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Blockchain Technology: The Disruption and Impact to the Accounting Profession

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Blockchain Technology:

The Disruption and Impact to the Accounting Profession

An Honors Thesis
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by

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Abstract

Blockchain is a digital ledger that records transactions conducted between different parties in a network. This technology has the potential to be very beneficial but is not currently in the place to apply practically to the accounting field. In today's environment, blockchain is being used in many different areas of business, namely supply chain management and logistics. It is in the process of being translated into the accounting field and potentially replacing the traditional enterprise resource planning (ERP) systems the majority of companies use for accounting today. However, with certain advancements in the technology, it could significantly change accounting in the fields of tax, audit, and financial reporting. Potential applications for tax include simplifying payroll tax, transfer tax, and value added tax (VAT). However, there are no current applications of blockchain with tax as this would require significant changes in governmental regulations. There are numerous potential changes that may impact the audit field with some scholars even suggesting fully automated audits in the future. While this may not be fully realizable, the possibility of real-time auditing is not unrealistic. Blockchain will change financial reporting in many ways but primarily by creating one version of the truth for enterprises to use. This makes the creation and reliability of financial data and statements much more straightforward for all involved parties. Overall, as blockchain continues to evolve, it will never completely take away the need for accountants, but it will certainly change the way accountants do their jobs. CPAs in particular will have new roles such as blockchain auditors, arbitrators, and moderators.

Blockchain Technology: The Disruption and Impact to the Accounting Profession

Over thirty years ago, multiple developers created a new network that eventually came to be known as the modern internet. The internet has changed almost everything about how society functions in today's world and continues to evolve with new technology and increasing consumer demands. The internet has become a part of people's everyday lives, which leaves the question of what new technology will come next. A new form of technology that is gradually increasing in popularity and gaining renown across the globe is blockchain. Best known for its Bitcoin application, blockchain is a recently created technology that allows users to exchange value electronically. As the technology has improved over recent years, larger organizations such as banks, accounting firms, and technology companies have begun to experiment with blockchain to find more ways to apply its secure, distributed, and immutable network to various business practices, including the accounting field. Its greatest potential is in financial services, especially accounting. Bookkeeping is essential to accounting and an immutable database such as blockchain could immensely improve the efficiency and security of several areas of the profession. Blockchain technology has the potential to be very beneficial but is not currently in the place to apply practically to the accounting field. However, with certain advancements in the technology, it could significantly change accounting in the fields of tax, audit, and financial reporting.

Background

In 2008, a programmer under the pseudonym Satoshi Nakamoto developed blockchain as a public digital currency system secured with cryptography (Dai and Vaserhelyi 6). Blockchain is a digital ledger that records transactions conducted between different parties in a network. This ledger includes every transaction since the creation of the

blockchain. Participants in the system are called "nodes," each of which has an identical copy of the ledger. One node adds a transaction by sending value to another. All of the other nodes must approve the validity of the new transaction using a consensus algorithm, which is a problem-solving operation on a computer that allows the nodes to agree on the accuracy of the transactions at hand. Once transactions are approved, all of the nodes' copies of the ledger are updated with a new block containing multiple transactions ("Blockchain Technology and Its Potential Impact" 3).

Each new block in the ledger contains a timestamp, a hash value which is a code that refers back to the previous block, and a nonce, which is "a random number for verifying the hash" (Nofer et al. 184). These three parts of a block ensure security because all of the hashes are unique. An attempt to change one block would change its respective hash value and require changing each hash of all prior blocks. Fraudulent activity is very difficult as the majority of nodes must approve the blocks (Nofer et al. 184). The more nodes there are in a blockchain network, the more secure it will be.

Consensus Mechanisms

One of the most important aspects of blockchain systems is the consensus algorithm. Consensus is necessary so that all parties involved in the network have equal opportunity to approve the validity of transactions. There are two popular methods of consensus that are currently in use, usually for Bitcoin. The first is proof-of-work (PoW). Through this method, the user's computer "solves a math problem involving the hash of the set of transactions to verify and a hash of the prior block in the chain" (Coyne and McMickle 107). Miners compete to solve the puzzle and add the next block to the chain. This method has some flaws that will prevent it from being applicable to a business blockchain, such as the need for large

amounts of electricity which makes confirmation time take much longer (Frankowski et al. 9). The second method is proof-of-stake (PoS), which is less resource-intensive than PoW and more ideal for blockchains that do not involve cryptocurrency. This method requires that the users "verify transactions based on their respective account balances" (Coyne and McMickle 107). The more of a stake a participant holds in the company, the more likely he will be tasked with verifying the transaction. This method encourages self-policing by currency holders (Coyne and McMickle 107). However, the issue with PoS is that it is not a fair method of verifying transactions for all parties involved. If certain parties hold a greater stake in the company than others, they can influence the transactions more than other parties. Blockchain's greatest strength is its ability to allow equal access to one version of the truth for all parties. PoS does not fall in line with this strength. There are countless different consensus algorithms in existence now, and as blockchain continues to expand, new methods are continually being created. These two are the most common methods of consensus but both have drawbacks.

Smart Contracts

Another aspect of blockchain that contributes to its efficiency is the smart contract. The idea of a smart contract was originally introduced in 1997 but has not become a realistic option for computers until now with the growing popularity of blockchain (Nofer et al. 185). A smart contract is a "computer code stored on a blockchain that executes actions under specified circumstances" ("Blockchain Technology and Its Potential Impact" 6). Tax specialists from Deloitte make the comparison of smart contracts to vending machines. They write, "If we try to imagine buying a soda, the transaction is simply based on the agreement that by putting some change in the machine and pressing a button, we get what we agreed to:

a soda, at a defined price. The manner in which our agreement is carried out is fully

automated" (Frankowski et al. 10). Smart contracts allow for the execution of terms based on

certain conditions to be carried out by the network rather than being done manually. This can

relieve certain employees of repetitive tasks and speed up business processes, reduce error,

and reduce costs. The terms and conditions are built into the blockchain so that when a

certain event takes place, the blockchain knows to carry out the appropriate response. For

instance, an invoice could fundamentally pay for itself after checking that goods were

delivered correctly and that the company had sufficient funds available to pay the invoice

("Blockchain Technology A Game-Changer?" 4). The possibilities with the combination of

blockchain and smart contracts are endless.

Defining Characteristics

There are multiple defining characteristics that make blockchain unique and

advantageous over current accounting systems. The first of these is its ability for near real-

time settlement. Once a transaction is posted, all parties can see and approve the transaction,

allowing payments to be settled quickly. The second quality is the distributed nature of the

ledger. Blockchain is a peer-to-peer, distributed network meaning that every party involved

has a public record of transactions and there is not one administrator that has access to all of

the information alone ("Blockchain Technology and Its Potential Impact" 4). This presents a

solution to the problem presented in the theory of information asymmetry. This theory

explores a situation in which one of the involved parties, usually in a transaction, "has more

information or more accurate information than the other party" (Kte'pi 524). When one party

has better information than another, it creates imbalances and inequality that can lead

anywhere from small discrepancies to major disagreements. Blockchain helps alleviate this

issue by giving all parties involved in a transaction access to the same records. This increases security because there is not one single point of failure in the system and each user has a copy of the blockchain. The blockchain provides a single version of the truth to users rather than different records on each side of a transaction. The third characteristic is irreversibility, or immutability. Using hashing, a blockchain becomes an irreversible, verifiable record of every transaction made on the blockchain ("Blockchain Technology and Its Potential Impact" 4). All of these qualities come together to enhance security through hashing and distribution as well as increased efficiency of recording and approving correct transactions. The characteristics of real-time settlement, distributed nature, and irreversibility are what make blockchain more beneficial than current record-keeping systems.

Types of Blockchains

Blockchains can be public, private, or permissioned. A public blockchain is open for anyone to participate, like Bitcoin and other cryptocurrencies. This was the original design for blockchain so that anyone "has the right to read, verify, and update transactions to the chain" (Dai and Vaserhelyi 6). However, this is not desirable for many companies in today's environment. Organizations typically do not want the public to have access to all of their records and financial information. This led to the creation of private blockchains, which involves giving access to a limited number of predetermined participants. This allows the company to protect private business data but still benefit from using blockchain technology. There are also permissioned blockchains which allows one authority to select the parties allowed to authorize and verify transactions. Irrelevant parties are not involved in transaction verification, making the verification process much simpler and quicker (Dai and Vaserhelyi 7). The issue is that the private and permissioned blockchains do not have all of the benefits

of a public blockchain like Bitcoin. Looking at the setup of the Bitcoin blockchain network gives insight into the beneficial qualities that come from using a public blockchain.

Relation to Bitcoin

Bitcoin, the original cryptocurrency created for blockchain, displays blockchain in its purest, most effective form. Users keep Bitcoin in virtual wallets, which are represented by long chains of numbers and letters. Each Bitcoin user has a private and public key. The public key sends deposits to other Bitcoin users. These deposits can only be accessed with the private key. The private key also unlocks the user's personal wallet for withdrawals. This private number must be guarded carefully to protect against Bitcoin theft (Guzzetta 21). The easiest form of a Bitcoin wallet for users to obtain is an app on a smartphone. The consumer must then either exchange cash for Bitcoin or use a card to purchase it directly for the wallet ("How to Pay with Bitcoin"). However, it is important to note that Bitcoin is its own currency and not just another form of online payment.

For any transaction, there is a 15 minute window to pay an invoice. If the payment is not made in 15 minutes, the invoice expires and a new one must be created to go through with the transaction. There are three different ways to pay for an invoice: scanning a QR code, opening the invoice in the wallet, or sending the payment manually with a URL. There are miner fees or network cost fees that accompany each transaction. These fees are what reward miners for solving transactions in the blockchain ("How to Pay with Bitcoin"). Miners are the users who are responsible for validating all of the Bitcoin transactions in a certain block and adding blocks with a hash and a nonce to the blockchain. The process of solving a block is extremely difficult and takes significant amounts of electricity and proper computing equipment to complete. However, the reward for solving a block is 12.5 Bitcoin

which equates to almost $45,000. Most miners today can solve a block in an average of ten minutes, but it is still a very difficult task to complete (Guzzetta 22).

Bitcoin is a public blockchain, meaning it is open to anyone in the world who wants to invest in and use the cryptocurrency. It is this openness to the public that makes blockchain so effective in this form. As mentioned earlier, blockchain becomes more effective and secure with more active members or nodes in the system, as in the public blockchain of Bitcoin. Looking at the defining characteristics of blockchain, one can see how Bitcoin is the purest form of a public blockchain. The first quality is real-time settlement. A Bitcoin invoice must be paid in 15 minutes. After payment, the transaction is then broadcast to miners. Then a block including this transaction can be solved in an average of 10 minutes. Once it is solved, anyone who has downloaded the Bitcoin software to their phone or computer will have an updated version of the blockchain including this block in near real-time (Guzzetta 22).

This leads to the second quality, which is a distributed nature. Because each Bitcoin user has a copy of the blockchain, there is not one single point of failure in the system as all users can see the transactions and have access to one version of the truth. This significantly increases security and makes it hard for people to change past transactions due to hashing and being in the public eye. This leads to the third quality, which is immutability. While being unable to change blockchain transactions does help with security, it can become an issue if information is initially entered incorrectly or when crimes are committed with Bitcoin. Due to the ability of Bitcoin users to hide their identities behind usernames and anonymous wallet numbers, Bitcoin often becomes the currency of choice for criminals for laundering, transferring, or stealing illicit funds (O'Leary 140).

Bitcoin is important in that it was the first application of blockchain, but there are so many more practical applications for blockchain beyond the realm of cryptocurrencies. Most scholars also believe that the future of blockchain is not in cryptocurrency but in fiat. Fiat is "currency issued by a government that is not matched by government holdings of gold or other securities," such as the US dollar ("Fiduciary Issue or Fiat Currency"). Blockchain specialist Christopher Modi of Ernst & Young (EY) stated that Bitcoin and other cryptocurrencies are not appropriate for business needs today because businesses today use fiat (Modi). Bitcoin is not perfect as humans will always find ways to manipulate a system like Bitcoin for crime. However, Bitcoin is one of the best current functions of blockchain and helps plainly display the most important qualities of blockchain.

Current Accounting Information Systems

Because blockchain is still being experimented with in the accounting profession, it is important to understand what systems are in use now as a comparison to blockchain. The two most common setups in larger companies today are databases and enterprise resource planning (ERP) systems. Databases are the most common "transaction recording and organizing applications" for companies in today's business environment. Distributed databases, which allow people across multiple networks to access shared data, are comparable to blockchain but still suffer from the conflicts of having multiple computers working on one item simultaneously. An ERP system is "prepackaged business software that provides an integrated solution for the organization's processing needs" (Dai and Vaserhelyi 8). ERPs are advantageous because they process transactions automatically in many cases and distribute the most timely and correct data to all members of the network (Dai and Vaserhelyi 9).

Blockchain itself is similar to a database that could serve as the accounting function with ERPs. It could also be used alongside preexisting accounting information systems. However, blockchain has a few advantages over an ERP. First, an ERP is traditionally organized in a centralized setup while blockchain distributes power in the network to all the approved nodes. This reduces the risk of a single point of failure and prevents overrides in the system by management. Second, blockchain is more effective at preventing cyber-attacks and unapproved data changes because it is an append-only system, meaning changes can only be added to the end of the blockchain. Additionally, ERP systems require much more human effort than blockchain does. Blockchain's design promotes operation with very little human interaction. Smart contracts especially allow for little intervention because accountants can set up different controls that will automatically execute throughout the system (Dai and Vaserhelyi 9).

The only downside of blockchain as opposed to ERP is that ERP contains accounting-specific modules that are not present in current blockchain systems (Dai and Vaserhelyi 9). Having accounting-specific modules that alleviate some of an accountant's daily, repetitive tasks will be key in incorporating blockchain into the accounting field. For this reason, scholars suggest that as blockchain is continually developed, innovators should incorporate ERP and blockchain technologies. By working the two systems together, it is possible that one day, blockchain may be able to fully take the place of current ERP systems (Dai and Vaserhelyi 9). However, there is a lot of development that needs to be completed before that point.

Current Blockchain Applications

Beyond Bitcoin and other cryptocurrencies, there are many companies across the globe that are currently creating and implementing new blockchain applications for the business world. These applications make it easier to see what blockchain can actually do and how it can potentially change business operations in the future. Many of these companies working with blockchain are large organizations in Asia, including Toyota, Samsung, multiple Chinese banks, and Asian insurance companies. In the United States, Bank of America is using blockchain in an attempt to automate the creation of credit letters. Wells Fargo is using the technology to track home mortgages. Apple has filed a patent for using blockchain to timestamp data. Other United States corporations applying the technology include Microsoft, Pfizer, Comcast, Intel Corporation, Amazon, and Walmart (Del Castillo).

One of the most common current applications of blockchain is for supply chain management. Companies across the globe are using blockchain technology in combination with the Internet of Things (IoT) to track the creation or transportation of products from start to finish, whether the product is grown in fields or manufactured in a facility. The IoT creates data about physical objects through a global network (Dai and Vaserhelyi 12). The IoT is a "near real-time collection, transmission, and analysis of data" that anyone from a large organization to an individual can provide in exchange for payment ("With Blockchain, What Comes First?"). Blockchain allows for secure collection and transmission of this sensitive data.

The IoT is important for supply chain applications of blockchain because it allows computers, vehicles, and other machines to send data to a network for business owners to see and the blockchain to record. Consumers can see where their product came from or where it

is located at any given point of time. For example, Ernst & Young (EY) created a network

for Italian winemakers. There is a widespread issue of counterfeit winemakers who try to sell

wine that they claim is Italian. By adding QR codes to the wine bottles, consumers can easily

scan and see where their wine came from, down to the plot of grapes in the winemaker's

field, because of the supply chain records of their blockchain (Modi).

Similarly, IBM helps consumer package goods (CPG) companies simplify their trade

promotion operations by tracking and recording each step in the supply chain with a

blockchain network ("Using Blockchain to Disrupt Trade Promotions"). Walmart is also

working with IBM to implement blockchain technologies with their leafy green suppliers.

They are working to use the technology to trace various types of lettuce products down to the

plot of land in which they were grown. This will help the company track down items and

locations where outbreaks such as salmonella or E.coli began. This will allow food outbreaks

to be solved in a matter of seconds whereas it used to take as long as a week. Blockchain is

expected to be implemented with all of these suppliers by September of 2019 (Smith).

Supply chain networks like that of Walmart are by far the most popular use of blockchain

outside of cryptocurrency right now, but many companies are working to create blockchain

networks for companies in other areas.

There are many corporations that are taking advantage of the growing popularity of

blockchain by becoming blockchain network creators and advisors. They will create a

blockchain network for any company that comes to them with a logistical issue to be

overcome with blockchain. In fact, many international accounting firms are taking the lead

on this, such as EY and Deloitte. EY in particular has implemented multiple successful

blockchain networks across the globe. EY has helped farmers in Australia manage their

assets more effectively through blockchain. By using the connection of the IoT, the network tracks information such as mileage, gas usage, and other statistics from farm equipment to help the farmers be more informed on the depreciation and efficiency of their assets (Modi). Tracking the performance of assets is highly important because it helps business owners understand if and how their assets are producing revenue for the company.

One of the current leaders in the creation of blockchain networks is IBM. IBM works with companies across the globe to create blockchain systems that will help businesses solve problems and improve efficiency. Their main goal with creating blockchains for companies is reducing the complexity of ordinary transactions through the blockchain by creating a shared ledger for all members of the network, approving transactions among all parties in the network, and removing the need for paper processes. Blockchain helps free up capital, lower transaction costs, speed up the transaction process times, and provide security and trust among users ("Blockchain 101").

In addition to their work on supply chain and trade promotion management, IBM has established frameworks for various different business environments such as government services, identity services, asset registration, and most notably World Wire. IBM Blockchain World Wire is what the company deems "the new global financial rail" ("World Wire Flyer"). World Wire allows people to remove several intermediaries, such as banks and governments, and their associated fees from global transactions. With only one exchange fee between major currencies, international payments can be settled in seconds and reduce cost and time while increasing efficiency and transparency. The people exchanging value can always see where their assets are and know the whereabouts of their money at all times. It is essentially a system for real-time clearing and settlement of international payments and

transactions ("World Wire Flyer"). This system can benefit all types of international

businesses especially as blockchain is continually improved and modified for different

business structures.

Literature Review

Taxes

With blockchain being such a new concept, there are not many scholars who have

deeply investigated the subject. However, there are many professionals who have studied the

potential changes that blockchain could bring to the accounting field. One area where

blockchain could be immensely helpful is with tax collection and tax accounting.

Professionals from one of the Big Four accounting firms, Deloitte, stated that there are many

different ways that blockchain could improve the collection of taxes. The first is payroll tax.

By using smart contracts in the blockchain to automate payroll processes, employers would

not need to act as intermediaries who are responsible for calculating tax and social security

payments from salaries. The employer would simply insert the gross amount of an

employee's salary in the system and the blockchain would send the appropriate tax to the

government and the net salary to the employee's bank account. Blockchain could also help

with transfer pricing and value added tax (VAT). Transfer pricing is an issue that arises in

global transactions where different laws and pricing may apply in different countries

(Frankowski et al. 11).

IBM is also creating solutions to the issue of transfer pricing with their IBM World

Wire Blockchain which creates a network that minimizes international transaction fees and

intermediaries ("World Wire Flyer"). VAT, which is more common in European countries,

could also be improved with blockchain. In the current system, the collection of VAT is very dependent on individual businesses themselves to calculate the correct amounts and submit it to tax authorities. Blockchain technology could automatically calculate and submit the correct payment to the government (Frankowski et al. 12).

In similar fashion, another Big Four firm, PricewaterhouseCoopers (PWC), gathered a panel of technology and accounting professionals in the United Kingdom to discuss potential impacts of blockchain. In regards to tax implications, the tax experts on the panel agreed that blockchain best suits transactional taxes such as VAT, withholding tax, stamp duties, and insurance premium tax. They also stated that blockchain could be highly beneficial in the prevention of accidental double taxation. Overall, the panelists agreed that the digitization of tax will come, possibly through blockchain or another method, as people are continually pursuing a more personalized, technological way to pay taxes ("How Blockchain Technology" 2-3). Scholars Jun Dai and Miklos A. Vaserhelyi also found in their research that tax regulations could be programmed into smart contracts to automate tax filings so that governmental agencies could receive continual updates (13).

However, PWC experts stated that creating brand new tax systems around blockchain is not realistic right now. Experimentation must start on a much smaller scale ("How Blockchain Technology" 4). Experts at Deloitte also agreed that blockchain is constantly developing but has not overcome important obstacles that are necessary to implement blockchain into the tax world. The greatest of these obstacles is that blockchain does not have any current applications for tax and introducing it to tax would require significant changes in "governmental databases and network systems" and legal regulations (Frankowski et al. 11). Overall, some scholars are more optimistic about blockchain's possibilities with tax than

others, but most agree that there are improvements to be made before blockchain becomes an established part of tax systems across the globe.

Auditing

Another area of accounting where scholars think blockchain will have some of its greatest impact is in auditing. Many publications suggest that blockchain has the potential to eliminate the need for a financial statement audit. If transactions are recorded in an immutable, completely secure network, does a CPA have any reason to audit? EY even suggests the possibility of a "plug-in, always-on audit" that by default constantly audits transactions in real time ("How Blockchain Will Revolutionize" 3). Deloitte also states that down the road, "fully automated audits may be reality" ("Blockchain Technology A Game-Changer?" 3).

The American Institute of Certified Public Accountants (AICPA) states in their report on blockchain's impact on assurance practices that recording transactions in a blockchain may not always provide enough evidence to completely understand the nature of the transaction. They believe auditors and their judgment will still be necessary, just in a new way adapted to the new technology ("Blockchain Technology and Its Potential Impact" 9-10). Similarly, authors Dai and Vaserhelyi also agree that the fundamentals of auditing could be changed by widespread use of blockchain, with one of the greatest benefits being the "increased audibility of information" (14). Auditing now does not provide real-time assurance because of the manual procedures and lack of tools to monitor large amounts of data. Posting transactions on the blockchain would allow for continuous verification of the technology and the transactions, making the auditing process very different (Dai and Vaserhelyi 14).

In contrast, scholars Coyne and McMickle of the University of Memphis are more skeptical of blockchain's benefits in recording transactions for an audit. First they argue that most companies will want to use a private blockchain, which is already very similar to a traditional transaction ledger. Public distribution of a blockchain is what makes it more ideal than a traditional system because of the increased security. They also state that current blockchain verification methods are sufficient for preventing double spending, a common issue in cryptocurrency systems, but are not sufficient for meeting current accounting standards. It is unclear whether blockchain would ultimately improve the reliability of numbers entered in the system. As a result, they write, "For example, a blockchain will not prevent asset misappropriation, nor will it prevent erroneous measurement or estimation of valid transactions" (Coyne and McMickle 109). Auditing would be just as necessary and very similar to what it is in a traditional setting. In his lecture at the Institute of Management Accountants (IMA) Student Leadership Conference, EY blockchain specialist Christopher Modi also stated that auditing will never become a fully automated process. There will always be a need for accountants and CPAs to verify the validity of transactions entered into a system and ensure that technology is working properly (Modi).

One last consideration with auditing is the potential for triple-entry accounting, a concept that has been discussed for years but is just now becoming a realistic possibility. Double-entry accounting is the standard right now and provides a decent amount of protection against human documentation error with two parties involved in a transaction. This reference to "double-entry" is different than what an accountant may traditionally think of as "double-entry." Traditionally, "double-entry" refers to the presence of a debit and a credit in a ledger. In reference to blockchain, a double-entry system refers to having two

parties recording a transaction in their own separate records. In the past, a triple-entry system brought in a third party as a neutral intermediary to record a third copy of a transaction entry. The potential now is that the third entry could be encoded into a blockchain network as validation that both involved parties have their entries correct as well (Dai and Vaserhelyi 10-11). Author Ken Tysiac also acknowledges the possibilities of a triple-entry ledger system through blockchain. Put simply, a system like blockchain "allows for the creation of a distributed, 'triple-entry' ledger that can automatically confirm and record transactions, virtually in real time, and is extremely difficult to change after the fact" ("How Blockchain Might Affect").

Financial Reporting

The third area where scholars believe blockchain will greatly impact accounting is in financial reporting. Financial reporting encapsulates elements of audit and tax in addition to other areas of the accounting profession. Chairman of the AICPA Kimberly Ellison-Taylor said the AICPA is currently exploring how blockchain can be used to support financial reporting ("Blockchain Considerations"). However, in the immediate future, the AICPA states that blockchain "will not replace financial reporting and financial statement auditing" ("Blockchain Technology and Its Potential Impact" 15). Deloitte remarks that blockchain advancements will help financial reporting in regards to complying with the regulations for accounting practices, proving the integrity of a file, and automating processes for reporting ("Blockchain Technology a Game-Changer?" 2). Along similar lines, EY states that the improvements that blockchain will ultimately bring about will release accountants from repetitive, time-consuming tasks in relation to financial reporting so that they can focus more on making strategic decisions in regards to what the data is reporting ("How Blockchain Will

Revolutionize" 4). Christopher Modi of EY also remarked that blockchain will improve financial reporting by increasing consistency. Blockchain provides a single version of the truth for all involved parties, which improves the consistency in financial reporting significantly (Modi).

However, not all scholars agree that blockchain is the solution to shortcomings in financial reporting today. After extensive research and examination of blockchain technology and the issues it is supposed to solve, Coyne and McMickle conclude that "the difference between digital asset management, including the negotiation of digital contracts, and financial reporting represents a chasm that the blockchain is not as well suited to bridge" (110). Generally, scholars' views on how blockchain will impact audit reflect their views of the impact on financial reporting. Overall, there are many different perspectives among scholars as to how great of an impact blockchain will have in the various areas of accounting, but most agree that there will be changes. Any new form of technology like this will alter the way that business is conducted.

Impact on Tax

Taxes are a part of everyday life for most people. Whether consumers are buying meals or shopping for clothes, they will pay sales tax. Anyone who has a yearly income must pay income taxes. The list of different taxes goes on and on. However, there is always a struggle to collect taxes that are not paid immediately with a purchase. As technology has advanced over the years, tax collectors and governments have worked on finding more efficient, personalized, and digitalized ways to collect taxes. Internet capabilities have certainly contributed to this, but there are still many issues in the system, some of which scholars believe blockchain can help solve.

As noted in the literature review, blockchain is thought to be best suited for transactional taxes like withholding tax, stamp duties, and insurance premium taxes ("How Blockchain Technology" 2). VAT is one transactional tax where blockchain could especially be of help. More common in Europe, a VAT is similar to a sales tax in the US. On the purchases of certain items, the consumer pays the VAT tax and the seller is responsible for reporting and sending the correct amount to the government. A blockchain-based system could automate the calculation and collection of VAT taxes so that it is not so reliant on the individual businesses themselves. In this setup, if a transaction requiring VAT is processed on the blockchain connected to the government, the correct amount would automatically be sent to the government (Frankowski et al. 12).

Another area of tax where blockchain could have a large impact is with payroll tax. Using smart contracts to calculate the correct amount of tax from a gross salary, an employer would no longer need to act as an intermediary in the calculation of tax amounts to send to the government. A blockchain-based system, like with VAT taxes, could automatically calculate, report, and send the correct amounts to the appropriate government institution. Payroll tax processes would therefore become faster, more efficient, and less costly (Frankowski et al. 11). Overall, blockchain technologies would make tax collection less burdensome for government workers and allow it to be collected at a lower cost.

Despite the perceived benefits of using blockchain in the tax system, there are many obstacles that prevent blockchain from being appropriate for the tax system right now. First, there is a significant lack of IT specialists who can properly implement blockchain in governments across the globe. Additionally, a blockchain network would have to be incorporated into current governmental databases and partnered with stores and organizations

in the country. This would not only be extremely complicated but also very costly. If specialists overcome these hurdles and blockchain becomes a facet in government networks, there will be a need to create legal regulations for blockchain systems. This would take time and experimentation to create, but it would be necessary to prevent potential manipulation and misappropriation of assets (Frankowski et al. 11). On top of all of this, most scholars agree that blockchain will not be the one solution to all issues in the tax system, and there is no evidence that a setup like this would be successful. In order for blockchain to change and become appropriate, experimentation with blockchain and government must start small before implementing it in a whole system ("How Blockchain Technology" 1-4). Also, there must be more experts who understand blockchain before the government implements it into a field that impacts almost everyone in a nation.

Overall, blockchain will not become a regular part of the tax collection process in the near future. There is great potential that blockchain will improve and benefit tax systems by speeding up collection and ensuring the validity of tax amounts, but it will take a while for it to become widespread enough to provide these benefits. As always, some people will want to do things the old way, which will also slow down the adaptation of blockchain. It will be very costly to implement blockchain across nations and the question remains if this technology will provide enough benefits to outweigh these significant costs of implementation. It will not be a perfect solution like some may suggest, but with further research, experimentation, and modification, blockchain could eventually provide some benefit to the accounting field in the area of tax.

Impact on Audit

Audit is another area that blockchain has great potential to change within the accounting profession. Auditing is defined by the American Accounting Association (AAA) as follows: "Auditing is a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between the assertions and established criteria and communicating the results to interested users" (Louwers et al. 5). There are differing views across the board on how blockchain could impact the complex field of auditing. Some specialists suggest the concept of a continuous or fully-automated audit that checks the validity of transactions in real time. This would come as a built-in part of a blockchain system through smart contracts and transaction capabilities. The argument here is that if blockchain systems are immutable and secure, the audit can be constantly monitored by the blockchain instead of a third-party auditor.

Other professionals believe that blockchain will be beneficial to auditing because it will make obtaining information quicker and keeping records secure much easier. However, auditors will still be necessary because a blockchain will not show all of the information necessary to complete an audit and give an opinion. Because there is a new form of technology to adapt to, the audit will certainly change ("Blockchain Technology and Its Potential Impact" 10-11). Along these lines, scholars Dai and Vaserhelyi argue that the fundamentals of auditing will change, but there will still be a need for auditors. However, there will be many benefits, such as information being easier to audit. Additionally, smart controls in the blockchain will provide constant monitoring of large amounts of transactional data that auditors may not have the time to always go through. This would allow for

continuous verification of the functionality of the blockchain systems (Dai and Vaserhelyi 13-14).

However, there are some that believe that blockchain will not ultimately have a positive enough impact on the audit to be beneficial. Coyne and McMickle state that companies will most likely use a private blockchain to protect sensitive information from a public setup of blockchain. A private setup is almost the same as a traditional transaction ledger. There is also the potential that numbers could be entered into the blockchain incorrectly from the start. Overall, they argue that blockchain verification methods are not sufficient for meeting today's accounting standards, and it is uncertain whether it would improve the reliability of data in the system. Ultimately, they argue that accounting systems and auditing methods will most likely stay the same as they always have (Coyne and McMickle 109).

Despite the many different views of the impact blockchain will have in the field, blockchain is not ready to be incorporated into auditing yet. It is more realistic that blockchain could be applied to auditing than to tax in the near future. Auditing one company's financial records on a blockchain is more realistic than collecting taxes for an entire government system, but there are still issues to be overcome before blockchain-based auditing becomes commonplace. First, as with tax systems, there is a great need for further experimentation and research to incorporate blockchain into current auditing systems, as well as experts who understand how to implement the technology. It is possible that CPAs and auditors themselves could become the ones to oversee blockchain implementation in accounting settings. Also, some of the benefits of a public blockchain must be incorporated

into a privatized setup before blockchain can be secure and cost efficient enough to be used in auditing.

Overall, auditing will never be a fully automated process. There will always be a need for auditors to oversee the process and offer an official opinion. As with implementing tax into government systems, it will be costly, but blockchain has the potential to be more cost efficient within a single company's audit rather than a whole nation's tax system. When companies start using blockchain to record their daily transactions, audit will fundamentally change because of how information is obtained and checked. But the process could become much quicker for auditors because large amounts of transactional data will be available all in one place.

Impact on Financial Reporting

Financial reporting is one of the most important aspects of the accounting profession. Revenues, expenses, assets, liabilities, equity, income, and more all come together on financial statements to inform stakeholders in a company how the business performed financially during the year. Blockchain could have a great impact on financial reporting depending on how the technology advances over the coming years. Like the audit field, there are many different opinions on how financial reporting will change with blockchain. However, with blockchain growing in popularity like it is, most scholars agree that it will impact financial reporting one way or another. With blockchain's distributed and immutable ledger of transactions, the network creates a single version of the truth for all parties with access to the blockchain to see (Modi). This could make it quicker and easier to produce accurate financial statements for stakeholders to see. Additionally, if some aspects of public blockchain networks were incorporated into private blockchains, it could eventually be

possible for all involved parties to see financial statements the moment they are ready. There

is even the possibility that one day financial statements could be produced solely by the

blockchain as a Decentralized Autonomous Organization/Corporation (DAO/DAC). A

DAO/DAC is a company that operates solely on the smart contracts of a blockchain network.

It is a self-organized company that is run strictly by decentralized controls on the blockchain

(Dai and Vaserhelyi 7-8). This may be a stretch for the near future, but the potential is

present. Blockchain would also bring about significant back office savings in regards to

financial reporting, but there is not significant research on how much money will be saved

compared to how much it will cost to implement. Pricing would vary by company.

All of these benefits make it seem like blockchain should be implemented

immediately. However, the technology is not ready for financial reporting functions yet for a

few reasons. There is still a lot of uncertainty as to whether blockchain will increase the

reliability of numbers entered into the system. Consensus mechanisms must be changed to fit

the needs of accounting ledgers and reporting standards better. Financial reporting is

dependent on having fairly-stated numbers; therefore, blockchain must be trustworthy in

producing accurate information before it is used for financial reporting. Some scholars also

believe that blockchain may not be the best option for helping solve the issues of financial

reporting. As mentioned earlier, scholars Coyne and McMickle found through their research

that blockchain is not the best option to bridge the gap between digital asset management and

financial reporting (110). However, they also state that further research is necessary to

conclude how to overcome the hurdles holding blockchain back from being ready for the

accounting field. They also suggest trying to use further research to change current

accounting ledgers and standards instead of trying to change blockchain (Coyne and McMickle 111).

Overall, it is evident that blockchain will one day impact financial reporting processes for the better. It seems that this could be the first area where blockchain takes off in accounting. It would be easier to start small with financial reporting as it could involve only stakeholders in a company on the blockchain. It will be easier to implement in an individual company as opposed to an entire government or entire auditing system. Incorporating blockchain into financial reporting will also impact audit because the two fields are closely related.

Conclusion

In the end, blockchain technology has the potential to be very beneficial for the accounting field but is not ready at this point in time to be practical for most companies. Single companies will not benefit from the implementation of blockchain as much as enterprises and business ecosystems will benefit due to their need for a single version of the truth that blockchain provides. However, as blockchain continually evolves, there is great potential that it could become as widespread as the internet is in today's world. Blockchain could significantly change accounting in the fields of tax, auditing, and financial reporting. While no process will ever be completely automated, blockchain can take some of the repetitive tasks out of an accountants' daily work.

Despite the many benefits of implementing blockchain into accounting systems, there are many hurdles that professionals must overcome before this becomes a reality. The first concern is confidentiality and the benefits of a private versus a public blockchain. A public

blockchain is not ideal for companies that do not want to release their financial information to the public, but the private blockchain setup does not offer all of the benefits of a public blockchain. So the question remains if a private blockchain will be more beneficial than a traditional accounting ledger. Another concern is insufficient transaction verification. At this point in time, blockchain verification methods are inadequate for validating transactions from the accounting perspective. Current verification methods are primarily used to prevent double spending generally for cryptocurrencies but are not sufficient to validate transactions in a company (Coyne and McMickle 108). This also raises the question of whether numbers entered into the blockchain will be correct. There is nothing at this point in time besides sub-par consensus mechanisms to prevent someone from accidentally or intentionally entering incorrect values (Coyne and McMickle 110). Another related concern is security. Because blockchain is not widely used at this point, there are many questions about how immutable and secure the ledger really is. Hashing makes it difficult to change past transactions, but the question remains if the system is better protected against hacking than a regular ledger.

Another issue is the amount of electricity required to operate a blockchain and its verification software. With Bitcoin specifically, the amount of energy required to validate all of its transactions in 2016 equaled the entire electricity usage of Ireland in 2016. There is a need for "less computationally-intensive alternatives for reaching a secure consensus" ("Blockchain"). Creating legal regulations to fit the software is another necessary step to take, as is the use of cryptocurrency or fiat. As Christopher Modi remarked, the future of blockchain transactions does not lie in cryptocurrency but in fiat currency, as cryptocurrency is impractical for organizations right now (Modi). Using a completely new type of currency that is only available online would significantly change how businesses operate. This is a

change that the business world will most likely not enact. Therefore, blockchain must be adapted to use fiat currencies to become more practical.

Overall, the greatest hurdle of implementing blockchain is the major disruption it will cause. Like the internet, it will cause a major shift in how businesses operate. It is unclear how rapidly or when this disruption will occur, but as the technology is constantly changing and improving, adoption rates are growing, largely in the supply chain sector. A major disruption is in the making, and companies across the globe need to learn about the technology and be ready to adapt their business to blockchain.

In light of this impending disruption, further research on blockchain and its relation to current accounting ledger systems is extremely important. One of the largest areas of research is with different consensus mechanisms, as PoW and PoS are not sufficient for accounting standards. Authors Coyne and McMickle stated that it is important to research "how to bring the assurance and consensus mechanisms of a public blockchain to a private blockchain in order to achieve cost savings for the firm and assurance for investors" (110). Additionally, they suggest that some areas may be found in current accounting ledgers which are incompatible with blockchain, so some research should be conducted on how to change current systems to work better with blockchain (Coyne and McMickle 110). Other areas of research may include the cost benefit ratio of implementing blockchain into government systems for tax purposes and how it will save on back office costs for governments and other organizations. There are also environmental concerns regarding electricity usage and legal concerns regarding regulations to address in further study. Additionally, research must be done on how to educate the public and business professionals on the details of blockchain and how willing the public will be to adapt to this new form of technology. There is a great

lack of blockchain experts and overall awareness which will be necessary in moving forward with this technology.

The most important action that business professionals can take is to educate themselves. They must stay aware of current events related to blockchain and study how their businesses will be impacted. CPAs especially need to educate themselves about blockchain, because if they do, they will be one of the more important moderators in the implementation and regulation of the technology. Widespread implementation of blockchain will create new roles for accountants and CPAs especially. CPAs have an important role in accounting functions today and that will not change. But their responsibilities will as people will turn to them with questions about their company's blockchain systems. Some of these new responsibilities could be an auditor of smart contracts, a service auditor of blockchains, an access-granting administrator, or even an arbitrator to settle disputes among participants in a private blockchain ("Blockchain Technology and Its Potential Impact" 11-3). As research and experimentation on blockchain continues, the need for accountants will never disappear. But accountants must stay up-to-date on and learn about blockchain as it will definitely change how they audit, collect taxes, record transactions, and produce financial statements, among many other responsibilities.

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