THE USE OF BLOCKCHAIN TECHNOLOGY AND DATA ANALYTICS IN THE AUDIT PROFESSION

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Abstract. Technologies such as blockchain technology and data analytics are causing major disruptions in various other professions and the audit profession will be no different in due time. The main aim of the study is to look at whether these technologies of blockchain and data analytics will assist the auditors in the various audit processes such as obtaining sufficient appropriate audit evidence, detection of fraud and exercising professional judgment. This study also aims to identify the future direction that the audit profession is heading with the introduction of these technologies and the potential skills that auditors would require in the upcoming years. Data was collected by the researcher in the form of primary data by conducting interviews. 12 auditors were interviewed. The data collected was analyzed using thematic analysis and the findings are presented accordingly to solve the research objectives. From the study, most respondents believe that these two technologies will assist the auditors in these audit processes in various ways. The study also shows that the auditors would have to equipped with skills such as IT related skills to stay relevant in the audit profession which is transforming to a technological/data driven profession.
Keywords: *blockchain, data analytics, auditing, Malaysia*

Introduction

Blockchain technology was the backbone of the newly introduced virtual currency of bitcoin in 2008. Blockchain is essentially a computerized system of distributed ledgers with complex mathematical systems that can automate authentication which allowed online transactions that do not happen in person to be conducted without needing the trust in a third party (Ammous, 2019; Patrickson, 2018). This technology helped create a breakthrough in the sense of not needing an intermediary or a third party such as banks to conduct transactions between anonymous users online with verification. In essence, Blockchain technology is a distributed ledger with unchangeable transactions that provides real time record of transactions and ownership of assets (Bishop et al., 2019). Data analytics is basically using analytical tools to analyze large volumes of data, that means very little in its raw form and making it useful information to be used for various analytical and decision-making purposes (Tang and Karim, 2017). Big data analytics has also created the fear of more jobs being computerized as big data analytics is providing real time approaches to help to solve business problems and reduce the level of complexity. These two technologies have created a huge wave of uncertainty on how the audit profession will shape up in the future and whether these factors will impact the audit profession to the extent as high as feared.

It is evident that technological advancement is ever rapidly affecting many different sectors and professions. Blockchain technology and data analytics are the two most recent technological advancements that have sent shockwaves throughout many professions and it is changing how things are done in those professions as we speak. For example, Big data is being used across many sectors, spanning business and marketing,

health, policy, and even politics. Police agencies are using big data analytics to anticipate criminality (Landon-Murray, 2016). With how these two technologies are affecting the other professions it is only fair to question whether the same would happen to the audit profession. Brender et al. (2019) and Jackson (2018) have conducted prior studies regarding the implication of blockchain technology on the audit profession. However, these studies have been conducted in developed countries of Switzerland and United States (US), respectively. Studies concluded that the interviewees believe blockchain technology will impact the audit profession in those countries. However, it is important to note that Malaysia is a developing country and there is an undeniable fact that there is a time lag between the implications of new technologies from a developed country such as the USA to a developing or least developed country (Utoikamanu, 2021). Therefore, the problem is to see whether there would be similar implication of these technologies in Malaysia and the extent to which it would affect the audit profession in Malaysia.

The study will focus on the perspective of auditors in Malaysia on the effects of blockchain technology and data analytics on the audit profession when it comes to the process of obtaining sufficient and appropriate audit evidence. With detection of fraud being another major area of concern in the audit profession, this study will also aim to provide insights on how these technologies could potentially assist auditors in the process of detection of fraud. Finally, the study will aim to give the audit profession in Malaysia a gauge of the future direction that the profession is heading towards and give the auditors an idea of the potential skills they may require in the upcoming years to stay relevant in the profession.

There is a lack of literature surrounding this topic as these technologies are fairly new and their implication to the audit profession are yet to be seen at a drastic level. Furthermore, research on this area in a Malaysian context is very much lacking and it is a gap that needs to be addressed as the future of the audit profession may highly depend on this matter. This study will help to provide the perspective of auditors in Malaysia regarding this matter. In essence, it will help the audit profession to get a better understanding of the current situation regarding the implications of blockchain technology and data analytics on the profession as well as give an idea of what is to come in the future and to prepare for it. This research could also be a foundation to further research being done in this area to cover more of the evidently present gap regarding this topic in Malaysia.

The remaining of the research paper will cover four sections. The next section will discuss the review of related literature and presents a theoretical background with respect to formal relevant studies carried out. This will be followed by the research methodology, findings and conclusion.

Literature review

Blockchain technology

Blockchain technology is also known as the distributed ledger technology due to how it functions. In simple terms, a distributed ledger is a digital record that will distribute among many participants connected through a network who have given their consensus on the rules to update their ledger. The records are essentially compiled and put together into blocks of data and they are kept in the form of a blockchain. The data will be arranged in a chronological manner with each block building next to each other (Koeppl

and Kronick, 2017). By providing real time record of transactions and ownership of assets, blockchain makes way for decentralized trading and contracting which questions the idea that these functions must be based on a centralized, public ledger or platform. This is where the virtual currency known as Bitcoin introduced in 2008 by Satoshi Nakamoto plays a big role as it is believed that a blockchain can be used to resolve this issue (Ammous, 2019; Besharat, 2019). The blockchain also creates an online ledger that help to distribute among the participants in the network to tamper proof that allows verification of online transactions that do not happen in person to be conducted without needing the trust in a third party (Patrickson, 2018; Collomb and Sok, 2016).

A well-made blockchain system would make it hard to manipulate or delete transactions as it would provide immutability by bundling transactions together into 'blocks' and then stamping them with unique identifying codes while still giving users access to the entries that they own and allowing them to conduct transactions that can be verified across the network (Henly et al., 2018; Koeppl and Kronick, 2017). With such features, Blockchain technology has the potential to change the audit profession in the future despite its issues such as lack of regulation due to it being in the early stages. Blockchain technology has the potential to reduce cost of maintaining and reconciling ledgers as well as provide certainty over ownership of assets (Rîndaşu 2019). Blockchain allows for processes such as confirmations to be real time and continuous allowing auditors to obtain a ready-made audit trail which will increase effectiveness and operational efficiency through the unchangeable and distributed record-keeping that blockchain technology provides (Smith, 2018a; Aste et al., 2017).

Blockchain is also believed to be the replacement of book-keeping and reconciling as all transactions are recorded and verified by the blockchain technology. Therefore, the need for auditors to reconcile transactions can be eliminated (Bishop et al., 2019). Blockchain will also result in auditors to change from the sampling method used in auditing to test the entire population of transactions which allows for increased level of assurance and audit quality (Wiatt 2019). Auditors will be required to come up with appropriate audit strategies for the increasingly complex systems and ways on how to tailor audit procedures to address the incremental risk blockchain will bring (Bishop et al., 2019; Mahbod and Hinton 2019).

Data analytics

Data Analytics is another emerging technology shaping how things are done in many professions. Data analytics is essentially a tool that helps transform large amounts of data that usually do not mean much on their own into more structured data which can be used for better decision making (Tang and Karim 2017). It seeks insights from a large amount of disparate data collected, processed and analyzed on a huge scale to reveal patterns, trends and relationships (Jiang and Zhang, 2015). It essentially crunches massive volume of data obtained from internal and external sources. Big Data Analytics allows for real-time data which basically means that data is being pushed through analytics software as it arrives. Its characteristics are based on the 3 V's which are volume, velocity, and variety. Volume essentially refers to the magnitude or the sheer amount of data that is being created. Velocity refers to the speed in which these data are being created and the speed at which it should be analyzed and acted upon whereas variety refers to the type of data such as structured and unstructured (Prem and Marthandan, 2018). The main reason data analytics is becoming huge is due to how complex businesses are getting which makes it harder to measure business performance.

Thus, data analytics helps analyze this large data's in order to make good business decisions and make sense of this large amount of data by asking the right questions (Patil, 2017; Danigelis, 2012). Therefore, data analytics help the firms to go for real time intelligence extracted from high volume of data and are capable of processing high volume of wide variety of data with unimaginable speed to bring out high value information for decision making. Data analytics is a tool helping companies from various industries to increase revenue, decrease cost and increase productivity which basically sums up the concept of data drives performance and data analytics drives results (Prem and Marthandan, 2018). With such features, this technology has the potential to impact the audit profession in a large scale and change the way auditors approach the audit process.

Big data analytics has created the fear of more jobs being computerized with the audit profession not being an exception as big data analytics is providing real time approaches to help solve business problems and reduce the level of complexity surrounding Accounting (Boomer, 2018; Rezaee et al., 2018; Vasarhelyi and Greenstein, 2003). With data analytics, the cost of gathering, processing, and storing information would reduce which can have an impact on the audit profession. Auditors would now have possession of audit evidence that is more reliable and relevant due to data analytics which would help improve audit quality and provide higher level of insight to the clients (Monterio, 2019; Alles and Gray, 2016). In essence, data analytics combined with new technology and access to detailed industry information will assist auditors in getting a better understanding of the business, identify risks and issues which in return enable them to deliver additional insights. Furthermore, the ability to analyze and review complete sets of data oppose to the traditional sampling method would bring a higher level of confidence to the audit. Due to the rise of Big data analytics, auditors would now be required to have some level of proficiency in data analytics in order to analyze and visualize data to provide the necessary evidence to draw conclusions. With real time data, data analytics creates potential for continuous audit to be done oppose to the traditional annual audit. Continuous audit would help reduce errors and fraud drastically as error checking and data verification is done in real-time with the aid of such technology (Murphy and Tysiac, 2015).

Obtaining sufficient appropriate audit evidence

With the introduction of blockchain technology and data analytics the question arises on whether these technologies will help the auditors in the process of obtaining sufficient and appropriate audit evidence. With Blockchain, auditors would now have to consider both the traditional stand-alone general ledgers alongside the blockchain ledgers when obtaining sufficient appropriate audit evidence (Atwood, 2018). Furthermore, with data analytics, there is likelihood for better standardization and transparency in accounting and reporting, which could enhance the efficiency of data extraction and analysis (Deloitte, 2017). By providing auditors access to immutable audit evidence via blockchain technology, the pace of financial reporting and auditing could be improved due to the improved efficiency in obtaining sufficient and appropriate audit evidence. An audit attempts to ensure that transactions that have been recorded are supported by evidence that is relevant, reliable, objective, accurate, and verifiable. When a transaction gets accepted into a reliable blockchain it may be deemed as sufficient appropriate audit evidence for several financial statement assertions such as the occurrence of the transaction (Deloitte, 2017). For example, this refers to a

transaction such as an asset recorded on the blockchain being transferred from a seller to a buyer such as a bitcoin transaction for a product, the transfer of bitcoin is recorded on the blockchain.

However, there is still the concern that these technologies might still cause difficulties in the process of obtaining sufficient appropriate audit evidence or might not be helpful to the extent expected. One of the issues with blockchain technology is that by recording a transaction in a blockchain it may or may not provide sufficient appropriate audit evidence when it comes to the nature of the transaction. This is because, by referring to the example above, an auditor may or may not be able to determine the product which was delivered by solely evaluating information on the Bitcoin blockchain. Therefore, transactions that have been recorded in the blockchain are still prone to issues such as it being unauthorized, fraudulent or illegal, incorrectly classified in the financial statements and so on (Atwood, 2018). Furthermore, even though every data in a blockchain is encrypted, if the private key is stolen and yet it still cannot be recovered by any third party. This would result in the assets to disappear and it is hard to identify the theft due to the anonymity that exists in the blockchain. This would cause problems such as auditors obtaining audit evidence of the existence of online assets but due to any loss of the private keys, it might disappear which questions the sufficiency and appropriateness of the evidence gathered (Li, 2017). Therefore, it is also wrong to assume that these technologies would improve the process of obtaining sufficient and appropriate audit evidence to the extent expected and would still require the discretion and skepticism of auditors when evaluating the evidences.

Detection of fraud

With the introduction of blockchain technology and data analytics the potential to assist the auditors in the process of detection of fraud and closing the gaps present in the current process due to inherent limitations seem evident. Data mining techniques can be utilized to identify patterns from financial records (Gray and Debreceny, 2014). Descriptive data mining tools can be used to discover internal fraud risks. Data analytics can help auditors identify specific journal entries with high risk profiles which will help them apply further audit procedures to assess the fraud risk (Capriotti, 2014). Through predictive analysis auditors can identify unusual patterns which lead to identifying high risk areas to identify potential fraud. It enables auditors to focus on outliers and exceptions, identifying the riskiest areas of the audit (Appelbaum et al., 2017). Data analytics provides enhanced risk assessment as now auditors will be able to efficiently and effectively identify risks in a timelier manner due to the real time risk analysis that data analytics provides (Rickett, 2016; Capriotti, 2014). Data Analytics can help provide real time data which will help answer a series of questions regarding fraud issues. With real time data, data analytics creates potential for continuous audit to be done oppose to the traditional annual audit. Continuous audit would help reduce errors and fraud drastically as error checking and data verification is done in real-time with the aid of such technology (Murphy and Tysiac, 2015). It can also help increase the rate of fraud detection which can lead to faster detection and recovery of consequences of fraud activity. Big Data can help auditors examine alumni relationships via operational analysis, especially those between audit committee members and managers (Tang and Karim, 2019). It can be used short term, by exploiting data and current information for the purposes to comply with the current activities for detection of fraud with maximum efficiency (Bănărescu, 2015).

The main role of operational analysis is to help auditors to detect and reduce illegal activities, by examining links between suspects, their characteristics (direct or/and indirect subordination relations), communication method and so on. It can assist auditors to complete the information asymmetries or to eliminate uncertainties and contradictions that may be present. In short, big data makes way for a greater resourceful information base that allows auditors to efficiently translate audit evidence into fraud risk factors (Tang and Karim, 2019).

Skills required by the audit profession in the future

The skills required by audit profession will see a transformation as these technologies start affecting the profession. With blockchain technology increasing the use of smart contract technology, the need for auditors to possess new skill sets which may require technical training to perform increases (Mahbod and Hinton, 2019). Blockchain allows for immutability in transaction recording which reduces the need for transactional level work done by auditors. However, the skills possessed by auditors may not become redundant completely but they would have to enhance their existing skills with new skills to adapt to the changes in the profession as the integration of big data will demand a greater skill set. For example, an auditor examining traditional audit evidence regarding inventory will now have to gather other relevant evidence supported by big data and analyze it. Therefore, audit professionals would be required to possess skills in both audit and information technology (IT). The need for IT, data analysis, statistics and modelling skills in the accounting profession will increase (Zhang et al., 2018).

Furthermore, with data analytics, it provides real time data for auditors to work with which helps enhance the traditional way audit has been done all this while using the sampling method. Therefore, the work done by auditors would shift from recording or verifying the data to using the data and making better decisions of answering higher level questions using their judgment which was not possible before without the enhancement data analytics provides. For example, audit professionals would apply existing competencies and skill sets, namely the ability to report and communicate different types of information, to new streams and sets of data (Smith, 2018b). Additionally, auditors will not only have to understand the data as it is produced, but also be able to interpret and explain the implications of this information to management decision makers. This would also require auditors to enhance their advisory skills for the future as blockchain advisory services will continue to develop (Dai and Vasarhelyi, 2017). This shows that skills such as IT, data analytics, modelling, advisory and so on, will be required in the audit profession as these technologies start to shape the future of the profession.

Gaps surrounding the study

The studies on how blockchain technology and data analytics affect the audit profession in terms of assisting auditors in obtaining sufficient appropriate audit evidence and fraud detection are all fairly new thus creating a gap in the amount of research studies available. Some of the prominent studies on the implication of blockchain technology on the audit profession were conducted by Brender et al. (2019) and Jackson (2018) and these studies have been conducted in developed countries of Switzerland and United States (US), respectively, by interviewing auditors from those

countries. Therefore, there is an evident gap surrounding the lack of literature and there have been no major studies done in developing countries outside of these developed countries. Therefore, this study would aim to fill the ever-present gap, which would allow auditors to better understand how these technologies will affect the audit profession in the upcoming years.

Materials and Methods

A qualitative approach was used in this research. Qualitative research is an interpretative approach which attempts to obtain insight into the specific meanings and behaviors experienced in a certain social phenomenon through the subjective experiences of the participants (Palmer and Bolderston, 2006). It essentially allows for a more subjective analysis which is more in depth. In this case, a qualitative approach makes the most sense as the aim is to obtain the perspectives of the auditors on what they think the implications of these technologies would be in the audit profession. Data was collected through a semi-structured interview where respondents were asked similar set of questions regarding the topic, but flexibility was allowed in the conversation. Auditors were approached by the researchers and were asked the permission on whether they would want to take part in the interview. The purpose of the interview was clearly explained before seeking consent from the auditors to participate in the interview and none was forced as they were willing to take part on their own accord. Amidst the current pandemic situation, interviews were conducted via telephone calls and emails. The mode was chosen depending on the preference of the participants. The telephone calls lasted averagely around 20 to 35 minutes. The calls were audio recorded in order to be used for the data analysis process later. The participants were asked for permission to record and all protocols were followed after obtaining the consent of the participants. Another manner in which the interview was conducted was via e-mails. The participants who were particularly busy to arrange a specific time to have a call opted for interviews via email. The questions were sent to them via email after obtaining consent to take part in the interview and they were given time to provide their typed responses back via email.

Purposive sampling was adopted in selecting the participants. Purposive sampling is selecting participants in the idea that they would be the perfect sample to define the population where the researcher believes the participants in the sample warrant inclusion (Taherdoost, 2016). Participants were sought after on LinkedIn randomly based on their profession of being an auditor with knowledge on Data analytics and Information Technology (IT). They were approached regarding the interview on whether they would be free and willing to take part as well as whether they had sufficient knowledge on the topic. Participants who had knowledge on the specific Audit processes, Blockchain Technology, Data analytics and those who were willing to take part in the interview are the ones that were chosen in order to obtain the best perspectives regarding the topic as they would be able to provide more meaningful responses. In total, there were 12 participants consisting of 7 males and 5 females. 8 of them were auditors from the Big 4 whereas the remaining 4 were auditors from non-big 4 companies but from well-known audit firms. All the respondents either have a professional qualification or are currently working towards one. The majority of respondents (6) have an ACCA followed by a few other participants being holders of CPA, MICPA, CFE, ICAEW and MIA. Some of the respondents also have professional

qualification related to data analytics or IT related qualifications such as Certified Network Security Specialist issued by International Cybersecurity Institute and Society of Actuaries (SOA). Most of the respondents have a working experience around 3 to 5 years in the field of Audit in positions of Senior Auditors, Audit Associates and IT Auditors. There is also a very well experienced respondent from a renowned audit firm who has 32 years of working experience in Audit and is currently an Audit partner. A simple summary of the demographic details of all 12 respondents are presented in the *Table 1*.

Table 1. *Respondents' profile.*

Auditor	Gender	Work experience	Professional qualitifcation
A	Female	2 years: IT auditor	Working towards CPA
B	Male	5 years: Senior auditor	MIA, currently working towards ACCA as well.
C	Male	3 years: IT auditor/data analyst	Society of actuaries (SOA)
D	Male	1 year: Audit associate	ACCA
E	Male	32 years: Audit partner and member of the partners	CPA(m), CFE, MIA
F	Male	5 years: Senior IT auditor	Certified network security specialist issued by International Cybersecurity Institute
G	Male	4 years: Internal auditor	ACCA
H	Female	5 years: Senior auditor	ACCA
I	Female	3 years 7 months: Senior auditor	MICPA
J	Male	4 years: Audit associate	Working towards ACCA
K	Female	1 year 2 months: Associate 2	Working towards ICAEW
L	Female	2 years: Associate level 2	Working towards ACCA

The data analysis was done using thematic analysis. Thematic analysis is essentially a qualitative method for identifying, analyzing and reporting patterns within a data corpus using themes which can produce insightful and trustworthy finings and also acts as a connector between those speaking the languages of qualitative and quantitative analysis which allows them to communicate each with each other (Scharp and Sanders, 2018; Nowell et al., 2017). Prior to that, the data had to be assembled. Those that were done via email were already in text making the process easier. However, those interviews that were done via telephone calls had to be transcribed from the audio recordings. Once this was done, all the necessary data was in text form which allowed to the next step of the analysis. Microsoft Excel was used in order to conduct the thematic analysis by slowly reducing and grouping the data into themes making it easier to present the data.

Results and Discussion

This section will look at the respondents' answers on how these technologies of Blockchain and Data Analytics will assist the auditors in process of obtaining sufficient appropriate audit evidence and detection of fraud. It will also cover the future outlook of the audit profession and the skills required by the audit profession due to the emergence of blockchain technology and data analytics. Questions were asked to the respondents regarding this matter and the main themes have been identified and presented below for each question.

Obtaining suffieicnt appropriate audit evidence

Blockchain technology

Auditors would have to consider both the blockchain and traditional ledger in the future. Auditor E states that:

Both traditional stand-alone ledgers and blockchain ledgers would need to be considered when obtaining sufficient appropriate audit evidence. Auditors will need the blockchain audit trail to help on verifying the transactions, but the process would be much faster oppose to traditional method.

Blockchain provides a secured and verified digital record which allows collection of audit evidence at a faster rate and of higher quality allowing for higher standardization and transparency in reporting. Auditor A mentioned:

Blockchain provides security and makes it hard to manipulate transactions which allows auditors to obtain audit evidence of higher quality at a faster pace as everything would be readily available. With data access on Blockchains, evidence can be obtained in a consistent and recurring format.

Auditor K added to this point by mentioning that:

I believe that it will help auditors as blockchain technologies make the transactions more transparent which would save the audit team's time when gathering such audit evidence. For example, sending out third party confirmations may no longer be required as the transactions can be found on the blockchain technology.

Auditor D further emphasized on this point by stating how Blockchain Technology could reduce the workload of auditors in this process:

Audit evidence basically are just documents documented by clients into files, while auditors need to search and make copies of such files and to create a folder to store these files to be taken as audit evidence....Thus, the emergence of blockchain seems to be the solution for this dead-end audit process. This can reduce unnecessary workloads that are not productive, consequently increasing the time available for auditor to perform and focus on other higher-level tasks. Client management team will be required to submit / upload the required documents into blockchain system for verification purposes on all related transactions throughout businesses, whether from supply chain, product manufacturing, assembly, collection, sales, and product delivery. These

procedures require documentation such as e-signature, agreement, invoice and contract as supporting documents for future references.

On a contrary, Auditor E mentions that Blockchain Technology at its current stage of development might not be the relevant to this specific process of Audit. Auditor E states:

Blockchain might not be so applicable in this process of audit as it is more towards storing the ledgers and transactions. It is also irrelevant in this process as information for each of the audit engagement is highly private and confidential. However, we are monitoring the developments in blockchain technology in considering whether blockchain technology will allow the auditor to create automated audit routines.

Data analytics

Data analytics provides real time data allowing for efficient obtainment of audit evidence. Auditor A mentioned:

As for data analytics, the real-time data feature it provides also would allow auditors to obtain the necessary evidence efficiently.

This was further emphasized by Auditor G who stated:

The real time availability of the data allows for evidence to be obtained on time as required allowing for sufficient and appropriate collection of audit evidence.

Data analytics allows auditors to easily navigate vast amount of information to obtain the necessary evidence. Auditor C stated that:

Using SQL, you can select samples easier with certain criterions. Most seem to do things manually and use their gut feeling to generate random samples but it would be much better to use data analytics such as SQL to filter out the thousands and millions of data and obtain the appropriate evidences.

Data Analytics can enhance the process of obtaining audit evidence by identifying key areas which require further evidences or investigations. Auditor B mentioned that:

From my audit firm's perspective, we use an analytical software which puts the general ledger in the system, and we can choose what we want to look at or what data to visualize. For example, we can use the software to identify what unusual transactions or outliers we are looking for. It can help reveal trends for the population in order to analyze the specific accounts. With that we can further investigate what evidence to collect. For example, the system could identify too much of reversal and it will list down all the reversal and from there you can select a sample and ask the client why have they done that and ask them to provide the evidence for that.

This point of how data analytics pinpoints the areas of concern which would direct the auditors to further investigations with the client was explained with an example by Auditor E who mentioned:

One of the areas considered under risk assessment in some firms is the review of 'journal entry dashboards. Comparisons can be made with other businesses or prior years using the information obtained in these dashboards. These dashboards will allow to auditors to identify high risk areas which would help them prepare for further substantive testing which could involve analysis on unexpected users and large journals. Dashboards allow auditors to identify specific journals which may require testing and helps address queries on whether journals are being posted by someone not involved with the finance department.

Detection of fraud

Data analytics helps identify unusual transaction/high risk areas more efficiently

This is the major point almost every respondent has agreed with by saying how data analytics can help auditors in identifying unusual transactions and high-risk areas more efficiently. Auditor D stated:

Data analytics will help in identifying the high-risk areas which are more likely to have fraud and help auditors identify unusual patterns which would help them take additional audit procedures.

Auditor E mentioned:

However, with the help of data analytics, it will help to analyze the unusual transactions, contra journal entries, account user's abnormal login time/date, unusual user's activities, unusual authorities' pattern on the accounting system. It will assist the auditor in looking for fraudulent financial reporting and misappropriation of assets. High risk areas and discrepancies would be more easily identifiable.

This point was further emphasized by auditor H who stated:

With blockchain and data analytics, it would be easier for auditors to analyze companies full datasets such as both structured and unstructured data rather than sampling to identify potential transactional anomalies (high risk areas), patterns of behavior and fraudulent transactions. This would help pinpoint the areas auditor would have to focus on which would ideally improve the level of fraud that is detected.

An example was provided by Auditor C on how data analytics can achieve this by stating:

Journal entry testing can be conducted to see if the journal entries match with the difference of the opening and closing balance of the trial balance. Parameter testing where you could pick out certain specific transactions, for example, users who posted during holidays or users who posted duplicated entries or users who posted huge amount of transactions. By pulling out these certain high-risk areas using data analytics and parameter testing we can see the areas of suspicion which seems unusual and identify fraud better.

Finally, Auditor L agreed with this similar point and provided further explanation by stating:

Data analytics on the other hand, has arrived at quite a mature stage with different firms coming up with different models. Power BI for instance, it can hold a large volume of transactions with different parameters that can be set, targeting at the journal entries posted by the management team. So, as the results generated will be directly obtained from the system, auditors are able to directly analyze if there are suspicious entries, then proceed with obtaining supporting documents. It has definitely replaced human limit of looking for a large amount of data manually and entries that are susceptible to fraud, however, it should be noted that human action is still involved in analyzing the trends and investigating the back-stories of such transactions. Data analytics only improve on presentation of trends and findings.

Data analytics provides real time data for better fraud deterction

Most of the respondents agree that data analytics allows for real time continuous data resulting in better fraud detection compared to traditional methods. Auditor A stated:

The real time data will allow for the change in method from sampling to being able to check most entries if not all of it.

Auditor D added:

It will definitely assist more in detecting higher level of fraud compared to the traditional sampling method.

Auditor F further emphasized on this point by stating:

Yes, it allows for continuous monitoring and continuous auditing of business transactions and accounting activity. When everything is streamlined and in real time it would assist the auditors in identifying fraud better.

Auditor G mentioned:

The real time data made available by data analysis really makes a difference as it can enhance the risk assessment procedures allowing identification of risk in a timelier manner.

Finally, auditor H provided further explanation by stating:

Back in the days, an auditor would manually have to go through large amounts of both structured (transaction data or general ledger) and unstructured data such as email, voice or free-text field in the database and electronics tags together with the massive amount of non-traditional data sources such as social media. However, now with blockchain and data analytics, it would be easier for auditors to analyze companies' full datasets as they are all available in real time.

Blockchain technology

A few of the respondents agree that blockchain technology ensures records are secured and immutable which eases detection and reduces risk of fraud. Auditor J stated:

Blockchain technology will help enhance the process of fraud detection by giving access to the public ledger that cannot be amended easily in the blockchain.

Auditor E provided further explanation on this point by stating:

The client that is using blockchain to record the transactions will generally reduce the risk of fraud as one of the benefits of blockchain technology is preventing people from editing or manipulating the transaction. Every in and out transaction is captured by the blockchain system. Auditor will base on the blockchain ledger and audit trail to verify the transaction.

Future of the audit profession

Technological/data driven approach

Most of the respondents agree that the audit profession will head towards a more data driven approach which would see these technologies becoming a vital part of many audit processes. Auditor C stated:

Audit profession would head towards a data driven approach. Companies who use this approach will be more successful because they make decisions better rather than relying heavily on gut feelings or making less data backed judgements.

Auditor G mentioned:

Data analytics could be implemented to the audit processes and blockchain could also be seen to be more prominent in the upcoming years as a new alternative for storing ledgers and transactions. Currently data analytics is on a pretty basic level such as utilizing excel or SQL for more advance matters, however we could see advancements in most companies in the upcoming years and more advance tools do analyze data could start entering the picture.

Auditor J touched on how this change in approach could lead to gaining competitive advantage:

The audit field will be more reliant on technology such as virtual platform and data analytics to pose a competitive advantage in providing a better service to their client by balancing audit quality and value-creating to their clients. Furthermore, "professional judgement" may be subject to AI analytics, hence human interruptions or influence will be minimal.

Auditor A Stated how this technological approach would reduce auditor's workload:

Modern auditors would tend to rely more on the technologies which has its pros and cons. Technologies such as data analytics can help auditors to reduce their workload making auditors work easier.

This was further emphasized by Auditor L:

The profession may be heading towards a more extensive usage of tools and software where a large amount of time can be saved as much as possible for results to be generated automatically and quicker, although it is important to note that it will be hard to affirm that technologies will be able to cover all manual areas.

Auditor E talked about the transparency that blockchain would create which would make the recording process easier by stating:

I would say that blockchain technology will help create new value to people. For example, a supplier and a customer using the blockchain technology will create an unchangeable transaction in the network and shared in between the blockchain system, it will further reduce the risk of human error or fraud in the companies. We can imagine if all the clients are using the blockchain system, the verification on all accounting transactions will be easier, more transparent and more reliable.

A challenge for fresh graduates and junior auditors

Some of the auditors believe that the changes to the audit profession would lead to issues where fresh graduates and junior auditors would find it hard to get a job as their job will become redundant with technologies such as blockchain and data analytics. Auditor B stated:

It can be a trap for juniors especially the fresh graduates as we would not require people to do tasks such as vouching. For example, with vouching we select the sample we look at the sale invoice and vouch with the accounts. Most of this is done by fresh graduates. With the introduction of these technologies, all of this can be done automatically by the system so we would not need fresh graduates to do this anymore. Only seniors would be required mostly to work on the judgments using these data that the systems provide so harder to get jobs especially for fresh graduates.

Auditor E also mentioned:

The audit works like "vouching", "matching" or "casting" might not apply in the future audit because everything will be done by artificial intelligence.

Auditor H further emphasized on this point by mentioning:

We might see a huge reduction in lower level audit jobs such as transactional level jobs as all of this would be done by the technologies. Senior auditors or those who are required to make judgements based on the data would be required more. However, junior auditors could struggle massively as they might not even find a job to get the experience to become a senior level auditor to be relevant in the future of the audit profession.

The extent of the impact of these technologies might not be as big as feared

Although the auditors agree that the profession will see changes moving forward with the introduction of blockchain technology and data analytics, some believe the impact will not be massive at lease in the upcoming 5 to 10 years. Auditor K stated:

I foresee with the introduction of all these new technologies that auditors will need to be more technology savvy in keeping up with the rapid changes and advancements. However, I do not see these new technologies threatening auditors' jobs as in my opinion, professional skepticism and judgements still has to be made by auditors. Hence, instead of threatening their jobs, I see new technologies as complementing their work instead.

Auditor L further emphasized on this by stating:

While AI is on the talk now, I personally do not think it can be accomplished at a well-developed stage within the next 10 years, besides, not only do we still require human judgment to analyze the results, the client-auditor relationships may still be hard to be replaced by AI because this is a service industry after all.

Auditor D mentioned about the confidentiality issues which could cause the changes to be slower than anticipated:

There is still a doubt whether such technology will be fully implemented to the point where auditors (mainly lower level) are fully replaced. Businesses might also not fully implement technologies like blockchain as they will not permit the excellence in transparency to happen.

Skills required by the audit profession in the future

IT related skills

With the introduction of technologies such as blockchain and data analytics, most of the respondents agree that IT related skills such as data analytics skills will emerge as requirements for auditors in the upcoming years. Auditor A stated:

In the future, with these technologies we can see an increase in need for IT skills and data analytics skills alongside the current skills we have.

Auditor C mentioned:

Auditors need to be more open- minded and adaptable to changes as these technologies will change how a lot of things are done in the profession Technology changes rapidly so auditors need to be able to adapt. There need to be willing to learn other skills such as coding and programming languages. Auditors would also require data analytic skills and communication skills as well.

Auditor B elaborated on the need for data analytics skills with an example by mentioning:

There would require data analytics skills. Now auditors need to understand more on how to analyze the data only from there you would know the procedures to be done. For example, my one of my audit clients implemented a new software in the past year, which is attached to excel, and the company is utilizing cash basis and it involves a lot of data. Therefore, we cannot use the traditional method to form an audit opinion. So, with these technologies, it can analyze the data to help form a better audit opinion.

Auditor J mentioned how the introduction of these technologies will require changes in the current skills auditors possess to IT related skills:

The major skills that auditors require today are most-used such as audit trail tracking, perform test of control manually and detect for unusual transaction via reasonableness test or manual-check GL will all soon be replaced by FinTech. Knowledge such as IT footprint tracing on virtual platform rather than the conventional "debit-credit" tracing will be required. In addition to this, focusing on analyzing and interpreting data analytics and blockchain results will also be necessary for auditors in the future.

Finally, Auditor K stated:

Among major skills required by auditors with regards to technology would be Excel skills as the most basic. As technologies continuously evolve, it is more important than ever now for auditors to learn more about blockchain technologies while it is still at its' relatively infant stage and less highly regulated, as there is a possibility that auditors would soon have to audit cryptocurrencies such as Bitcoin, Ethereum, and so on in the future when regulators tighten regulations surrounding blockchain investments.

Professional judgement and skepticism

A handful of respondents believe that professional judgment and skepticism are vital skills for auditors in the professional currently and will remain vital in the future regardless of the introduction of these new technologies. Auditor A Stated:

The major skills are professional judgement and skepticism which is required throughout the audit in many of the areas.

Auditor E mentioned:

Currently, the major skills of the audit profession are professional judgement and professional skepticism, and critical thinking skills. Although the profession is transforming due to emerging technologies, the need for these types of essential skills remains.

Auditor G further emphasized on this point by stating:

Skills such as professional judgement and professional skepticism are those skills that are unique to auditors which will always be a major requirement regardless of how the profession changes with the new technologies as they are essential.

Communication skills

Most of the auditors believe that communication skills will be very important as auditors need to be able to present and explain their findings well to be understood easily by clients. Auditor C stated:

Communication is important with data analytics as you have to be able to communicate and collaborate with both ends where one is fully in the business technical side such as finance and the other side which is fully focused on the IT part of things. Collaboration skills would also be required.

Auditor H mentioned:

Some of the skills required currently will stay constant such as communication skills. The part of an auditor having to communicate or express their opinion to clients will always be part of the job.

Auditor G further explained how communication skills will be more important in the future with the introduction of technologies such as data analytics by stating:

In the upcoming years, auditors would require more data analytics skills as well as good communication skills in order to visualize and present their data to be understood well by other staffs and clients.

Finally, Auditor L provided enhanced insight on the importance of communication skills in the audit profession moving forward by mentioning:

Communication skills are vital. This entails both email communication and face-to-face communication (physical/Zoom/Skype). Whilst face-to-face communication directly puts you at a certain pressure when facing client, it is the best method if a major issue needs to be communicated effectively, not only you may be able to directly demonstrate or present the issues, client values if you can articulate well with a good eye contact. Email communication, on the other hand is important to keep track of the matters that have been discussed in "black-and-white" so that we can trace back from the email trail in the future, it is also important to main a composed tone. This also replaces the weakness of face-to-face communication which only relies on verbal evidence.

Conclusion

From the research, it is evident that these two technologies will assist the auditors in obtaining sufficient appropriate audit evidence as most respondents agree with this. However, on a contrary a few auditors believe that blockchain technology might not be a suitable technology in assisting auditors in this specific audit process. Secondly, most of the respondents are in the consensus that blockchain technology and data analytics will assist the auditors in the process of fraud detection by allowing them to detect fraud better. They believe that these technologies have the potential to fill the gaps that exist in the current process of fraud detection. Finally, we can see that the respondents expect the audit profession to be more technological and data driven in the upcoming years which could be a problem to fresh graduates and junior auditors. This is because, lower

level tasks such as vouching, and matching will be made redundant by these technologies and only the senior auditors would be required to make higher level judgments. This would result in fresh graduates and junior auditors struggling to find a job. However, they believe the extent of the change will not be as large as feared in the upcoming years which allows the auditors to prepare for the skills they might require in the future such as data analytic skills, programming skills, communication skills and so on.

Therefore, these two technologies will impact the audit profession in various ways in the foreseeable future which the auditors would have to prepare for. The findings are along the same lines of similar research done by Brender et al. (2019) and Jackson (2018) in the countries of Switzerland and United States (US) respectively. The study is not without limitations. Amidst the current circumstances regarding the Covid-19 pandemic, it was more feasible and preferred by the respondents to conduct telephone interviews and email interviews. With the email interviews, it is harder to have a conversation like interview as respondents would just provide their responses for the questions asked. Therefore, if there were face to face interviews, a good atmosphere could have been created to ease the respondents which could have made the data collection process smoother and have the possibility of obtaining more in depth responses.

Furthermore, there are no specific guidelines on what the right sample size is when it comes to qualitative research. In this case, the sample size of 12 was used as the information was deemed sufficient. However, if a larger sample size were used the information obtained could be different or more enhanced. Therefore, the findings from this qualitative study cannot be generalized to represent the entire population. Future research could look at how other technologies may impact the audit profession such as Artificial Intelligence (AI). This would allow the audit profession to prepare for the imminent changes that will affect the profession in the upcoming years. Future research can also be done on the impact of these technologies of blockchain and data analytics on the other major audit processes other than obtaining evidence and fraud detection. For example, impacts of these technologies on exercising professional skepticism can be looked at. Furthermore, the research could be done using face to face interviews with a larger sample size. This would potentially allow for better representation of the population.

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Conflict of interest

There is no conflict of interest with any parties involved with this study.

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