Blockchain for Audit Provenance and Trust: Push Factors, Value Creation and Challenges

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A B S T R A C T

The digital ecosystem has a new value proposition that ensures provenance and audit evidence gathering. Blockchain technology introduces a shared consensus distributed ledger system that is immutable and built upon principles of trust. This allows provenance for evidence gathering and audit guarantee as alteration of data is not possible on a distributed ledger. As such the technology provides trust based accounting that will always be grounded on the principle of true and fairness. The research question addressed in this paper is: How does Blockchain create value for audit and accounting professionals particularly in the context of trust, compliance, as well as true and fairness of reporting? This study presents discrepancies of an inefficient centralized financial ecosystem. The study further highlights push factors for value creation on Blockchain to overcome these discrepancies. The main highlight of this paper is the taxonomy of value creation which is depicted via nine significant use cases for trust, compliance and true-fairness. Distinctly showcasing how a Trusted Third Party (TTP) platform can be achieved on an untrusted setting. The paper is divided into five sections. The first section illustrates the reasons for a growing digital ecosystem for accounting processes and why a TTP is much desired. The second section highlights push factors that correspond to the accounting value creation activities which are often regarded as the driving force for Blockchain. In the third section, nine significant use cases for Blockchain that creates value for accounting and audit are presented. In the fourth section, value that can be realized via controls (preventive and detective) within tax, audit and overall financial reporting is discussed. In the fifth section, the paper highlights issues and challenges of rolling out this technology for accounting in general.

1. Introduction

The central theme of this paper is possibilities of a trust based provenance that is embedded in the Blockchain technology. Financial statements are

generally expected to be correct and trustable with no material misstatements either created accidently or on purpose. However, throughout history we have seen fraudulent activities of "cooking the books" or "creative accounting" in practice as in the case of Enron, Madoff Investment Securities and World Comm. As a result trusting audited financial reports has indeed become a major challenge for stakeholders and often times there is an argument of how much does audit guarantee fair representation of a company's financial statement. This is largely attributable to the nature of data managed centrally (central ledger system) without shared consensus. The transaction owners of individual ledgers may alter and amend data to a large extent as they have full access to permission to alter. Although controls may be distributed throughout various policies that ensure segregation of duties and responsibilities, fraud is still prevalent. The digital economy setting (Clarke, 2017) is completely revolutionizing audit evidence and has introduced Blockchain that will negate any possibility of fraud. This provides the trust and provenance that have always been desired by stakeholders. Transaction data on distributed ledgers will be seamlessly authenticated and tagged into separate blocks of data that will be connected by a common link (i.e. chain) that binds them. The value proposition of this technology is objectivity and trustable financial data. Digital ecosystem (Arner, 2015) can also be referred as a sharing economy that uses decentralized asset ownership to match sellers and buyers. Blockchain technology promises provenance, data integrity, auditability (Schmitz et al, 2019) and trust. With Blockchain platforms in place, each entity involved in a transaction will maintain its own copy of authenticated ledgers with hash codes that will be error free, making middle men completely expendable. Smart contracts defining specific business rules that are particularly significant for compliance of Financial Reporting Standards (FRS) can also be executed on the Blockchain automatically.

2.   Push Factors for Audit on the Blockchain

The crux of accounting as illustrated in figure 1 below is attributable to three major functions of objectivity which are really the core push factors for audit on the Blockchain. According to the Financial Reporting Council (FRC) the substantive form of true and fairness, compliance and trust are required at all levels of accounts preparation, reporting and audit. Auditing although regarded as a powerful technique for providing stakeholder confidence, however presents an expectation gap between what audits can do and what stakeholders or investors would like see it do. In other words, audit assurance has been adversely implicated by malpractices which are

now creating pressure for enhancing trust on audit. Audit failure must be avoided at any cost and Blockchain technology provides the right solution for this problem.
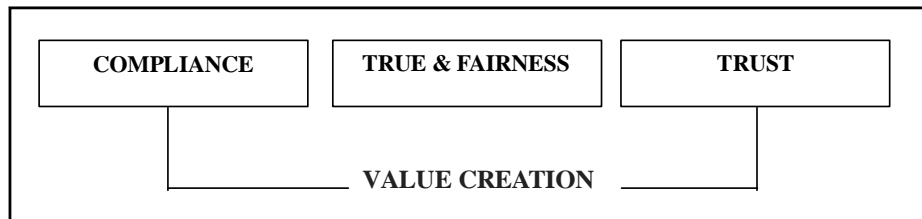
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Figure 1: Components that are in the core of accounting practice

2.1. Compliance

Compliance audit is regarded as a comprehensive review of adherence to regulatory standards and guidelines. The strength of the audit report is evaluated based on the rigor and strength of compliance to guidelines which includes policies, risk and adequate controls. Blockchain provides the rigor needed for a compliance management system. Manual manipulation of data can be prevented via complex digital signatures (cryptography) that ensures accurate compliance.

2.2. True and fairness

In external audit, stakeholders look towards auditors as trusted third parties and the party that carries out the audit is responsible for a true and fair report. In the context of Blockchain driven platform, trust and transparency are embedded into every transaction across the digital ecosystem. This essentially provides stakeholders a true and fair view of financials that is real time. Section 3 of this paper provides specific use cases to support this.

2.3. Trust

In a centralized ecosystem only entities that are privy to a transaction will have access to the data. This causes multiple problems such as errors in reporting, duplication of entries, fraud and most importantly lack of trust. The administrative framework of a Blockchain allows distributed trust to be deployed across all transactions. In other words it creates a secure platform that is authenticated and verifiable based on agreed consensus that ensures provenance, immutability and finality (i.e. where a transaction is seen as complete). In essence a unified vision that is agreeable and verifiable by all parties involved in that transaction becomes a possibility. The value of a shared immutable ledger can be illustrated through a simple

example shown in figure 2. When an automobile is sold there are many parties that are involved in the transaction, namely the buyer, dealership, manufacturer, insurance company, department of motor vehicle (DMV), road and transport department (to ensure road worthiness and inspection), financiers (if car is bought on loan) and lastly the services and warranty centers.
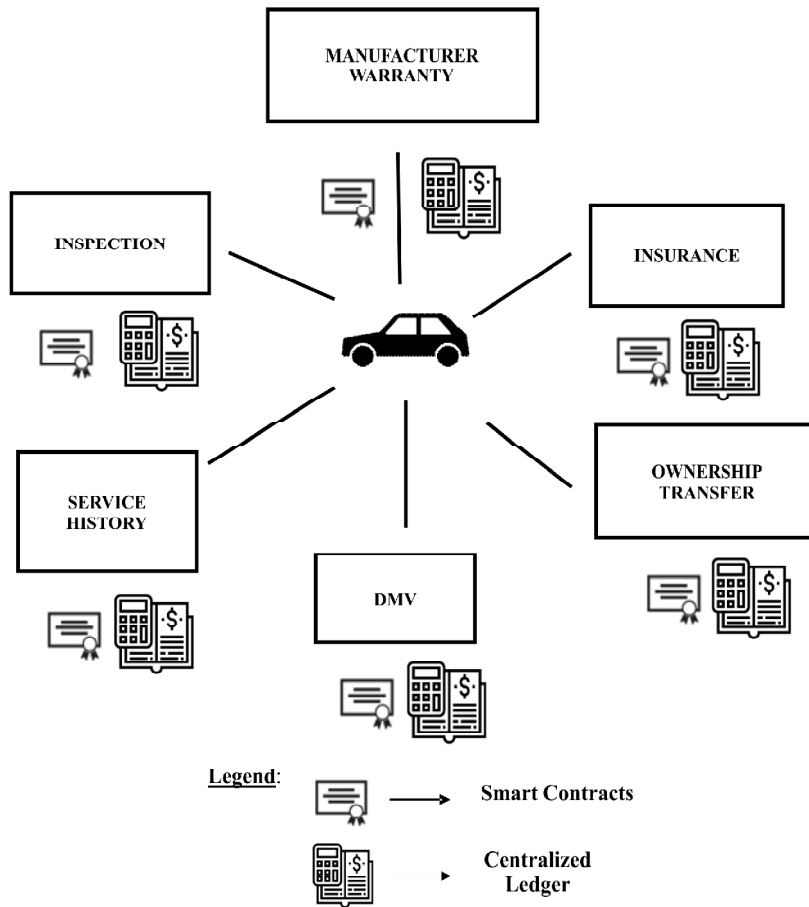

Figure 2: Centralized ledgers

Traditionally transaction ledgers are maintained individually and there is no proper data sharing that is agreed by shared consensus between all parties with regards to the exact value, wear and tear, history of accidents, service history, road worthiness and agreed book value (for second hand automobiles).Once again this creates inefficiencies and intermediaries

manipulate these circumstances to make bigger profits. The six participants shown in figure 2 do not have to agree on the transaction or previous transactions if any as such creating subjectivity to the fair value of the asset that is being transacted.
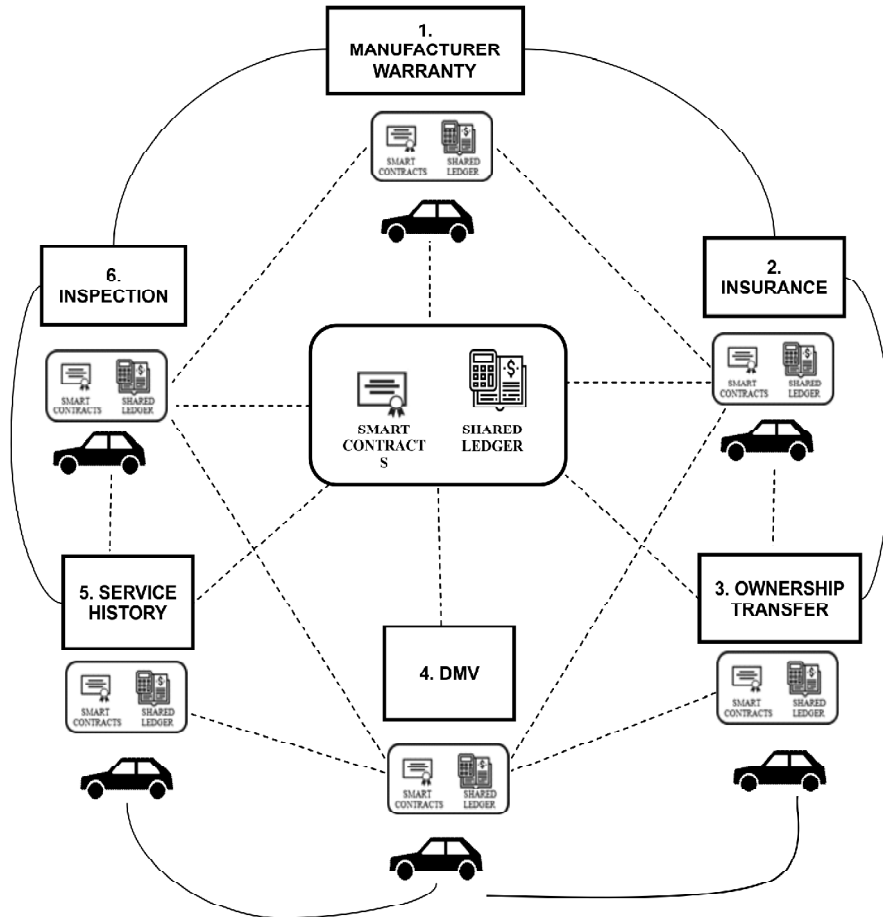

Figure 3: Value creation of shared immutable ledgers

In a centralized environment the parties do not have shared consensus and may decide to over value or under value the asset creating a free market scenario where willing buyer and seller meet at a price that may not be fair to the seller or buyer. Suppose a used vehicle has void warranty problems or previous accidents in history, this data will not be available for buyers to make a more informed purchase decision or even to arrive at a fair value for the vehicle. Particularly we see this scenario happening in dealerships

where prices are subjectively determined and has no basis to useful life of the asset, depreciation, service history, maintenance, warranty and previous ownership. Figure 3 illustrates how smart contracts and shared ledgers provide access to consensus data which has been historically transacted to all those who are privy of the transaction. In this case all six parties will agree to consensus data that will create objectivity to the fair value of the asset that is being transacted. From previous transactions it will be clear to the seller and buyer to decide on the fair value of the asset. Since participants have access to data transacted, the identity and time stamped value of commissions of third party intermediaries will be known to all and the consensus algorithm will determine that the transaction is valid.

3.   Value creation in Accounting and Audit

Blockchain technology can be defined as a distributed trusted ledger system that allows multiple agreed transactions into a consensus based ledger. In addition to the available double entry it also provides an allowance to track assets through asset contracts. This also applies to contract documents like a land title, deed of transfer, loan approval and bank guarantee. Blockchain is considered a killer application for the FinTech (Moffit 2018) digital ecosystem and creates value for audit in the following ways:

3.1. Improved auditability

Blockchain serves as an Audit Documentation Platform (ADP) which is key for validating and verifying provenance of transactions akin to an audit trail. This provides clear authenticity to identities of those who entered data into the ledger, time stamp of data, ownership of data, and value of transaction that can be verified from the time the asset or data objects had been transacted. This is particularly interesting to note as most historical access to data is often not known or limited.

3.2. Taxation

Historical access to data mentioned earlier allows data lineage to be determined beyond just seven years that is currently a mandatory practice for tax filing worldwide. The idea of encapsulation of current transactions that include finger print (authenticated hash tokens) of previous transactions make it impossible for duplication or fraud to happen without the consent of all parties involved since the time the asset had been recorded into the ledger. This is particularly efficient for tracking transaction data for income receive but not declared for taxation purposes.

3.3. Asset valuation

The fair value of an asset will no longer be a mystery as all data that was previously transacted for that particular asset will now be accessible to the new purchaser and is almost impossible to duplicate or tamper with. Valuation of asset, true and fair reporting and trusted financial statements can be a reality with this technology.

3.4. Crypto assets

Blockchain supports tangible and intangible assets evaluation. Digital assets that have value or can be used to create value to the organization such as cryptocurrencies and utility tokens can be accounted for on the Blockchain objectively. Figure 4 illustrates the four types of crypto assets namely crypto currency, utility token, platform token and transaction token.

3.4.1. Cryptocurrency – is a crypto asset e-money that promises a high value as it is limited to supply unlike fiat currency that can be printed. The intangible and subjective nature of these currencies have prevented companies from itemizing them in the Balance sheet. With this new technology intangible assets can be treated just like any other asset.

3.4.2. Utility token – also known as Ethereum is a crypto commodities (e.g. ERC-20[1]) carries transaction data and contract information. ICO (Initial Coin Offering) also use data from contract data. Tokens carry information on transactions and intrinsic value. Tokens can be used to represent contract data and promissory notes. As such the term utility is used.

3.4.3. Platform token – are also known as protocol tokens like Filecoin and Bancor which are used for exchanging assets, currency or operational functions.

3.4.4. Transactional token –enable cross border payments such as IOTA and Ripple. IOTA is used together with Internet of Things (IOT).
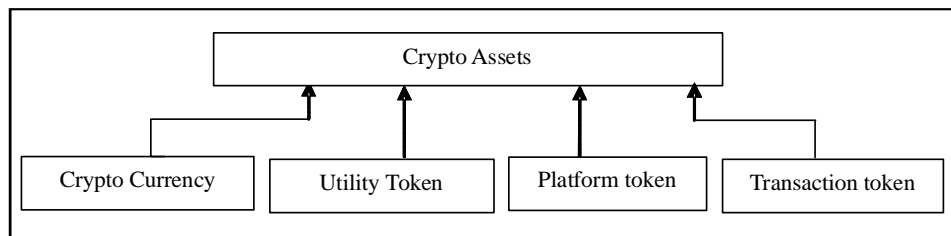

Figure 4: Crypto asset classification

3.5. Smart contracts

Smart contracts are useful to determine proper execution of acceptable standards that include the GAAP, FRS, audit guidelines and audit standards.Over and above the standards, principals of prudence, going concern and materiality can also be enforced on the Blockchain. It's physically impossible for auditors and accountants to remember, interpret and properly execute multiple standards and some of which may be also contradicting at the same time. Business rules algorithms can be written and executed to process transactions thereby ensuring objectivity, true and fairness.

3.6. Revenue Assurance

A trusted public filing system like the Blockchain is useful to determine revenue leakages. Coupled with predictive and detective analytics, revenue shortfall and recovery strategies can be easily determined within a very short period of time.

3.7. Provenance

Using hashing and public key data, unauthorized access can be prevented, any sort of data tampering will quickly flag rogue transactions making them invalid as shared consensus will not be achievable. All related data to a relevant transaction will be authenticated at multiple levels. Such provenance will ensure validation of the truth throughout the history of a transaction. If entries to ledgers are updated the time of the update, person who updated and value will be captured across all participants.

3.8. Fraud prevention

As mentioned on provenance, Blockchain provides a clear audit trail for better detective controls. Atomicity within each transaction will determine correctness of data that is shared across all ledgers.

3.9. Sustainability for reporting

A shared ledger with data or asset objects that are tagged allows every updated transaction to reflect real time data that creates a unified vision of truth. In other words a single version of the truth that cannot be manipulated, tampered or replicated.

4.   Impact of Blockchain on audit and accounting practice

With more companies exploring the assurance possibility of Blockchain in audit and accounting practice, the objective of this section is to determine

the potential impact of this digital ecosystem on accounting and audit practice. The approach used in this section was based on a methodology used by Robert Half (2014) and EY's Global Finance Performance Improvement (EY 2019).The approach was purely exploratory and to purpose was to seek a deeper understanding of what auditors knew were value creation activities of the Blockchain particularly on controls (preventive and detective) within tax, audit and financial reporting. A focus group 15 experienced auditors were asked to provide anonymous feedback by voting on their smart phones to questions displayed on our polling tool[2]. The research questions and summary of the feedback obtained is illustrated below.

RQ 1 – Will Blockchain impact on how data is processed, authorized and recorded?

RQ 2 – Financial reporting and tax preparation will benefit from this technology?

RQ 3 – Skill sets of auditors will change and new Blockchain-based methods will emerge?

4.1. Will Blockchain impact on how data is processed, authorized and recorded?

The approach for this question was for the experts to vote only once and they had to select the level of impact from 0% to 100%, the latter meaning that Blockchain impacted greatly on processing, authorization and recording tasks. Figure 5 highlights the overall consensus and 93% of the participants agreed that the technology will be a major disruptor.

4.2. Financial reporting and tax preparation will benefit from this technology?

Surprisingly many felt that the audit practice will indeed improve indicating a positive experience about the technology. Knowing that if any participant in the digital ecosystem were to amend transaction data in any manner and that this will automatically make all data null and void and result in failure of all transactions made them understand the tangible benefits of the technology. This is skin to the atomicity definition in relational databases. It's an all or nothing algorithm that processes all the data or none of it making it a full proof fraud prevention system.

4.3. Skill sets of auditors will change and new Blockchain-based methods will emerge?

Auditors unanimously agreed that the skill sets of audit personnel will have to be upgraded as Blockchain based techniques begin to emerge.

Methods for audit evidence gathering on a distributed ledger system are quite different from a standalone ledger. New skills for standardization in reporting for data extraction and analysis will be highly sorted after. New challenges and opportunities will arise for the audit profession especially in using automation and data analytics for auditing.
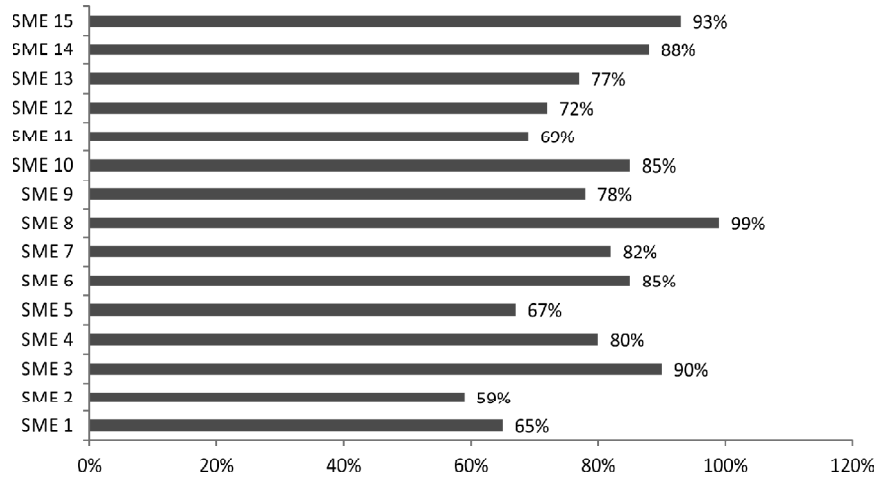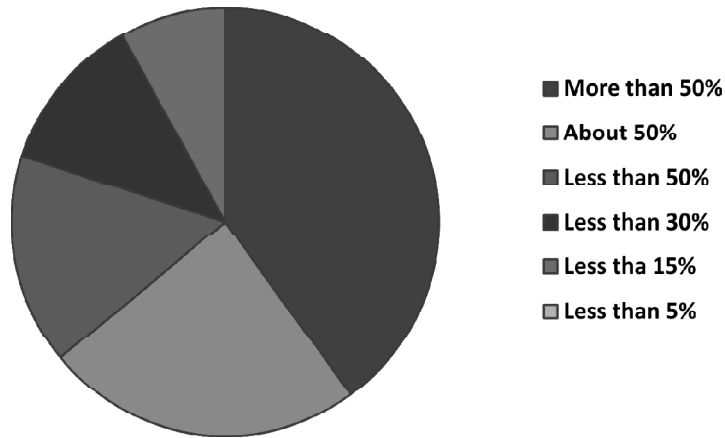

Figure 5: Impact on how data is processed

Figure 6: Benefit for tax and financial reporting

5.   Audit evidence made easier on the Blockchain

Gathering evidence in audit practice usually involves multiple techniques such as visual observation, records examination and employee interviews.The major strength of the Blockchain is that it is distributed in

nature. Any businesses transaction or transfer of value between must be agreeable and authenticated by everyone in that transaction. To understand this one has to imagine the track changes feature provided on Microsoft Word. When changes are made to a document shared and viewed by everyone, the document becomes a living document. All changes made will be visible to all authors, date of changes are time stamped and if anyone makes any modifications it has to be agreed by all and only then the final version is accepted. Smart contracts, token and private key encryption embedded in the Blockchain platform creates trust for an untrusted ecosystem and generates value for all parties in this aspect. We never had the technology with such possibilities in terms of trust, evidence gathering and objectivity. Single point of failure problems can also be avoided with only legitimate transactions that are referenced to stipulated standards and operating guidelines.

6. Blockchain is not a substitute for audit

It is important to note that auditing will not necessarily be replaced by Blockchain (AICPA, 2019). Audit trail and provenance that leads to audit evidence is the main value proposition of this technology. As such auditors will be able to work more efficiently to seek out audit evidence rather than performing multiple manual processing that can be cumbersome. Low value activities in audit that are mostly operational can now be handled by the Blockchain technology leaving higher value processing to the auditors. Based on the five components highlighted by the Committee of Sponsoring Organizations (COSO), Blockchain is expected to strengthen: 1) Control of environment, 2) Control of activities, 3) Risk Assessment, 4) Information and communication and 5) monitoring. The distributed nature of ledgers will allow auditors to perform higher value processing for the following:

6.1. Authorization – where transaction approval for authorization controls will be made secure through public keys and hash functions that can only be verified by unique private keys belonging to the authorized process owner.

6.2. Recording –source documents, centralized ledgers and reconciliation will be handled by the Blockchain and process automation will eliminate the need for human inputs. The system can be completely autonomous.

6.3. Custody- function responsibility for custody will be authenticated with platform and transaction tokens which will enforce separation of duties as well.

Roles and skill sets of auditors may have to be upgraded as transaction records, authorization, recording, custody and tax preparation may very well be different on this new platform. Auditors may have to be up skilled to understand how a Blockchain based report can be audited. New procedures for data extraction and analysis will also be required (Raconteur, 2019).

7. Issues and challenges

Blockchain has had problems in terms of malware, software flaws and attacks. As any technology attacks cannot be prevented as perpetrators will want to hack into the system particularly those that have crypto currencies that hold value. Several Blockchain hashrate have been used to reverse transactions and prevent miners from confirming the blocks. Ongoing work on security layers for countering cyber-attacks are ongoing and have been promising (Wang et al, 2019).

8. Conclusion and future work

Digitalization of the financial ecosystem has created opportunities as well challenges. While the technological advancements are promising and acts as an enabler to more value generation in terms of audit, controls and reporting, the digital skill gap is widening faster than ever. Tertiary education providers have to make a more proactive stand to impart digital skills among students so that they can understand how to use the technology to improve their competency. In line with narrowing the digital skill gaps of accountants and auditors alike, in our future work we would like to investigate to what extent is the digital talent gap causing lack of competency among graduates and what courses or skill inclusion is needed to better prepare students for the digital economy.

Notes

1. Ethereum Request for Comment (2015), is a technical standard used for smart contracts on the Blockchain
2. *https://www.polleverywhere.com*

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