pachamanova, "Blockchain: Emergent Industry Adoption and Implications for Accounting," *Journal of Emerging Technologies in Accounting* 14, no. 2 (2017).
[4]Hans Byström, "Blockchains, Real-time Accounting, and the Future of Credit Risk Modeling" (Lund University, March 2016).
[5]UK Financial Reporting Council, *Blockchain and the Future of Corporate Reporting.*

Production

According to the UK Financial Reporting Council (FRC) report, the production of financial information includes the cost and complexity of recording and aggregating transactions across multiple entities across jurisdictions as well as consolidating the information. Blockchain could be used to help solve these problems in the production of accounting records because having a single structured location enhances accessibility.

In addition, the role of blockchain could enhance the consolidation process. The complexity of combining financial information from multiple entities spanning multiple territories can be problematic. Blockchains could bring efficiency and reliability to consolidation processes.

When setting up a blockchain as an accounting ledger, the first question a company must ask is who should be able to access the blockchain.

Private Versus Public Blockchains

A blockchain may be public or private. A public blockchain allows anyone to join. Hence, if a company had a single ledger that contained all its transaction and accounting data, it could be shared instantaneously with regulators, investors, and creditors. Of course, this is unlikely because of the desire for confidentiality. Companies keep their records private for perfectly good commercial reasons.

Private blockchains may be more desirable to companies as accounting ledgers given their need for privacy. Because private blockchains are not distributed, companies don't have to publicize their transaction ledgers. Private blockchains, however, do pose other challenges. First, private blockchains are permissioned, and only authorized participants are allowed to add transaction blocks to the chain. The problem with this authorization is that although it affords privacy, it also makes private blockchains more of a sophisticated transactional database rather than the blockchains used for cryptocurrencies.

Second, private blockchains allow for companies to retroactively manipulate the blockchain. A blockchain needs to result in a large distributed network so that it is not susceptible to the 51 percent attack or to the manipulation of additional new blocks to the blockchain by a majority of agents participating in the distributed network. A 51 percent attack on a blockchain refers to participants in the network trying to control more than 50 percent of a network's computing power or hash rate. People in control of such computing

power can block new transactions from taking place or being confirmed. They also can use 51 percent attacks to reverse transactions that already have taken place.[6] A private blockchain, by definition, is not a large distributed network.

Blockchain and XBRL

Currently, many jurisdictions around the world require public companies to produce financial reports using XBRL. The myth that blockchain could replace XBRL in the production of financial information is incorrect. Blockchain is not a data standard. And XBRL is not a distributed ledger system. Replacing one with the other would be like replacing the English language with an iPhone. Both are used to communicate, but one is the standard, and one uses the standard. In fact, just as you need to be able to speak a language to communicate, blockchain needs a data standard to record and exchange information. Blockchain is a new technology that will need data standards to work effectively but, as its use and purpose are completely different than the XBRL standard, it could not be used in place of data standards.

A smart contract is one example of why blockchain needs a data standard. These are self-executing contracts that run on blockchain networks. Although it is not an inherent requirement of blockchain technology, smart contracts can be incorporated into the blockchain and can be executed when certain conditions are met. Such contracts contain a set of conditions under which a buyer and a seller are in agreement. When those conditions are met, the contract is automatically enforced without the need for trusted intermediaries to verify and execute the contract. These digitized contractual obligations reside on the blockchain. For example, a smart contract between two parties may specify that if the debt coverage ratio of one party falls below a certain level, an action is triggered by the digital contract.

The paper "Toward Blockchain-Based Accounting and Assurance"[7] argues that smart contracts could play an important role in the encoding of accounting rules and the autonomous recording of transactions that are in compliance with certain accounting standards. For example, after programming the rule of "sales should be recorded after shipment of goods" into smart contracts, such programs could examine the shipment date before inserting a sales record into the blockchain ledger and pause transaction updates until goods are shipped. The paper maintains that smart contracts that have accounting rules encoded could effectively control the recording of accounting activities. Therefore, these

[6]Kokina et al., "Blockchain: Emergent Industry Adoption and Implications for Accounting."
[7]Jun Dai and Miklos A. Vasarhelyi, "Toward Blockchain-Based Accounting and Assurance," *Journal of Information Systems* 31, no. 3 (2017).

contracts would provide automatic assurance on processes, such as posting, classification, and cutoff.

As the concept of the smart contract was developed, it became clear that reliable, consistent, machine-readable data are necessary for smart contracts to be fulfilled. The only way to enable access to consistent, machine-readable data is through universally accepted data standards. Smart contracts that rely on data prepared using a financial data standard can automatically trigger an action without the need for human intervention.

In fact, the development of blockchain makes the need for standards essential. The excitement and interest in blockchain-based technologies has raised awareness about the lack of financial standards. This, in turn, has focused technology enthusiasts on identifying existing standards that can be leveraged and on developing new ones where needed.

As the blockchain community has evolved, and as it continues to investigate new use cases for these technologies, it has recognized that mature, widely used data standards are critical to the smooth functioning of blockchain applications. They need data standards that support numerous information collection and analysis systems and that produce good quality, consistent, clean, digitized data that are interoperable with other data.[8]

Audit

Companies prepare financial statements and an auditor then issues an opinion on the accuracy of the financial statements. Users, such as investors, then have to trust the accuracy of that information. The concept of trust is central to the preparation and audit of financial statements.

If a company keeps it transactions on a blockchain, then by construction, the blockchain can to some extent replace the auditor in confirming the accuracy of all transactions and balances. Furthermore, because past transactions in the blockchain cannot be tampered with, trust is automatically built into the company's accounting process.

The following advantages are seen with blockchain:[9]

[8]Mohini Singh and Campbell Pryde, "Should Blockchain of AI Replace XBRL?" XBRL, 11 June 2019, https://xbrl.us/blockchain-ai-replace-xbrl/?utm_source=Master+List&utm_campaign=b60de6ea53-EMAIL_CAMPAIGN_2018_09_27_12_11_COPY_01&utm_medium=email&utm_term=0_da5920711b-b60de6ea53-183331841.
[9]Kokina et al., "Blockchain: Emergent Industry Adoption and Implications for Accounting."

- Validation and verification of transactions
- Traceable audit trails
- Automated audit processes
- Use of smart contracts
- Tracking ownership of assets

Validation and Verification of Transactions

The verification of transactions is automated by blockchain technology. For example, blockchain solves the issue of unauthorized spending because cryptographic identity verification is required for each payment. In a transaction, a payment has a sender and a recipient. The sender has to digitally sign the transaction verifying the sender's identity to authorize payment.

Some argue that when blockchain is used as an accounting ledger, this process should be restricted to certain parties, such as accountants, management, and auditors. The blockchain ledger thus falls into the permissioned blockchain category.[10] In such a scenario, each party would have a specific role in the verification process. For example, a doubtful transaction might be paused for confirmation by accountants with the chief financial officer having the role of approving or cancelling it.

Valid transactions can be grouped into blocks and added to the main chain, and these cannot be manipulated given the nature of blockchain. Only users with authorizations can view them. To protect the privacy of a company's sensitive data, the transactions could be encrypted before being uploaded to the blockchain ledger, and only users who have the decryption key should be able to view the content of the transactions.[11]

Permissioned blockchains are also more scalable. Because only a limited number of parties can verify transactions, the consensus among the participants to validate transactions can be reached more quickly. The limited number of participants, however, requires a high degree of trust that they do not collude to create false transactions.

[10]A permissioned blockchain serves as a bridge between a public and a private blockchain with various customization options. The options include allowing anyone to join the permissioned network after suitable verification of their identity. But in a permissioned blockchain, not every user is granted the privilege to take part in the transaction verification process.
[11]Dai and Vasarhelyi, "Toward Blockchain-Based Accounting and Assurance."

Traceable Audit Trails

The use of blockchain in accounting results in the establishment of a detailed audit trail. Audit trails could be documented on the blockchain to facilitate tracing and review in the future. Invoices, bills of lading, letters of credit, and receipts could be documented on the blockchain, whereby all documents are traceable and unchangeable. In other words, a blockchain ledger could be used to store any audit-related documents, thus allowing auditors to test the completeness of financial information. Those documents also could be shared among related parties, such as customers, suppliers, and creditors, for cross-validation, thus providing assurance from a broader group than just the auditors.

In addition, many analytical tools then can be applied to the accounting records within the blockchain to discover patterns and identify anomalies.

This allows auditors to review exceptions generated from a population of transactions rather than a sample. Also, distributed ledgers could provide an opportunity to conduct audits on a more frequent or even continuous basis with an increased sense of trust. The technology would make it impossible to modify any transactions before an audit and the greater coverage will improve the level of assurance gained in such audit engagements. With blockchain, the emphasis on the auditors' role would change from that of verification to greater use of judgment.[12]

Automated Audit Processes

Blockchain can be used as a source of automated audit verification processes. For example, instead of asking clients for bank statements or sending confirmation requests to third parties, auditors can verify transactions on publicly available blockchain ledgers. Such automation also will drive cost efficiencies in the audit.

Indeed Deloitte, Ernst & Young, KPMG, and PwC are working with 20 Taiwanese banks to test blockchain technology for exactly this purpose. The pilot aims to streamline external confirmation processes, which currently require an auditor to manually obtain and verify audit evidence of companies' transactions with third parties. These confirmations require that auditors check that the balances held with companies' banks align with internal records of cash on hand. Historically, a number of high-profile frauds have been facilitated by faking bank confirmation letters. Securing the data involved is therefore essential. In the new scheme in Taiwan, transaction data are migrated by the banks onto a blockchain that is accessible by the audit firms. The pilot harnesses the tamper-proof,

[12]Dai and Vasarhelyi, "Toward Blockchain-Based Accounting and Assurance."

distributed, and immutable structure of a blockchain system to secure and automate the confirmation process. This potentially accelerates the confirmation times from an average of two weeks to within a single day.[13]

Use of Smart Contracts

As noted, with increasing automation of accounting information today, most accounting standards should be embedded into the software and systems that implement and execute the recording process. Then, for example, self-enforcing smart contracts could automatically invoice, process, and record payments.

Tracking Ownership of Assets

A fundamental property of the blockchain is that once something is on the blockchain, it cannot be altered. Therefore, the blockchain can be used as an ownership verification tool. Once an asset is listed on the blockchain, ownership is immutable unless the owner verifies a change. As with high-value items such as diamonds, a company can track the ownership of its assets.

To sum up, accounting processes can be vastly automated while control and audit costs will decrease because of the built-in validation.

Distribution

Companies have regulatory filing requirements to multiple parties within and across different jurisdictions. The question is whether blockchain could help solve problems in the distribution of financial reporting to regulators and other users at a national and international level. In fact, blockchain is currently being tested as a distribution mechanism in Europe.

The European Financial Transparency Gateway

The EU Transparency Directive required the European Securities and Markets Authority (ESMA), and the national competent authorities (NCA) from each EU member state, to work together on creating a single, centralized point of entry for the public to access

[13]"Blockchain for Audit Confirmations?" XBRL, 31 August 2018, https://www.xbrl.org/news/blockchain-for-audit-confirmations/.

statutory information of listed companies — the Single European Electronic Access Point (EEAP). The ESMA Board of Supervisors, however, decided to pause the project in January 2018.

Currently, every EU member state has its own Officially Appointed Mechanisms (OAM) to store regulated information. Hence, any investor who wants to compare and contrast companies across different member states will need to access a different OAM for each one. Furthermore, member states have different national mechanisms for storing information about companies, which all work in slightly different ways, and the information they provide varies in terms of scope and quality. This is not efficient for investors. The EEAP is necessary to facilitate accessibility, analysis, and comparability of annual financial reports by investors and other users.

As a result, the European Commission has started its own pilot project based on an approach to build a distributed and decentralized system by interconnecting the OAMs in Europe into a dedicated platform for sharing data instead of exchanging it — that is, a blockchain platform infrastructure offering traceability and ownership management of both submitted and consumed financial data known as the European Financial Transparency Gateway (EFTG).

The platform system is being tested to see whether it might provide easier cross-border access to regulated information, lower the search time, and reduce the information access costs. Potentially, investors will obtain faster results because they no longer will have to go through 28 different portals but rather will go to a single-entry point from a single distributed framework across the EU. Of course, we don't know what the outcome of the pilot project will be, and the biggest question that remains open is: how easy will this platform be to use?

The EFTG would create a single location for European company reporting. Listed companies' information would reside on the OAM but also would be accessible through the EFTG. Potentially, investors could access free up-to-date official information for all European listed companies from one location.

But what are the drawbacks? The EFTG has to join the 28 OAMs in different countries each of which has different legal and statutory requirements. The FRC[14] has made this argument:

[14]UK Financial Reporting Council, *Blockchain and the Future of Corporate Reporting.*

> In this situation, replacing all the legal, regulatory and technical infrastructure with a single agreed database that works for all could be challenging and expensive. Therefore, the use of blockchain to augment the local filing system, rather than replace it, might be preferable, as participants would remain in compliance with local rules. It could also be attractive to use similar technology at a local country level. Companies could file the location of various regulatory filings (annual reports, business register documents, gender pay reporting etc.) that are traditionally released publicly to different bodies into a single public blockchain, greatly enhancing the effectiveness of access.

There are further issues, however. Blockchain is a complicated, specialized, and expensive technology to be used for distribution purposes. Furthermore, how would it be maintained and governed?

Complexity and Cost

Blockchain is computationally expensive. It relies on intensive computing power — and hence a lot of electricity — to run. According to a *Forbes* article, blockchain relies on encryption to provide its security as well as to establish consensus over a distributed network. This essentially means that to "prove" that a user has permission to write to the chain, complex algorithms must be run, which in turn require large amounts of computing power.[15]

In addition to the cost issues, there is the issue of complexity. It takes quite some education to understand how blockchains work and potentially could be useful. In a distributed network, no central authority exists, so intermediaries essentially are cut out. Hence, blockchain has been touted as being useful in areas such as clearing payments. But, for example, when the financial services industry already provides this service at a relatively low cost to the end user, it may not make sense to replace the current system with another that is too complex. Similarly, it may be a complicated solution to a distribution problem.

[15]Bernard Marr, "The 5 Big Problems with Blockchain Everyone Should be Aware Of," *Forbes*, 19 February 2018, https://www.forbes.com/sites/bernardmarr/2018/02/19/the-5-big-problems-with-blockchain-everyone-should-be-aware-of/#ece82d51670c.

Blockchain Versus Distributed Database

Users need a single structured location to enhance accessibility, but given the issues of cost and complexity with blockchain, this may need to happen through a different technology, say, a distributed database.

A public blockchain creates trust where it doesn't exist in a decentralized world. In this case, it is not necessary to create trust among the 28 member states so perhaps a simpler and more cost-effective way to distribute information would be to create a distributed database. Distributed databases are centrally managed and their goal is to create a logical center, which can provide efficient, low-cost services.[16]

As explained in the article "The Difference Between Blockchain and a Distributed Database,"

> The core value of blockchain technology is not to provide rudimentary data services (like the decentralized database), but to build a new ecosystem of digitized data assets and automated trust services. The global blockchain updates its state autonomously, and data is traceable to its source.
>
> On the other hand, the core value of distributed database is to provide data storage and access services to business systems. The database is designed to provide operational support, mainly for business products and development projects, with the data being stored with a focus on supporting analysis and retrieval.

Hence, given the value proposition of a distributed database and the fact that it is cheaper, is less complex, and can be centrally managed, it is far more efficient for distribution of information.

Consumption

Users want to be able to access the distributed information freely. We live in a world of increasing amounts of data. We believe preparers should seek to use technology to make their reports an engaging form of communication with investors. They need to think about technology not

[16]Ning Li, "The Difference Between Blockchain and a Distributed Database," Medium, 23 December 2018, https://medium.com/ultrain-chain/the-difference-between-blockchain-and-a-distributed-database-556f8361e6b3#:~:text=-The%20difference%20in%20value%20propositions&text=The%20global%20blockchain%20u.

only as a means to reduce the cost of reporting but also as a communication platform that enables analysts and investors to consume the information more efficiently and effectively.

The FRC report says that users need corporate communications to be useful for their analysis and understanding. Furthermore, users want a credible source of information that has a clear level of assurance attached to it. Having a boundary around information is important for investors because it provides context and adds to credibility. Historically, of course, these boundaries have been established by the physical boundaries of a specific document. An annual report is a boundary that is related to a set of specific reported information with appropriate assurance attached to it.

Disclosurechain

With the greater use of technology, the reporting boundary does not necessarily need to be physical. The FRC report says,[17]

> An entity-specific blockchain of individual disclosures not of reports, but of individual disclosures, either in traditional documents or using new mediums, might be a more engaging solution to the boundary issue. By providing a chain of links to disclosed information this "Disclosurechain" would allow an up-to-date picture of a company's position to be communicated as well as the relevant credibility/assurance and context around it (i.e. users could trust that it had not changed since it was issued and assured). Furthermore, by providing the full history (chain) of disclosures, changes over time could also be understood.

A single-entity blockchain, however, may not be seen to be useful. If the system was set up to connect with audit and regulatory users, it could have more widespread use, including communicating assurance. Per a Deloitte report,[18] "As a technology that facilitates transactions across a network, the value of a blockchain network increases with the number of users." We agree. There is no benefit in such a system unless it is adopted very widely. For widespread use to occur, however, we need standardization. Investors and other users do not want to access multiple different networks that work differently.

[17]UK Financial Reporting Council, *Blockchain and the Future of Corporate Reporting*.
[18]David Schatsky, Amanpreet Arora, and Aniket Dongre, "Blockchain and the Five Vectors of Progress," *Deloitte Insights* (2018). https://www2.deloitte.com/content/dam/insights/us/articles/4600_Blockchain-five-vectors/DI_Blockchain-five-vectors.pdf.

Need for Standardization

Currently, there is no standardized blockchain. Different chains are set up and operate differently. This is not efficient for investors. Investors need compatibility because they will not try to figure out how different blockchains work.

Blockchains need to be standardized. What do we mean by this? Consider a blockchain to be an envelope. There are contents within the envelope. Those contents need to be standardized—for example, by using XBRL. As previously noted, it is a myth to say that with the advent of blockchain you don't need XBRL. In fact, they need to work together. To be of real value, content and nomenclature must be consistent. For this to happen, regulators need to continue to work with industry and initiatives, such as XBRL and Legal Entity Identifier, to develop consistent naming, taxonomy, and identification for companies and company filings.

The lack of standardization leads to issues of interoperability. With an increasing number of companies and suppliers using blockchain, no standard allows them to interact with each other. It is not efficient, for example, for a supplier to interact with a different chain for each group of customers with multiple chains, which causes issues for those seeking compatibility between the blockchains and their accounting systems, as this may limit any cost savings.[19]

More Collaboration Needed

A number of groups have been formed to increase collaboration in the space and encouraging standardization — something that could address the lack of interoperability between networks. One such group is the International Organization for Standardization that set up the ISO Technical Committee on Blockchain and Distributed Ledger Technologies in 2016. The objective is to achieve the standardization of blockchains and distributed ledger technologies to support interoperability and data exchange among users, applications, and systems. Various web service providers such as IBM, Oracle, Azure Blockchain Services, and SAP also have been vocal in their support for cross-chain platforms.

As more companies realize that they cannot exist in isolation, interoperability for information transfer and data exchange through the use of blockchain technology increasingly is being examined. But when looking at cross-chain systems that include private and

[19]UK Financial Reporting Council, *Blockchain and the Future of Corporate Reporting.*

public blockchains, the governance structure must be the focus. As the article "Blockchain Interoperability: The Holy Grail for Cross-Chain Deployment" points out,[20]

> All interoperability solutions will likely have trade-offs; so it's a matter of designing systems that find a balance between security, governance, adaptability, and economic incentives that suit their target market.
>
> Private chains operating without distributed consensus are more prone to data manipulation and the integrity of the data/assets being transferred from a private, permissioned and centralized chain to a more decentralized chain could be questioned. Overall, there is no one solution that fits all in terms of being public/private, centralized/decentralized — it is a broad spectrum with specific trade-offs.

We appear to be at the initial steps of forming solutions to the issues of standardization and interoperability and, therefore, we are far from the widespread use of blockchain for corporate reporting purposes. At the moment, it would not serve investor interests.

[20]Shiraz Jagati, "Blockchain Interoperability: The Holy Grail for Cross-Chain Deployment," *Cointelegraph*, 21 May 2020, https://cointelegraph.com/news/blockchain-interoperability-the-holy-grail-for-cross-chain-deployment.

Other Limitations

Blockchain has several limitations that need to be addressed before it becomes efficient for users, including investors. As noted, these limitations include its heavy consumption of power (making it expensive to run and environmentally unfriendly), complexity, privacy issues, and the lack of standardization. Other hurdles that need to be addressed are as follows:[21]

Scalability Issues

The scalability issues of blockchain include the limited rate at which the network can process transactions. Basically, blockchain can be slow. Consensus is needed among the participants on the network that the transaction is valid for it to go through. Although this system reduces the risk of malicious activity, it also increases the time required for transactions to settle.

Compared with other transaction processing systems able to process tens of thousands of transactions per second, the bitcoin blockchain can handle only seven transactions per second. The current capacity of blockchain is insufficient for financial institutions, such as payment and settlement networks, which process thousands of transactions per second. For example, Visa Inc. processes 4,000 transactions per second, and Depository Trust and Clearing Corporation's Universal Trade Capture processes 47,000 transactions per second.[22] Consequently, many do not consider blockchain technology to be feasible for large-scale applications.

That is not to say blockchain will not be beneficial to a number of other industries, such as health care, real estate, or law — industries that have large trails of paper records and outdated technology. Slow transaction speeds, lack of standardization, and privacy issues, however, threaten to inhibit the growth of blockchain in financial reporting.

Need for Regulation

The lack of regulation creates a risky environment. Regulators are becoming increasingly uneasy about the speculative nature of the cryptocurrency market. Because of the lack

[21]Ryan Browne, *Five Things That Must Happen for Blockchain to See Widespread Adoption* (Deloitte, October 2018).
[22]Kokina et al., "Blockchain: Emergent Industry Adoption and Implications for Accounting."

of regulatory oversight, scams and market manipulation have become common. Certain jurisdictions have banned initial coin offerings (ICO) having discovered fraudulent ICOs.

In other areas in blockchain, regulation is uncertain, such as smart contracts. Existing regulations don't cover smart contracts. As the paper *Blockchain: Emergent Industry Adoption and Implications for Accounting* notes, smart contracts not only are computationally expensive as miners have to complete the calculations to trigger the execution of the contract but also the lack of central authority raises issues about regulation and who is responsible for solving software-related problems if they were to arise.

According to Paul Brody, blockchain leader at EY Global[23]

> Regulatory approval is going to be required for any major implementation of blockchain in company accounts and reporting, which means that we won't see a rapid adoption of the technology.
>
> Blockchain is spreading quickly in non-regulated areas, both as a general-purpose information technology and as a tool for integrating financial services with operating technologies. Companies will use these unregulated use cases to build confidence as they gradually implement blockchain in their core financial operations.

[23] https://www.ey.com/en_ch/assurance/how-blockchain-could-introduce-real-time-auditing

Conclusion

A blockchain is distributed across a number of participants in a network and not under the control of a single participant. Any changes made to the data are clear to all participants. It is different from a traditional database because of the way it creates trust among the parties. Provided it has been designed and implemented correctly, the blockchain ensures that both the data and the network are resilient because it cannot be tampered with.

When used as an accounting ledger, every transaction in a company's ledger is instantaneously available to all participants in the network. A change made by a participant in this network would be validated and reflected in everyone's view of the ledger in one shared record. As a result, information does not have to be entered into and reconciled in multiple databases. This not only increases the speed of transactions but also reduces human error and fraud. Such a trustworthy network ensures data security, thus improving the quality of information. Information is more timely, transparent, and accurate. This process may result in real-time updates of accounting information. Blockchain not only could be used to record and process transactions but also could increase the speed of consolidation within groups.

For privacy reasons, companies may find private blockchains more desirable as accounting ledgers. As private blockchains are not distributed, companies don't have to publicize their transaction ledgers. The problem with this is that it affords privacy, but it also makes private blockchains more of a sophisticated transactional database rather than the blockchains used for cryptocurrencies. A blockchain achieves maximum benefit when it is widely adopted because sufficient participants are required to ensure the security of the ledger, provide reliable verification of transactions, and prevent illicit collusions.

Furthermore, a single entity blockchain may not appear to be useful for investors. The system needs to be set up to connect with audit and regulatory users to communicate assurance. Such a system offers little benefit unless it is adopted widely. For widespread use to occur, however, we need standardization.

Blockchains need to be standardized. Consider a blockchain to be an envelope. There are contents within the envelope. These contents need to be standardized—for example, by using XBRL. To be of real value, content and nomenclature need to be consistent. For this to happen, regulators need to continue to work with industry and initiatives, such as XBRL and Legal Entity Identifier, to develop consistent naming, taxonomy, and identification for companies and company filings.

Currently, there is no standardized blockchain. Investors and other users do not want to access multiple different networks that work differently. This is not an efficient way to consume information.

The need for privacy by companies and the lack of standardization stand in the way of widespread adoption of blockchain for financial reporting. Issues such as cost, complexity, scalability, interoperability, and lack of regulations also hinder widespread use. Until these issues can be addressed, the use of blockchain technology is not the most efficient way for investors and analysts to consume information.

Of course, the use of blockchain in accounting is in its infancy. It is important to monitor the progress of blockchain implementation in companies to see how companies determine whether to place data in a distributed ledger or choose to encrypt some data to balance the needs for both transparency and privacy.

We need to monitor the progress of the groups that have been formed to increase collaboration and encourage standardization, which could help with the lack of interoperability between networks. We need to monitor where blockchain creates the most efficiencies, such as preventing fraud.

For the moment, blockchain is well suited for tracking diamonds and other goods for which the buyers want to know the provenance — that is, the origins and previous owners — but it is not best suited for financial reporting.