2018

Understanding the Implication of Blockchain Technology on the Audit Profession

Brittany Jackson
University of Central Florida

UNDERSTANDING THE IMPLICATION OF BLOCKCHAIN TECHNOLOGY ON THE AUDIT PROFESSION

by

BRITTANY JACKSON

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major in Accounting
in the College of Business Administrations
and in The Burnett Honors College
at the University of Central Florida
Orlando, Florida

Fall Term, 2018

Thesis Chair: Jeffrey Reinking, Ph.D

ABSTRACT

The purpose of this research is to identify the implications of blockchain technology on the auditing profession. By conducting interviews with current professionals in the auditing profession, as well as those in academic with a background in auditing, primary data was collected to aggregate what potential effects will be on the auditing profession in the next five years and the next decade. The data includes assumptions of how the accounting major itself, the auditing planning phase, assumptions of risk, and audit completions will change with the developing technology. The goal of this research is a better understanding of how auditing will be affected by blockchain technology for students, current audit professionals, and those in academia. With the results, it was concluded that training of new and current employees will need to evolve with more emphasis on IT skills and analytical reasoning, blockchain's development is on a precipice of adoption within the next decade, and that there is a current gap regarding regulation of blockchain technology.

ACKNOWLEDGEMENTS

I would like to give the greatest thanks to my thesis chair, Jeff Reinking, for his help during the past year in putting this work together. Additionally, I would like to thank for committee members, Greg Trompeter and Steven Hornik, for their valuable input and continued dedication to the students in the Dixon School of Accounting. I would also like to extend thanks to Kennedy Harkins and Jordan Doman for their support during this process, as we all worked at some point to complete theses together.

TABLE OF CONTENTS

INTRODUCTION

Technology is well-known to be a speeding bullet train that continues to only grow more advanced. Accounting as a profession has slowly merged its practices to keep up with the rapidly growing technology, both creating and eliminating tasks with developed supplemental software. The development of blockchain, specifically, has the potential for huge leaps in advancement concerning accounting, especially as accounting is still described as being in digital infancy compared to other professions (Blockchain Technology: A Game-Changer in Accounting?).

A general ledger is the base way of recording transactions for a given business, and blockchain developed from that idea. Blockchains can best be described as "digital sequences of numbers coded into computer software that permit the secure exchange, recording, and broadcasting of transactions between individual users" (Campbell-Veryduyn). Transactions typically involve an intermediary, i.e. a bank or organization, and requires verification at different points to ensure accuracy. Blockchain's internet-based foundation eliminates the need for an intermediary and provides an added level of privacy for users. As Campbell-Veryduyn notes, these transactions are periodically bundled into blocks; these are linked together in chains, making up the entirety of blockchain (Bitcoin and beyond: Cryptocurrencies, Blockchains, and Global Governance). The implication of this, is that blockchain provides for a more secure and enhanced ledger for transactions to be recorded in, which in turn creates a unique opportunity for those in auditing to utilize such a technology in their work. A breach in the security of this system is virtually impossible, namely because all entries are distributed and cryptographically sealed (Blockchain Technology: A Game-Changer in Accounting?).

Blockchain's development can best be likened to the development of double-entry bookkeeping, which revolutionized the industry by creating a dependable, accurate system for recording transactions. Not only did that establish a better foundation for accounting to grow

upon; it created an avenue for the audit profession to prosper.

The purpose of this research is to evaluate the implications blockchain will have on accounting, specifically in the auditing process. The primary focus within that will be on the profession, with individual auditors being interviewed to collect data. As defined above, the peer-to-peer transactions on an internet database create an almost immediate audit of itself, with verification being done in real-time. The goal will be to identify specific outcomes that are likely to occur in the future, on both a five-year basis and a ten-year basis. The growth of this new technology creates many questions, with answers coming from a variety of different industries. Given that this research demonstrates significant, probable changes, further research will be conducted to analyze what form these changes will take, as well as their long-term impact.

The research conducted will be qualitative in nature, primarily through the use of interviews of professionals in the audit field, individuals from academia, and others with relevant knowledge. First, I will provide an in-depth background of blockchain's development, and its related concepts, such as Bitcoin. This background will provide both the reader and the thesis a foundation for the conclusion and will focus heavily on the accounting side of the technology. Additionally, a literature review will be conducted to understand analyze the current findings in this relatively new technology and use that to help interpret the results at the conclusion of the research.

Following that, a methodology will be provided to show the planned research method in more detail. Upon registration and approval from the Institutional Review Board, a series of questions will be utilized to record primary data through interviews. These questions are outlined through the methodology and will aim to best understand the current environment surrounding blockchain, known implications of the technology, and first-hand predictions based in experience

of where blockchain will carry the profession. Additionally, it will help provide an understanding of the general knowledge of the technology in the auditing profession and in academia, to fully interpret the results. A hypothesized summary of what the results will be is included, to provide a basis of comparison following analysis of the interviews.

Once the interviews are complete, the data will be recorded, transcribed, and analyzed into hard data that can be read and understood. This data will also provide the basis for the conclusion of the thesis, as well as where the research question could be extended. A conclusion will be provided with the backed results, wherein I will provide interpretations and informed predictions of the research.

The importance of this research is to outline potential impacts of blockchain on the auditing profession by contributing relevant primary data in a scope that can be used by existing auditors in the profession in learning about its usage. It will contribute to the discipline by supplementing the limited information available. This research will help fill that hole by hopefully providing those specifics for auditors to learn and grow from.

LITERATURE REVIEW

Brief History of Cryptocurrency and Blockchain

Blockchain developed as a technology following the initialization of virtual currencies, defined as "a digital representation of value that is neither issued by a central bank or public authority nor necessarily attached to a conventional currency but is used by natural or legal persons as a means of exchange and can be transferred, stored, or traded electronically" (Kancs, Ciaian, and Miroslava). Of these virtual currencies, perhaps the most well-known is Bitcoin, the first open-source virtual currency that utilizes an algorithm to store data and verify transactions (Institute for Prospective Technological Studies). Introduced with Bitcoin in late 2008, blockchain has become the basis for over a thousand different cryptocurrencies (Iansiti and Lakhani). The technology itself progressed, even as the high price volatility and risk associated with cryptocurrencies such as Bitcoin fluctuated (Institute for Prospective Technological Studies). While cryptocurrency adoption is a different avenue altogether, the implications of adopting blockchain technology are huge, especially with providing "visibility into transactions" (Taylor). As cryptocurrency and blockchain are still relatively new, literature revolving around the topic, while plenty, is varied. This highlights the many different facets of blockchain technology, with one of the most notable being where "transferring value or assets between parties is currently cumbersome, expensive and requires one or more centralized organization" (Bible, William, et al).

Brief History of Auditing

Auditing is "accumulation and evaluation of evidence about information to determine and report on the degree of correspondence between the information and established criteria (Arens, Beasley and Elder). The evidence noted in the definition includes financial statements prepared

by management, data relating to transactions, auditor observations, and client testimony. One unexpected fact that came up in this research was that widespread adoption of auditing methods was that the implementation of railroads were major catalysts in the development of the accounting profession in the United States, with their efforts to report and controls costs, production, and operating ratios. The need for fraud detection and financial accountability, and reliability of financial reports for investors prompted the expansion of the use of auditing mechanisms. After 1929, the year the stock market crash and kickstarted the Great Depression, auditing became a requirement in the United States. This was first seen by the installment of the Securities and Exchange Act of 1934, which created the Securities and Exchange Commission (SEC). The SEC was the first authority over accounting standards and the oversight for audit functions (Byrnes, Al-Awadhi, Gullvist).

Over the next century, multiple changes and updates were made to the environment of accounting, most notably the Sarbanes-Oxley Act in 2002 and the development of other oversight boards, such as the Public Company Accounting Oversight Board (PCAOB) that regulates audits of public companies and the Accounting Standards Board that regulates audits of non-public companies. As moves were made to further regulate companies, and ensure more accurate and reliable information, an entire profession has arisen to meet these needs. Blockchain technology creates a possible new evolution of this, with the implications of it being explored in this research.

Explanation of Current state of Auditing and its process that is used

Upon the signing of an engagement letter between management and the auditor, audit engagement will begin with a risk assessment and the development of the audit program that covers the scopes and goals of the audit. Auditors than work to collect and analyze audit

evidence through different methods, including observation, reperformance, and analytical procedures. They will also work to establish what the level of internal control exists within the client, and how well these controls work. At the end of the audit, the auditors will issue an opinion, either stating they affirm the reports, deny the accuracy, or found it inconclusive (Byrnes, Al-Awadhi, Gullvist). This serves as a brief overview of the audit process, and now an in-depth discussion mainly because the focus of this paper is on the implications of blockchain on the profession-level, and not the process-level.

With the onset of technology and its rapid development over the past few decades, the time and scope of audits has significantly been impacted. When taken into consideration the amount of work it takes to collect evidence and rifle through each paper, the development of technology itself has streamlined the process. As this AICPA whitepaper states, "in the current business realm, transactions are often entered and aggregated such that they can provide near immediate feedback to relevant stakeholders." Additionally, they state that "an enterprise that moves toward greater automation relative to data, processes, controls, and monitoring tools begins to naturally structure itself for the coming of the future audit (Byrnes, Al-Awadhi, Gullvist). The paper does not explicitly state what the future audit is, but posits educated guesses based on the current state of auditing. Additionally, it concludes one section with "the need for a 24/7 auditing protocol becomes apparent if firms intend to compete for scarce resources and ultimately succeed in the current and evolving real-time global economy" (Byrnes, Al-Awadhi, Gullvist). This is a specific hole that was noted, and blockchain technology can fill exactly was is described. It is the belief of the researcher that blockchain technology is exactly what was meant by future audit, even if at the time of the paper it was not prominent.

Development of Blockchain technology in the last decade

Decentralization is an aspect of blockchain technology that makes it so attractive, and the progression towards decentralization eliminates a need for an intermediary. As the whitepaper, "Blockchain Technology and Its Potential Impact on the Audit and Assurance Profession", describes, "a blockchain allows parties to transact directly with each other through a single distributed ledger, thus eliminating one of the needs for centralized transaction processors" (Bible, William, et al.). Blockchain has grown to take on two main different forms: permissionless, or public blockchain, and permissioned, or private blockchain (Bible, William, et al.). These can be differentiated by who can access the specified network. Where public blockchain is just as it sounds, open to sharing with anyone on the internet, private blockchain is only shared with certain participants (Bible, William, et al.). An example of a public blockchain is Bitcoin, which takes advantage of the decentralized system, complete lack of intermediaries, and distributed ledger (Bible, William, et al.). While public blockchain hosts these benefits, it also has future limitations in terms of outgrowing the current state of technology, as well as the risk of information being revealed due to the public nature. Blockchain's development therefore has begun to move towards privatization, in order to eliminate the size limitations and protect private information from being released.

Further development has seen the rise of the smart contract, which is an automated payment and the transfer of currency or other assets as negotiated terms are met (Iansiti and Lakhani). This can, as the AICPA notes, speed up business processes, reduce operational error, and improve cost efficiency (Kancs). This elimination of errors presents an opportunity for increased validation and assurance in a term transaction. While still in the time prior to mass adoption, there are existing examples of smart contracts being utilized, such as with venture funding, banking, and digital rights management (Iansiti and Lakhani).

Over the last decade, blockchain technology has continued to grow and gained increasing usage. However, like the implementation of the internet, the timeline for widespread use of the technology, especially smart contracts, is still murky. This is due to the limitations of current technology, and the issues with public blockchains that must be addressed. By understanding blockchains existing form, an understanding of how much it will have to grow can be achieved.

Current state of auditing in relation to double entry bookkeeping

Accounting currently functions on a double-entry bookkeeping system, meaning that when a transaction occurs, it's considered in its entirety. This gave way for the auditing profession to verify transactions against a general ledger of debits and credits (Taylor). This takes the form in manual, labor-intensive tasks to verify checks and balances, systematic duplication of efforts, extensive documentations, and periodical controls" (Blockchain Technology: A Game-Changer in Accounting?). Accounting has built on this foundation, and blockchain technology brings in a new factor that could shift the very foundation at its core through triple-entry bookkeeping. As Deloitte outlines, "a blockchain allows parties to transact directly with each other through a single distributed ledger, thus eliminating one of the needs for centralized transaction processors (Blockchain Technology: A Game-Changer in Accounting?). The elimination of an intermediary and the immediacy of the transaction inhabiting the ledger open an opportunity for further development of triple-entry bookkeeping. While not a new concept, triple-entry bookkeeping would depend on a secure, enhanced system to manifest the transaction and keep reliable records. Blockchain provides this, as "all entries are distributed and cryptographically sealed, falsifying or destroying them to conceal activity is practically impossible" (Blockchain Technology: A Game-Changer in Accounting?).

While there is no literal "third" entry, there is an immediate receipt that acts as both proof of the transaction and an "entry" in the consolidated digital ledger. Outlined by the AICPA, this process is conducted using a mechanism known as a consensus algorithm wherein upon acceptance of a transaction by the network, all existing copies of the ledger are updated with the new information (Bible, William, et al.). Multiples of these are combined into a block, and as they are linked "in the distributed identical copies", chains with immutable data are formed (Bible, William, et al.). As introduced earlier, this provides an extremely secure evolution of the accounting system. Research will further pinpoint just how this evolution will take shape in the coming years, especially as blockchain technology continues to develop.

Blockchain implication for the audit profession

Synonymous with the development of the internet, blockchain technology has many different predictors in regard to the effect it will have on accounting, specifically the audit profession. The Journal of Accountancy summarized the potential effect as blockchain being able to allow CPAs to "streamline the audit process" (Tysiac). The article points out potential new roles CPAs might adopt as the profession evolves, including as an auditor of smart contracts, a service auditor of consortium blockchains, access-granting administrator, and an arbitrator of potential blockchain disputes (Tysiac). Deloitte simplified a timeline of blockchain integration with accounting, stating that "it can be gradually integrated with typical account procedures: starting from securing the integrity of records, to completely traceable audit trails. At the end of the road, fully automated audits may be reality" (Blockchain Technology: A Game-Changer in Accounting?). While the literature has a consensus on this outcome, the timeline varies. Ultimately, "true blockchain-led transformation of business is still many years away"

(Iansiti and Lakhani). The development of the internet took over thirty years and is still experiencing new avenues of growth with each passing year.

Auditing may one day be completely automated, but the profession has the unique opportunity of being able to grow with the technology. By undertaking it in all of its entirety, an understanding of blockchain will provide new roles that may not even exist yet. Administrators of the system will still need to be existent, and while a transaction or transfer may be recorded on the blockchain, "the auditor may or may not be able to determine the product that was delivered by solely evaluation information from that blockchain" (Bible, William, et al). The AICPA also concludes that while these changes may occur, "auditors will still have to apply professional judgment when analyzing accounting estimates and other judgments made by management in the preparation of the financial statements (Bible, William, et al).

Final Analysis of readings as a whole

The literature selected and reviewed provided a general overview of blockchain and its immediate relevancies with the research question. While limited research has been conducted due to the uncertain nature of the technology and difficulty to predict the future, there seems to be a general consensus of thought regarding blockchain technology and auditing. It is being encouraged for CPAs to learn the basics of the technology and keep up-to-date with the emerging growth. As Tysiac notes, the AICPA "urges members of the profession to learn more about the technology and consider the skills they will need to meet market demands as blockchain use increases". The seeming inevitably of blockchain paints a changing future for auditors, but also demonstrates the evolution of technology. Further research, as detailed in the methodology, will provide first-hand insight into whether the accounting community believes blockchain technology to be impactful, and in what ways this will take form.

HYPOTHESIS BASED FROM READINGS

The literature prompted me to consider the big picture in terms of blockchain technology, despite my specified focus in the audit profession of accounting. Blockchain is still relatively new and developing continuously every day. The literature consistently lists examples of prior technological changes, the importance of developing a firm understanding of blockchain, and how auditing will evolve in the coming decade. This has led me to develop the hypothesis that blockchain technology will have a significant impact on auditing, specifically in the way transactions are performed, the audit process is carried out, and the training of new, current, and future professionals in the audit career.

METHODOLOGY

The methodology planned during this research is namely face-to-face interviews conducted with pre-established questions to best obtain the necessary quantitative data. Through the course of my research, I conducted two interviews. A vetting process was utilized so that those with little to no knowledge blockchain would be excluded from the study. These vetting questions are available in Appendix E. These provided valuable insight regardless of the limitations presented by the timing of the study. Additionally, finding participants that had both the audit experience as well as the working knowledge of blockchain was difficult, especially given the new nature of the technology. The interview questions prepared were semi-structured, open-ended to pinpoint relevant answers, and best receive pertinent data. Additionally, the questions are modeled from my variables of interest, which include process tools, audit implications, auditor knowledge, and blockchain dependency. In Addendum 1, the specific proposed questions, and guiding probes or follow-up questions are listed for further reference. The questions will be used to ascertain what knowledge of blockchain exists, relevancy of blockchain to the audit profession, the implications of blockchain in the future, and to pinpoint relevant answers to develop a strong conclusion to the proposed research questions.

The questions serve to highlight common insights, as well as a consensus of how blockchain technology will affect the future of the auditing profession. I expect the consensus to be that while it will affect it, the timeline is quite longer than current readings are pinpointing. Like the development of the internet, blockchain technology still has room to grow and develop before it reaches the level of assured trust that lies in the current system of accounting. I expect a range of responses, from little knowledge regarding blockchain to answers that resemble an in-depth analysis.

My hypothesis from this methodology is that blockchain technology will have a

significant impact on the future of accounting, specifically with auditing. I believe those in the career field and those with auditing as their field of study will identify the different routes this change will take, as well as the implications of these changes it will have on the profession as a whole. The interviews were compiled to present topical data that can be easily interpreted for results, as well as provide the foundation for my conclusion.

INTERVIEW INTRODUCTION

The interviews conducted went smoothly and provided highly relevant information to the conclusion of this paper. There were twelve questions asked, each with a probe or follow-up attached in case further information was needed. The two participants had varying backgrounds but filled in the holes the other didn't necessarily know. To fully encompass the data obtained, I will analyze the answers by question, rather than by participant. The interview questions can be found in Appendix A for further reference. Each section will describe the purpose of the question, the most relevant responses from each participant, and an analysis of the responses provided. Appendix B provides the pre-screening questions used to vet the participants. Each interview analysis section will be referencing these transcriptions and summarizing where needed. Appendix C shows the approval from the Institutional Review Board for conducting research with human subjects. The interview analyses are broken up to create a flow between each question response and utilize the section to fully focus on a single analysis. The conclusion will summarize the overall analysis, as well as provide an answer to the thesis hypothesis.

INTERVIEW ANALYSIS – QUESTION 1

The purpose of the first question was to have a general understanding of the background of the participant. This background would be used to understand the thought process behind the answers given, and to open the air for the more in-depth questions later in the interview. The follow-up question was also used to possibly connect a pattern to past technologies, experiences, or projects that could have relevance to the topic. The responses from the participants were varied, as they had different backgrounds, but both had intensive experience with accounting.

Participant 1 was more experienced with the information technology side of accounting and had experience with supporting accounting and making sure they had the firm had correct technology. This provided a better basis to answer the remaining twelve questions. Participant 2 has been in accounting for over two decades and has spent the most time with a public accounting firm, not to be identified. As such, the probing question was not asked to Participant 1. Participant 2 was asked the probing question, as a way to further distinguish their response to the first interview question. They described the most surprising part of their career as being the extent of fraud that goes on. Specifically, they referred to who the people are committing the fraud as the most surprising. This is most likely because fraud is often committed by those high-up in organizations, who have been around the company for several years, and have access to areas where internal controls should be in place. As the ACFE notes, "high-level perpetrators cause the greatest damage to their organizations…Executive-level frauds also took much longer to detect" (Who Is Most Likely to Commit Fraud at Your Company?).

This supports the need for a more secure way of tracing transactions and detecting fraud, which seems to be provided by blockchain technology.

INTERVIEW ANALYSIS – QUESTION 2

The second interview question served to ascertain the knowledge the participant had of blockchain currently, and what their current opinion regarding it was. The follow-up question was made to determine the participant's opinion on blockchain technology, upon which the response could be used to determine the level of bias in the remaining interview questions. Due to Participant 1's technical background, they held a better understanding of what blockchain technology was, and a more in-depth understanding of it as a whole. Participant 1 described blockchain technology as "a centralized ledger with distribution, making it so everything can be verified. It's a better and cheaper way to store information, and better for areas with no established financial system". This aligns with my understanding of blockchain technology, and the previous definitions provided in the literature review. The belief of Participant 1 is that blockchain technology will help make accounting more secure in the long-run. They cited Bitcoin as an example, stating

> "Look at what Bitcoin was; no one took it seriously, but now there's a cryptocurrency asset management. We've started accepting bitcoin as payment, something way more relevant than expected. Seeing it now at enterprise-level shows how much it is growing."

Bitcoin is known to use blockchain technology in order to function and is the first example usually given when describing what blockchain is. This proves positive to the evaluation of this research, as it was noted briefly in the literature review. Participant 1 likening the development of Bitcoin to blockchain supports the continued relevance of blockchain because of how the two are linked, and the background the participant has to uphold their answers. They were not asked the follow-up question as it was established well in their answer that the participant considered it relevant.

Participant 2 had a less technical background, but still knew of blockchain and the surface-level definition of what it is. They described it as a "series of complex calculations that lead to certain results, very computer-based", but weren't sure how it would impact accounting specifically. They noted, however, that many public accounting firms, especially the "Big 4", were exploring the implications as well. This is also shown by the references utilized in the literature review, as both Deloitte and Ernst & Young were used as sources. The follow-up question was asked to determine further relevancy and provided a more in-depth look into Participant 2. They believe it to be relevant, as any development is relevant, and that any change will start with the larger firms, then the mid-size firms, and finally the smaller, regional firms. Their answers were insightful due to Participant 2's experience with audit and showcased the sleeping giant of research that public accounting is.

The responses of the participants support the relevancy of blockchain technology to accounting, specifically audit as this research focuses on. In order to best understand the implications of blockchain technology wholly on the audit profession, it is important to determine if there is any causal relationship that exists between the two. The responses from the participants showcase this and help further solidify the basis for the following questions.

INTERVIEW ANALYSIS – QUESTION 3

The third question aims to pinpoint the security of blockchain in terms of transaction verification, and how it would affect interactions with audits. A probe was added to further investigate why the question of security is relevant to auditing in the first place. Participant 2 opted to skip this question, as they were not sure of the security of blockchain. Participant 1 gave a more forthright answer, lining up information with what was found in the literature review. When asked about how secure they thought blockchain was when verifying transactions, they responded,

> "What I like about blockchain is that everything is transparent, and information is secured with encryption, which makes it more secure. You can see what is going on in real time, and not just taking it at face value. It allows it to be more transparent."

This response provided an interesting description of how blockchain protects information, and the secure aspect of it. Additionally, the transparency is a word that also describes what consumers want out of companies, especially with their financial reporting. The transparency of blockchain allows for it to traceable to every degree, and preventative of fraud in a way that any potential fraud would be detected almost immediately because of the chain-structure that makes up blockchain. Companies could allow consumers to view their transactions to provide assurance to the validity of their financial statements, with auditors validating this. Participant 2 supported this by stating that, "decryption would be next to impossible…the difficulty is insane. Since everything is connected, one block changed would change the whole chain. We would immediately tell that something is wrong. It would be one versus one million saying that the information is inaccurate".

In short, blockchain is extremely secure, and even if someone managed to break through the encryption, it would be immediately detected. This is quite different from the current state of auditing, as most fraud goes undetected for long amounts of time due to weak internal controls,

availability or access, or hidden nature of the fraud. The answer Participant 1 provided was sufficient, so the probe was not asked.

INTERVIEW ANALYSIS – QUESTION 4

The purpose of this question was to ascertain the effect of blockchain technology on a career in auditing, if the participant believed there was one. The follow-up was used to identify any other specific occurrences that were similar to the position that blockchain is in today, i.e. developmental stages. Participant 1 utilized their IT background to answer this question, noted in the technical way they thought blockchain would affect accounting, or more specifically, auditing. They prefaced their answer with a story of a partner they'd been speaking to a few years ago about Bitcoin. The partner didn't take it seriously and had said that it was going to bust and get shut down by the government. They were proven wrong based on where Bitcoin is now. In relation to the career aspect of the question, they answered,

> "An accountant who joined four years ago never through they'd deal with cryptocurrency, and it creates a whole new sector. How to report taxes, and probably more inner workings. It's definitely something to take into consideration. What it can do to transactions, and how companies might change currency. It'll challenge how we do the accounting for it, and how it'll disrupt everything will also be a consideration."

This indicates that blockchain is not being taken as seriously as it should be, and in comparison to other things such as the development Bitcoin, a technology not taken seriously until just a few years ago, it'll be something that will become larger than can believed in a matter of years. Careers in auditing will be affected by it due to the changing landscape, and as some jobs disappear, new ones will rise up to take their place. The disruption blockchain technology will have a challenge to those currently in the auditing field, despite making certain things easier and more secure. Participant 2 echoed this idea, by asserting that blockchain will allow auditors to be "a little more precise…go[sic] beyond the level of audit materiality; level of judgement will not be moved, but precision will be increased". Materiality is left to the judgement of the auditor; therefore, if the level of judgement won't be affected as Participant 2 asserts, then the level of

materiality wouldn't necessarily change in response to the development of blockchain technology. Precision would be increased because it would be less likely that there were errors, either on the management side or the auditor side. Communications between an auditor and a client would change, as less inquiries would need to be made to verify information.

The follow-up question was directed to both participants in this case, as their prior answers gave way to possible further data. Participant 1 noted a technology that had changed the field, rather than one that didn't, because it provided a good example of something similar. Participant 1 cited the onset of cloud computing, where it began as something almost ahead of its time, but "everything is on the cloud now, because it's cheaper and makes more sense. It's only a matter of time that blockchain technology will be smoke on the fire". Even if only exaggerative, Participant 1 strongly believes that blockchain technology will be as widely used as the Cloud is now.

Participant 2 has been in his career longer, and talked about Y2K, the turn-of-the-century phenomena that caused millions to plan in the case of a complete technological shutdown. As Participant 2 notes,

> "A lot of people spent time preparing for it, but ultimately it didn't happen. A lot of audit risk was prepared for this; revisiting programs that needed to be rewritten, amidst worries that electrical grids could shut off, but none of that ever happened."

This response was interesting, but Y2K is not something someone who didn't fully experience that time would consider, as was the case here. Participant 2's note that a lot of audit risk assessment had been conducted, and that many companies spent time preparing for it, was very interesting. It doesn't necessarily support the hypothesis, but it does provide an example of when something that seemingly would change the field fell short of expectations.

The combined responses of the participants present the idea that a career in auditing will be affected through more than just adoption of a few more rules, and that the level of assessment auditors provide will change in unpredictable ways.

INTERVIEW ANALYSIS – QUESTION 5

This question was meant to understand not only where education and training is now, but how it will be affected in the future by the development of this technology. As many students currently in school are in the transitional point between no-knowledge and early adoption, it leaves many questions open as to how students should prepare while in school and upon starting their careers. Participant 1 mentioned that how firms deal with cryptocurrency assets in general will change it, something brought up in an earlier response. To them, the actual understanding of blockchain will be needed, especially as clients are taken on that are dealing with cryptocurrencies. This isn't anything out of the ordinary, as change in technology often challenges what is currently known against what needs to be known. Participant 2 didn't have any specific examples, but did say that, "new auditors will need to have a greater IT background than the previous generation of auditors and will need to be able to use IT effectively throughout an audit". Adoption of blockchain technology will change the accounting major itself, as incorporation of more technology-based classes will emerge, and those IT skills will become required rather than just a preference.

The follow-up question received similar answers from both participants, as both basically describing the environment of education to be changing with the times, or as Participant 1 puts it, the need to "be ahead of the curve". These were not as specific as would have been preferred in answers, but still provide a basis to support this potential implication of blockchain technology.

INTERVIEW ANALYSIS – QUESTION 6

The purpose of this question was to identify the gaps in knowledge or possibility that current exist in order to possibly link them to the development of blockchain technology. Additionally, the probe was to be used to see how long it typically takes for changes made to fill these gaps when they do develop, and how easy the process generally is. Participant 1 noted more of a gap with blockchain technology's development, rather than in general. According to them, people are taking it seriously, and this show by the consistent reference to Bitcoin. People can't see past the Bitcoin side of it to the other side of the "transaction technology, lower fees used for transaction technology using cryptocurrency technology, i.e. blockchain…going to take time to really get on board". Participant 2 had a much more in-depth answer, referring back to the auditing standards that public and non-public companies must abide by.

> "At the moment, there are two primary sets of standards: PCAOB and the ASB. They don't have a great deal of differentiation, but the application and rigor with which the standards are applied needs work. With respect to non-public clients, accounting controls self-regulate with no government oversight. The PCAOB added additional government oversight and rigor of PCAOB inspections, and public auditors are because of the rigor and stricter standards. Better audits result from these kinds of standards."

The mention of PCAOB and ASB are further supplemented in the literature review section. Related to auditing standards, it makes sense that the auditors of companies that face government oversight and additional review have become more skilled or better able to handle audits, and exercise professional judgement when issuing opinions. This reference especially opens the possibility of blockchain adoption as being likely in companies, large or small, as the desire for accuracy and better judgement make up a big part of what auditing tries to accomplish.

The probe question was asked to both participants, and both yielded positive responses that help understand what the adoption process could potentially look like. Participant 1 noted that one effect of the process itself is that jobs are will change, either positively or negatively.

They noted cloud computing again, and how companies went from having “eighteen engineers to only two because of the cloud.” They assert that blockchain will be similar, and as new uses develop, it will take off even more. Participant 2 discussed that it “depends on the magnitude of the change”, and further talked about how public clients are in the middle of adopting new revenue recognition standards. Given that the FASB gave a deadline of three to four years for adoption, this indicated how difficult they expect the standard to be. As blockchain technology further develops, it will probably be expected that full-adoption of standards might take a few years given the difficulty of understanding blockchain and its uses. As Participant 2 summarizes though, “change is streamlined as much as it can be”.

INTERVIEW ANALYSIS – QUESTION 7

The purpose of this question was to go right into the hypothesis of the research and utilize the previous questions as grounds to shift the participants into the mindset of blockchain. The probe was in case the participant didn't specifically think it would affect them. For this question, Participant 2 opted out of answering, and both participants were not asked the probe. When Participant 1 was asked this question, they provided:

> "Taxes and cryptocurrency assets. Types of regulations on cryptocurrencies, and also regulations relating to blockchain. There's no regulation now, as you could easily make $1000 in profit in a month with basically no oversight. People are looking at it as not real money. Regulations have to start coming into place as far as cryptocurrencies go. Implication-wise, it needs more regulations, and how it's going to happen will be interesting. It's decentralized and can't just be shut down."

Participant 1's response indicates that some of the imminent implications of blockchain technology include how to account for the taxes and the cryptocurrency assets that people have. Given the nature of auditing, the instant that accounting for these types of things begin to have regulations auditing will change to adapt with it as well. Auditors will need to be knowledgeable of these things in order to complete their job, and issue opinions following the conclusion of the audit.

INTERVIEW ANALYSIS – QUESTION 8

This question was meant to try to identify a timeline for the implementation of blockchain and its potential implications, as well as identify the point that an impact will be able to be measured. The follow-up question was to ascertain how the timeline will relate and affect auditing. Participant 1 specified that change will be seen within the next five to ten years, wherein "record keeping has to move from a legacy database to a system that uses blockchain, especially when dealing with larger enterprise." Despite this, Participant 1 did note that blockchain will need something additional, another use or creation, before it takes off. This could be filling another gap that exists right now or generating more public knowledge about it to facilitate further adoption. Participant 2 had a better idea of the timeline, most likely due to a longer time in the profession. They stated that, "The best estimate will be that it affects big firms first, before coming to the middle-market, and then down from there. The Big 4 will probably see it in the next three to five years, middle market will see it in the next five to seven years, and more than seven years for the others".

Neither participant was asked the follow-up question. Their responses echo each other in that the timeline for implementation will begin within the next five to seven years, and that it will have a trickle-down effect. In combination with the literature review, the adoption of blockchain technology and its implications will not be immediate, but we are currently in the midst of this change. Within the next decade, the term blockchain technology will be more common knowledge, and an understanding of what it is will be more common than know, at least within the circles that will use it.

INTERVIEW ANALYSIS – QUESTION 9

The purpose of this question was to see if knowledge of triple-entry bookkeeping existed, and to see if the participant had an idea of how it could change accounting. Additionally, the probe was to be used to form a connection to the potential effect triple-entry bookkeeping might have on auditing. Participant 1 had very little to say in response, and Participant 2 opted not to answer the question. The probe was not asked of either participant. The absence of answers provides a clue that triple-entry bookkeeping is still relatively a new subject that is not well known about or understood. As Participant 1 notes, it is “very hard to explain to people”, and further highlights that there is a gap in knowledge of this subject matter. The use of interviews would be most beneficial during the initial peak of blockchain technology, where it becomes more of a commonplace understanding. For the purpose of this research, the lack of knowledge will be used to push for implications blockchain technology will have.

INTERVIEW ANALYSIS – QUESTION 10

On the downward slope of this interview, this question is used to capture any information that might not have made its way into a previous answer. The immediate purpose was to ascertain what possible changes to a career as a CPA or an auditor could look like, and the use of the follow-up was to see how relevant it might be for students seeking a career in this field to be aware of this technology. Participant 1 used this question to segue into an explanation about why understanding the technology is so important. As they state, "a lot of people don't understand how it works, how it goes, or how it is profitable. They need a base understanding of it; they think cryptocurrency is fake money when in reality something is going on behind the scenes". From this answer, it can confirm the need for understanding blockchain technology, and its importance to the future of accounting and auditing. Participant 2 opted out of the question itself, but answered the follow-up, stating that:

> "It would be very relevant to have an understanding of it and what the implications will be. We look to students to bridge technology gaps, so if they come out of school with a working knowledge of blockchain, they're more valuable to the audit and to the firm."

This pushes the need for students to understand blockchain even further, and it would benefit not only them to invest in resources to understand this, but also firms and institutions as a whole to help provide the foundation for their future employees to grow and learn.

INTERVIEW ANALYSIS – QUESTION 11

This question served to connect what several papers have noted in relation to blockchain technology to what current employees in the industry actually have to say. The probe was to dive further into and understand if its development would slow down in the next few years. Participant 1 brought up the potential use of blockchain as a groundwork for financial systems in third-world countries, a concept that didn't appear very much in the literature review. Upon being asked the question, they responded:

> "Profit is one thing, and a second this is that it offers - other countries don't have this – the ability for countries who have never had that financial system to have it. You see it changing transaction fees and making it cheaper to do things across countries. Setting up financial systems in third-world countries. You send someone bitcoin with 23-25 cents in fees if trading in the system; eliminating transaction fees to save money, lowering fees and increasing the speed of transactions. This is still a couple of years away, as we're out 100 transactions per minute compared to a company like Visa which can do 1 million transactions per minute"

The utilization of blockchain technology has consistently noted the elimination or decrease in the transaction fees of an intermediary. The possibility that this could further have implications of developing financial systems in third-world countries that have never had one in place or are very unstable with their currency is huge and warrants further investigation on an economic level. The auditing aspect of this as well is changed when the potential for large amounts of almost immediate transactions with little regulation is considered. Participant 2 further supported this by stating that they don't think blockchain's development will have a slow-down or a loss of relevance in the future, making Participant 1's answers all the more relevant.

INTERVIEW ANALYSIS – QUESTION 12

With the use of this penultimate question, the goal was to possibly gain an understanding of how the accounting for transactions could be changed by blockchain, because of the elimination of the need for an intermediary. The follow-up selected was to further ascertain if not using an intermediary would make blockchain's security seem better or worse. Participant 2 opted out of the question entirely, but Participant 1 answered both the question and the follow-up.

Participant 1 believes that blockchain will positively affect how transactions are recorded, and while not able to give precise details, they do think that it "makes it more accurate because it makes it so there's a distributed ledger. Any fraud would be immediately detected" (Appendix B). They also talked over some of the positives and negatives associated with utilization of the blockchain network in recording transactions.

> "You have to trust the math and the encryption, but at the same time there's no regulation or governing body to help people if they're hacked or if their money is taken. Even then the blockchain network could show what wallet stole the money and where it was put. You could see everything, that's how transparent it is."

Due to the nature of blockchain, you can see everything that is done. This is why it keeps being described as so transparent, and really highlights the fact that it is secure in a way we don't currently experience. Auditors ensure that financial reports are accurate, but this transparency would almost eliminate the need for it. If it is possible to rely on the transaction at face value because anything done to it would immediately be seen, an auditor wouldn't be needed to verify. The self-verification that the literature review brought up supports this. While keeping in mind that it is true that there is little to no regulation existing to control this in any fashion, the implications this could have are extreme.

INTERVIEW ANALYSIS – QUESTION 13

This final question was used to determine any final changes blockchain could have on transactions, and how it could affect the auditing process itself. While the responses were not helpful regarding potential effects on the auditing process, they were helpful in garnering the final thoughts from each participant in regards to the interview as a whole. Participant 1 described the ramifications with descriptions of the creation of a company's own internal system that would store their own records. They would receive a better understanding of how it works, and this would create positions being made on the basis of blockchain technology, such as a blockchain engineer, blockchain analyst, and others. Participant 2 gave a more audit-specific response, noting that the profession would become more technology-based and experience more interfacing of blockchain with the client's technology. This would generate populations of exception that will point out transactions that seem normal at face value and focus more on exceptions and material populations. This would let them be able to eliminate transactions that don't need their attention and focus more on those that do.

Overall, blockchain will eliminate processes that aren't necessary, while allowing for better focus on the areas that are needed. Companies will make moves to develop their own foundation in blockchain, and then utilize that in coordination with their clients, even possibly going as far to help their clients develop their own blockchain interface.

CONCLUSION

Over the course of this research, there have been developments in the real world and with the development of this thesis. What started as a curious interest in cryptocurrency evolved into an in-depth look at the foundation that made it up – blockchain – and how it could relate to accounting, specifically auditing. The literature review conducted provided a brief overview of audit, blockchain, and the current state of research leading up to the publication of this paper in relation to the implications of blockchain.

Blockchain technology is a growing technology, already notable for the potential impacts it will have on numerous fields. Is blockchain technology going to have a significant impact on the auditing profession, and in what ways? The interview questions served to uncover information and provide data from those either with experience in auditing or knowledge of blockchain, or both. The data that was provided supported that blockchain technology would have an effect on the auditing profession, and while the specifics relating to the audit process were not able to be determined yet, there are certain implications that arose from both the participants responses.

These implications were that the current education and training of students and new employees will be changing, and that a bigger focus in IT will be required for those looking to be in the profession. Additionally, it will be at least five to ten years before any significant adoption is seen, but firms are still currently exploring the implications for themselves to serve as this development. The lack of regulation and acceptance of blockchain technology makes it vulnerable to misuse, despite the security it can provide in transactions. At the profession level, it would be expected that while jobs for entry-level auditors might change or disappear, new jobs for blockchain-oriented accounting students would appear just as soon. It is the belief of the

researcher that the hypothesis was positively answered, and that not only do these implications exist, but they are many. Perhaps the greatest conclusion that can be taken away from this is not that auditors will have less work or not be needed anymore, but that their level of independence and professional judgment will be all the more important moving forward as blockchain technology is adopted. The accuracy with which information is recorded, and the speed, ease, and self-verification of blockchain are all positive things, but auditors will need to start evaluating this adoption as if it was an audit all in itself, thus beginning with risk assessment.

By assessing the risks of blockchain and attaining an understanding what it is and what it can do, auditors will be better able to adapt and perform as blockchain becomes incorporated within companies. They'll be able to bridge the gap that existed for an immediate transaction system, while still utilizing their professional judgment in even more analytical ways.

There are dozens of uses for blockchain technology, and just focusing on the audit profession still yielded a wide array of results. The technology is a value-added development, and by utilizing all of its strengths, blockchain will lead to a new level of evolution in auditing.

APPENDIX A

INTERVIEW QUESTIONS

Question #1

Describe your background in accounting, and your overall experience with it as a profession.

Probe: What has been the most surprising part of your career as it relates to accounting?

Question #2

In your own words, what is blockchain and how do you think it applies to accounting? If no, move on.

Follow-up: Given your explanation, how relevant do you think the development of blockchain technology is to your career?

Question #3

How secure would you say blockchain is in terms of verifying transactions, and given access, how could it affect your interactions with audits?

Probe: Why is the security of blockchain so relevant to the accounting field, specifically auditing?

Question #4

How do you think a career in auditing will be affected by the development of this blockchain technology? If you think it will not affect it, describe why, including insight from personal career experience.

Follow-up: During your career, have there been similar times where an up-and coming technology would supposedly change the field, but didn't?

Question #5

How would education and training of future auditors be affected by the adoption of blockchain technology?

Follow-up: Describe the current state of education in regards to accounting careers, and

how it has changed in the last decade.

Question #6

Have you observed specific gaps in the auditing field that need to be filled or addressed, and if so, please describe them. If not, describe why the current system of auditing is adequate.

Probe: In your experience, how long does change typically take to be enacted, and is it a streamlined process?

Question #7

What are the future implications of blockchain technology?

Probe: With its development, do you think it will impact your personal career? If so, in what ways? If not, explain why.

Question #8

With your best estimation, describe the timeline for this technology to have any impact on the auditing profession. If no impact is believed to happen, describe what you think the auditing profession will look like in the next five years. Ten years? Twenty years?

Follow-up: In the timeline you provided, do you believe careers in auditing will grow or shrink? Based on your answer, please describe why.

Question #9

Blockchain is heavily associated with triple-entry bookkeeping. What is your understanding of this, and how does it change the current state of accounting?

Probe: Do you believe triple-entry bookkeeping could hinder, or even possibly eliminate, the need for auditors?

Question #10

If changes were to occur for a career in auditing or as a CPA due to blockchain technology,

describe what form these changes could possibly take.

Follow-up: How relevant would it be for students seeking a career in this field to be aware of this technology, and to make moves to understand it?

Question #11

Why do you think the development of blockchain is being described as “revolutionary” or “game-changing”? Do you agree? Should it be taken seriously?

Probe: Do you see its development reaching a slow-down or a loss of relevance in the future?

Question #12

Blockchain eliminates the need for an intermediary, such as a bank. In what ways could this impact recording transactions?

Follow-up: In your opinion, does the disuse of an intermediary make blockchain seem more

secure, or less?

Question #13

Describe the ramifications of blockchain technology on auditing transactions, and how this could change the auditing process.

Follow-up: In what ways could you see the audit profession shifting to accommodate these

ramifications?

APPENDIX B

PRE-SCREENING QUESTIONS

1. Have you had any experience, or do you have working knowledge, of blockchain technology?
2. Are you able to detail how this could potentially affect the audit profession?

Answers to both questions must be yes in order to be qualified for the interview.

APPENDIX C

IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Determination of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Jeffrey F. Reinking** and Co-PI: **Brittany Jackson**

Date: **October 12, 2018**

Dear Researcher:

On 10/12/2018, the IRB reviewed the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	Understanding the Implication of Blockchain Technology on the Audit Profession
Investigator:	Jeffrey F. Reinking
IRB Number:	SBE-18-14387
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

This letter is signed by:

Signature applied by Gillian Morien on 10/12/2018 10:53:44 AM EDT

Designated Reviewer

REFERENCES

Arens, Alvin, et al. *Auditing and Assurance Services: An Integrated Approach*. Pearson Education, 2017, pp. 4-6. PDF. September 2018.

Bible, William, et al. "Blockchain Technology and Its Potential Impact on the Audit and Assurance Profession." Chartered Professional Accountants: Canada, 2017, www.aicpa.org/content/dam/aicpa/interestareas/frc/assuranceadvisoryservices/downloadabledocuments/blockchain-technology-and-its-potential-impact-on-the-audit-and-assurance-profession.pdf. PDF. March 2018.

"Blockchain Technology: A Game-Changer in Accounting?." Deloitte & Touche, March 2016, www2.deloitte.com/content/dam/Deloitte/de/Documents/Innovation/Blockchain_A%20game-changer%20in%20accounting.pdf. PDF. March 2018.

Byrnes, Paul, et al. "Evolution of Auditing: From the Traditional Approach to the Future Audit." American Institute of Certified Public Accountants, Nov. 2012, www.aicpa.org/interestareas/frc/assuranceadvisoryservices/downloadabledocuments/whitepaper_evolution-of-auditing.pdf. PDF. October 2018.

Campbell-Verduyn, Malcolm. Bitcoin and beyond: Cryptocurrencies, Blockchains, and Global Governance. Abingdon, Oxon; New York, NY : Routledge, an imprint of the Taylor & Francis Group, 2018., 2018. EBSCOhost, login.ezproxy.net.ucf.edu/login?auth=shibb&url=https://search.ebscohost.com/login.aspx?direct=true&db=cat00846a&AN=ucfl.035875202&site=eds-live&scope=site.

Iansiti, Marco and Karim R. Lakhani. "The Truth About Blockchain." *Harvard Business Review*, 6 Mar. 2018, hbr.org/2017/01/the-truth-about-blockchain.

Kancs, d'Artis, et al. "The Digital Agenda of Virtual Currencies: Can BitCoin Become a Global Currency?" *Luxembourg: Publications Office of the European Union*, 2017,

publications.jrc.ec.europa.eu/repository/bitstream/JRC97043/the%20digital%20agenda%20of%20virtual%20currencies_final.pdf. PDF. February 2018.

Morabito, Vincenzo. *Business Innovation Through Blockchain. [Electronic Resource]: The B^3^ Perspective*. Cham: Springer International Publishing: Imprint: Springer, 2017., 2017. *EBSCOhost*, login.ezproxy.net.ucf.edu/login?auth=shibb&url=https://search.ebscohost.com/login.aspx?direct=true&db=cat00846a&AN=ucfl.036211759&site=eds-live&scope=site.

Taylor, Ben. "Triple-Entry Accounting And Blockchain: A Common Misconception." *Forbes*, Forbes Magazine, 28 Nov. 2017, www.forbes.com/sites/forbesfinancecouncil/2017/11/28/triple-entry-accounting-and-blockchain-a-common-misconception/#2ab41444190f.

Tysiac, Ken. "How Blockchain Might Affect Audit and Assurance." *Journal of Accountancy*, 15 Mar. 2018, www.journalofaccountancy.com/news/2018/mar/how-blockchain-might-affect-audit-assurance-201818554.html.

"Who Is Most Likely to Commit Fraud at Your Company?" Association of Certified Fraud Examiners, ACFE, 2010, www.acfe.com/press-release.aspx?id=1677.