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Blockchain Disruption on Management Accountant as Business Partner: Systematic Literature Review

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Abstract

Recent technological advancement presents an indispensable and immense impact to the strategic direction at many industries and professions, of which the management accountant's role have also been gradually evolved. As a result, the role of management accountant is transitioning to become a business partner. This research aims at explaining about how blockchain disrupt management accountant's role as a business partner. To achieve the objective, we consider two research questions: first, what are the latest research which focus on blockchain disruption in relation to management accountant as business partner and, second, how does blockchain disrupt management accountant as business partner. In this paper, we adopted a systematic literature review with formulated protocol based on several referenced studies. Selected relevant literatures were then reviewed to make sense the already-defined research questions. Total of seventeen literatures passed the screening and quality assessment process. We have figured relation between blockchain capabilities and management accountant's role as a business partner. Findings identify thirteen blockchain's capabilities that have relation. The distribution of primary studies and challenges on implementation of blockchain in general are also discussed.

1. Introduction

The role of management accountant has transformed from data and information oriented (Zainuddin & Sulaiman, 2016) into business and strategy oriented (Horton & Araujo, 2016). As a consequence, "*business partner role*" has emerged as a new term in which management accountants are expected to contribute by suggesting solution for occurring problems, participating in making decision for operational activities, and conducting strategic intervention (Morales & Lambert, 2013).

In executing the business partner role, management accountants are heavily influenced by information system (IS) implemented by the enterprise. This is due to the fact that the data and information used in performing an analysis depend on whether or not the system itself is reliable (Zainuddin & Sulaiman, 2016). One of the latest technology

that draws attention and perceived to be able to improve the performance of management accountant's business partner role is blockchain (Moll & Yigitbasioglu, 2019a).

Blockchain – a block of chain technology – is a new innovation that is attracting many practitioners and academicians interest with its capabilities to eliminate or reduce the role of a middleman (disintermediation), automate tasks and execution (automation) through the utilization of smart contract, and reducing cost as an implication from disintermediation and automation. As a distributed ledger technology, blockchain has the capabilities and characteristics that enables a more transparent and secure data record in comparison to a centralized transaction systems (Yli-Huumo, Ko, Choi, Park, & Smolander, 2016; Yoo, 2017). These capabilities are predicted to have impact on how management accountant extract and analyse data.

As a preliminary stage of a systematic literature review, the researchers collected data from ScienceDirect with the keyword "blockchain application" and found a significant increase within 2016 – 2020 with the details as follow: 6 manuscripts in 2016, 47 manuscripts in 2017, 187 manuscripts in 2018, 635 manuscripts in 2019, and 492 manuscripts in 2020. The result shows that academicians' enthusiasm on blockchain technology is reflected from the increasing number of research in a form of journal article or proceeding.

Academicians and practitioners explored blockchain from many different perspectives by focusing on different domain or sector as well as applying different method and approach. One of the methods that is frequently used is a systematic literature review that is useful for identifying similarities in findings (Thomé, Scavarda, & Scavarda, 2016). However, there is only one journal article in a form of systematic literature review which focuses on the impact of blockchain on management accountant. It is very unfortunate because the role of management accountant is highly influenced by the development of IT and IS including blockchain technology (Pietrzak & Wnuk-Pel, 2015).

The existence of blockchain raise concerns among the practitioners of management accountant. It is shown by the result of a survey on 161 members of *Institute of Management Accountant* which concludes that 41% respondents are concerned that their existence will be eliminated by blockchain's capability in performing automation (Moll & Yigitbasioglu, 2019a). It is unfortunate that there are only less then 20% of executives and decision makers in financial institution who understand about blockchain technology (Equisoft, 2017). This result indicates that management accountants are aware about the new technology, but they have not been able to take an adaptive move towards the change.

The impact of management accountant that is not adaptive with changes are threats from new professions or disciplines. The first threat comes from the emergence and development of new disciplines that have started to learn and adapt to the development of technology in accounting domain (Dutta & Lawson, 2009). The next threat is another profession such as the expert and professional that could threaten the jurisdictions of an accountant (Moll & Yigitbasioglu, 2019a). The consequence of these threats is that those new professions or disciplines could disrupt management accountant's area and role in an organization or enterprise.

That being said, the researchers are trying to review blockchain capabilities in disrupting management accountant's profession in performing a business partner role through a systematic literature review. The aim of this research is to identify blockchain

capabilities that could disrupt or support business partner role of a management accountant.

This paper will be organized as follows: Section 2 provides literature review related to blockchain technologies, management accountant's roles as business partner, and the concept of disruptive technologies. Section 3 outlines the process of the systematic literature review that was conducted. Section 4 describes the findings from the systematic literature review in a form of descriptions and statistics. Section 5 and 6 discuss and conclude the paper as well as provide suggestions for future studies.

2. Literature Review

2.1. Blockchain Overview

In general, blockchain can be defined as distributed ledger technologies that enable user to have a distributed peer-to-peer network that involves in confirming and verifying block of data (Yoo, 2017). In this technology, data blocks are time-stamped, chained or linked to other blocks, and distributed to every authorized user in the networks. On its report, Deloitte stated that blockchain is a special case of distributed ledger technologies where consensus protocol makes the data chained immutable and dispute ledger of all transaction that are shared with the members of the network (Deloitte, 2017).

Blockchain mechanism starts from transaction or data written in unconfirmed transaction which are distributed to all authorized nodes on the network. Subsequently, these unconfirmed transactions are checked by the nodes on blockchain network and will be confirmed if there is a consensus. Blockchain system would give hash value to the confirmed block, then the block will be chained to the previous block. The hash value came from an algorithm that change all of the data into a combination of digits. When there is an alteration or modification on one block, the hash value will change and impact other blocks. This mechanism made all of the data stored in a blockchain to be immutable or secured from any alteration or modification.

Blockchain consists of four building blocks and components, namely blockchain transactions, cryptography & digital signature, data stores, and consensus mechanism (Alketbi, Nasir, & Talib, 2018). Blockchain transactions enable transfer of data, information, or value between two users without the need of a third-party or a centralized authority. The data stored in a blockchain is a ledger consisting transactions or data from unconfirmed pool, and blocks that were verified by a consensus mechanism. Cryptographic digital signature is used to check the authenticity of each data. Consensus mechanism is known as a mechanism which ensures that the blocks do not contain any contradicting or invalid transaction or data. There are two common consensus mechanism known as Proof-of Work and Proof-of-Stake.

Current literatures categorised blockchain into public, private, and consortium blockchain. These three categories were formed according to the network's management and permission (Casino, Dasaklis, & Patsakis, 2019). Public blockchain enables anyone to join the network as miners or nodes in which every node can perform operation such as validating transaction and copying information blocks. The key benefits of public blockchain are transparency and security of transaction (Kshetri, 2017). On other hand, private blockchain is a type of blockchain which only several users or miners or nodes are

allowed to join the networks with particular characteristic and permissions over the network operation. One of the advantages of private blockchain is that transaction speed in a privately-run blockchain can be faster than those in a public blockchain (Petersen, 2017). A consortium or federated blockchain is a combination of open and private blockchain. This type of blockchain can be defined as a blockchain that is accessible only for limited public and partially centralized users.

2.2. Management Accountant as a Business Partner

Management accountant's role are shifting to become more strategic and business oriented (Horton & Araujo, 2016; Zainuddin & Sulaiman, 2016). In other words, the role is transforming from a bean-counter management accountant to a business partner which integrate leadership, communication, and analytical skills in comprehending both financial and non-financial indicators.

As a business partner, management accountant is expected to support and assist managers by taking a part in daily operational decision-making process and undertaking strategic interventions after performing risk and data analytics (Morales & Lambert, 2013). To sum up, they can contribute by providing a report on financial and business process analysis that will be helpful for the management in making decision. Furthermore, management accountant's role that is becoming more strategic and business oriented also leads them to become more innovative (Janin, 2017).

A research by (Janin, 2017) categorises management accountant's role as a business partner into external business partner and internal business partner (Janin, 2017). Janin identified management accountant who monitor daily expenses, allocate budget into the core business of a company, track and reduce inefficient cost items, and analyse multiple contracts within an organisation as internal business partner. In a way, it can be interpreted that management accountants work within an organisation. On the contrary, external business partners are those who become a bridge between management and external actors e.g. *Directions Nationale du Controle de Gestion* (DNCG) Auditors

3. Methodology

This research used a systematic literature review to answer the research question. Systematic literature review (SLR) are a systematic, comprehensive, and reproducible method for collecting, identifying, screening, and synthesizing literature and recorded work produced by researchers and practitioners (Okoli, 2015).

The protocol used in this study is inspired by Chitu Okoli, Kitchenham, and Charters guidelines. The overall methodological approach of this study includes the following steps:

1. Identifying objective and outcome research
2. Formulating research question
3. Preparing search and review protocol
4. Assessing quality of studies by title screening, abstract screening, and quality assessment
5. Data extraction
6. Data synthesis
7. Reporting the result of the review

3.1. Formulating objective and research question

The first step of systematic literature review is the formulation of the research objective and research questions. The purpose of this review is to provide an in-depth view of blockchain disruption in management accountant's role as business partner. Therefore, we determined one research questions:

RQ 1: How does blockchain disrupt management accountant as business partner?

Database and Search Terms

The second step of this review was preparing and planning a search strategy. The purpose of this strategy is to minimize the possibilities of research bias (Yli-Huumo et al., 2016). The database and search strings used are listed in Table 1 below.

Table 1. Database and Search Terms

Database	Search Terms
Science Direct	(Blockchain OR blockchain application OR Distributed Ledger OR Smart contract) AND (Management Accounting or management accountant or accountant or business partner)
IEEE Explore	((Blockchain OR Blockchain Application OR Distributed ledger OR Smart Contract) AND (Management Accounting OR Management Accountant OR Business Partner OR Accountant))
JSTOR	((((blockchain) OR (blockchain application)) OR (smart contract)) AND (Management accountant))
ACM Digital Library	[[All: blockchain] OR [All: blockchain application] OR [All: smart contract] OR [All: distributed ledger]] AND [[All: management accounting] OR [All: management accountant] OR [All: accountant] OR [All: business partner]] AND [Publication Date: (01/01/2010 TO 31/12/2020)]
SpringerLink	(Blockchain OR blockchain application OR Distributed Ledger) AND (Smart contract AND Management Accounting OR management accountant OR accountant OR business partner)
PlosOne	((everything:Blockchain OR everything:"Blockchain Application" OR everything:"Smart Contract") AND (everything:"Management Accountant" OR everything:"Management Accounting" OR everything:"Accountant"))
Emerald	(content-type:article) AND (Blockchain OR Blockchain Application OR Smart Contract OR Distributed Ledger AND (Management accountant OR Management Accounting OR Accountant OR Business Partner))

3.2. Study Selection

Not all the papers and studies collected are relevant to the research questions. Therefore, their relevancies should be assessed by going through the first selection process that is title and abstract screening (Kitchenham et al., 2009; Taylor, Dargahi, Dehghantanha, Parizi, & Choo, 2019).

Inclusion Criteria in this stage are: (1) Manuscript published in span of 10 years (2010-2020); (2) Focus on the topic of blockchain, Business, and/or Accounting; (3)

Manuscript written in English Language. Exclusion Criteria are: (1) Conference Proceedings, Magazines, Books, Opinion Pieces, Viewpoints, (2) Not written in English

3.3. Search and Screening Process

Fig.1 shows that the papers were obtained by applying the search strategy on seven databases that are IEEExplore, Springerlink, ACM, Science Direct, PLoS One, JSTOR, and Emerald. Throughout the search, we have obtained a total of 677 papers from phase one.

Prior to the first screening that contained abstract and title screening process, we have eliminated duplicated papers. The duplication screening was carried out with MAXQDA 2018 as a qualitative data analysis software and Mendeley as a citation manager. After the screening process, one paper was found to be a duplication and was eliminated resulting a total of 676 papers.

Afterwards, the researchers carried out the second phase of the research that is filtering the remaining 676 papers based on the abstract and title of each manuscript. In this stage, MAXQDA 2018 was used to assess the relevancy of each paper with the research question of this study. From this phase, 528 papers were eliminated resulting a total of 148 papers that will be processed in next stage.

Thereafter, the researchers conduct manual screening as a way to enhance the reliability of the screening process. In this stage, each paper's abstracts relevancy was assessed based on the topic "*blockchain capabilities that might disrupt management accounting and accounting profession*". From this phase, a total 17 papers were obtained as the relevant manuscripts that will be reviewed in quality assessment, data extraction, and synthesis phase

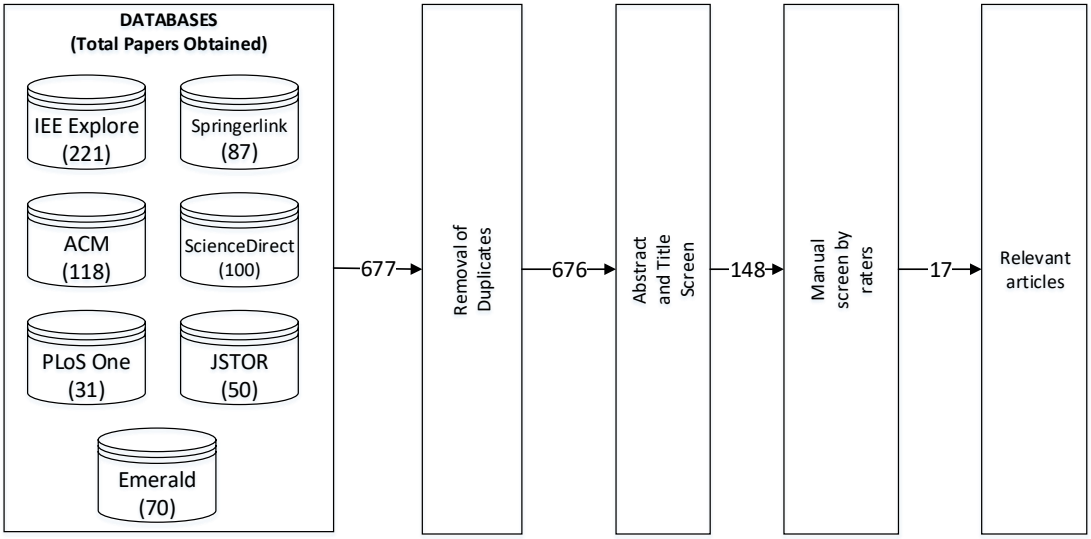

Fig. 1. Process Search and Screening Literature

3.4. Quality Assessment

In this phase, we scored each relevant studies based on the quality assessment criteria list that was adapted from the systematic review guidelines which the purposes to make sure that the selected manuscripts are within the context of the study (Kitchenham & Charters, 2007). There are six items as shown in Table 2.

Table 2. Quality Assessment Table

Quality Assessment Items	Assessment Criteria [Score]
What is the method used in the paper?	Empirical AND design paper [1]; Empirical OR design paper [0.75]; Empirical AND conceptual paper OR design AND conceptual paper [0.5]; Conceptual paper [0.25]; Others [0].
To what extent blockchain in management accountant and accountant profession is being discussed?	More than 3 information cues [1]; Two to three information cues [0.5]; One information cue [0].
How intensive does the paper cover an area of interest?	More than 3 information cues [1]; two to three information cues [0.75]; one to two information cues [0.5]; not detailed [0]
Does the research provide detailed illustration on blockchain capabilities?	
Does the research provide detailed information about blockchain's challenge in general?	

3.5. Data Extraction

The next stage is data extraction from relevant manuscripts that passed the screening and quality assessment process. In this stage, we extracted data from the 'remark' column in quality assessment form which contains information about blockchain capabilities that might use or remove management accountant or accounting's jobs; management accountant's roles as business partner; blockchain capabilities in general; and challenges in blockchain implementation. Also, we collected some basic information from the papers. We use those data to identify the distribution of primary studies.

3.6. Synthesis

The first step in synthesizing is open coding phase. In this phase, the researchers tried to generate as many categories as possible to make sure that this phase is open to whatever is going on in the data (Avdelidou-Fischer, 2013). The second phase that is axial coding which is researchers established a link between categories from open coding phase, then categorised them into a higher-order analytical construct (Avdelidou-Fischer, 2013; Broom, 2005). In this phase, we categorized the main properties or categories from open coding phase. In the last phase, we produce a theoretical scheme that become the centrepiece of the analysis and answer the research question. The technique of writing storyline, reviewing notes, and using software products helped us in this stage.

4. Results and Discussions

4.1. Result

There were 17 papers as result from screening and quality assessment phase. These papers can be found in table 1 in appendix.

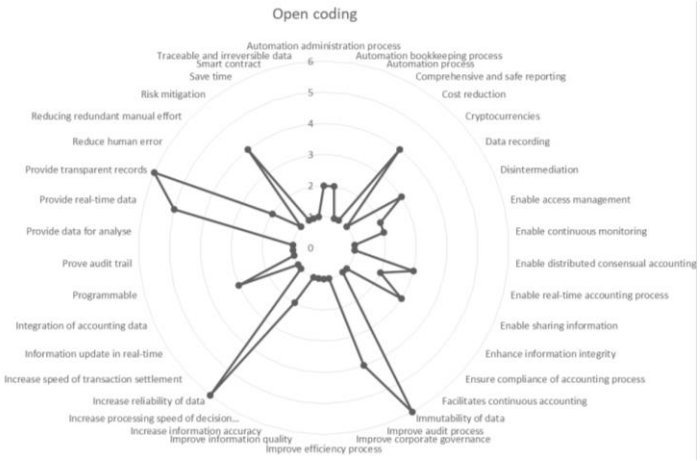

Figure 2. Open Coding for Blockchain's Capabilities on Management Accountant's Roles

Figure 2 and 3 presents open and axial coding for blockchain's capabilities that might disrupt management accountant's role as business partner. The result indicated that the most frequent terms in open coding are "Immutable data", "Increase reliability of data", and "Provide transparent records" which were mentioned by six papers, followed by "Provide real-time data" that was mentioned by five manuscripts. We also found that "Cost reduction", "Improve audit process", and "Risk mitigation" each have been mentioned by four manuscripts. Other open codes that were mentioned by less than four manuscripts are shown on table 7 in appendix.

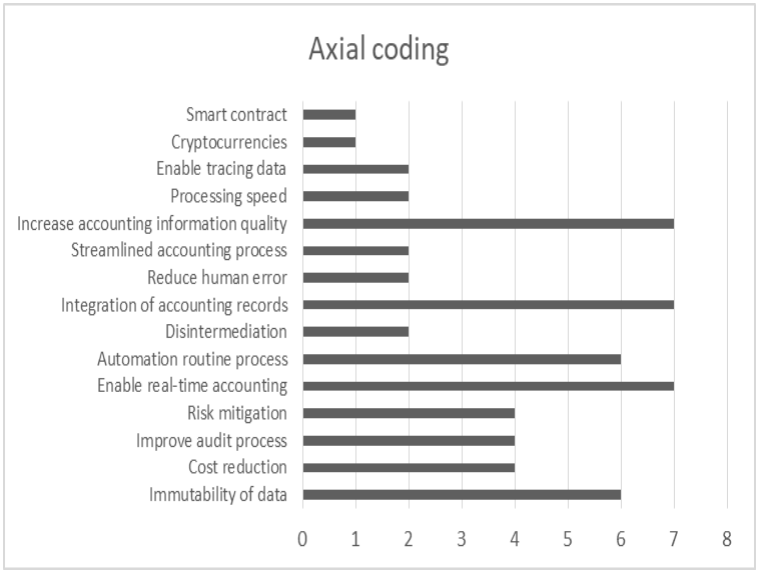

Figure 3. Axial Coding for Blockhain's Capabilities on Management Accountant's Roles

All codes in Open Coding's column were categorized based on its similarities. Subsequently, we found that there were 12 blockchain capabilities from axial coding in which the most frequent terms on axial coding are "Increase accounting information quality", "integration of accounting records", and "enable real-time accounting" that were mentioned in seven manuscripts.

Figure 4 and 5 presents open and axial coding for management accountant's role as a business partner which is the majority of the labels or codes were "Support decision making and integrated thinking", "Bookkeeping", and "Analyse accounting data", in which each factor was mentioned by two papers. All codes in Open Coding were categorized based on its similarities and we found there were 6 roles that defined management accountant's role as a business partner.

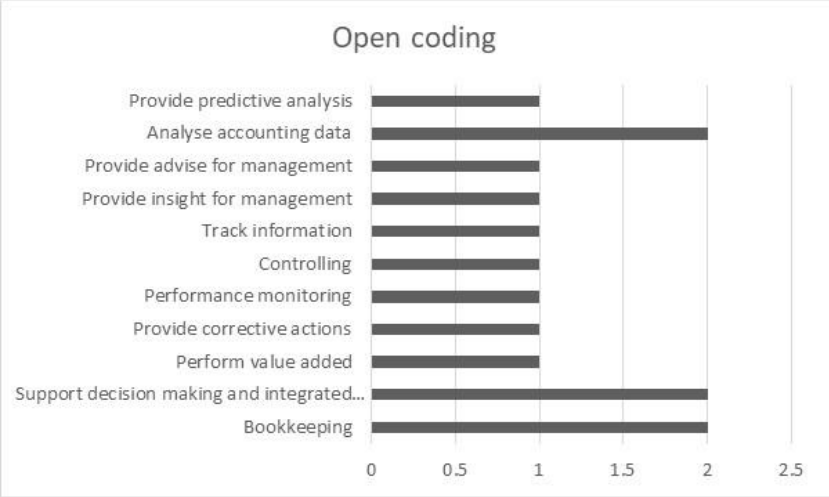

Figure 4. Open coding for Management Accountant's Roles as Business Partner

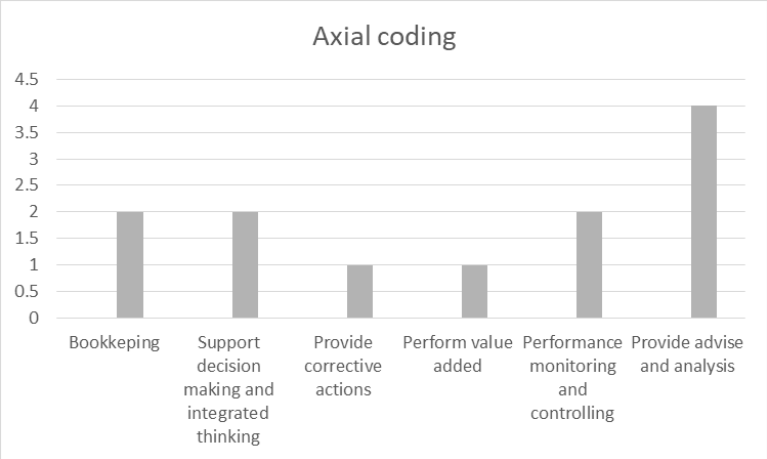

Figure 5. Axial Coding for Management Accountant's Role as Business Partner

4.2. Discussion

Blockchain capabilities in management accountant or accountant profession

As a distributed ledger, blockchain provide ledger that cannot be modified, altered, tampered, or deleted which is labelled as immutability of data (Khaldoon et al., 2019; Mauricio & James, 2019; Wu et al., 2019; Zhang et al., 2020). Immutability of data happened because all entries are distributed and cryptographically sealed (Khaldoon et al., 2019). Blockchain-based accounting provided immutability on accounting data because the blockchain can generates self-verifying information, transparency, and distributed ledger that are shared in a decentralized system (Enrique & Michaela, 2019; Wu et al., 2019). With these capabilities, management accountant can provide more accurate and reliable information since all data are immutable and impossible to alter.

Immutability of data and transparency enabled user (e.g. management accountant and auditor) to trace data or information from original source. For example, in (Wu et al., 2019), each figure, table, or data in financial report that are shared in blockchain system comes with hyperlink, which can be used to trace the original transaction or record. Another examples comes from (Soonduck, 2017), they discuss that blockchain on accounting and auditing improve traceability and availability of document e.g. electronic records of inventory items, invoices, bills of leading, etc. These capabilities can improve management accountant's work to provide data and track documents for controlling or evaluating purposes.

We also found that one of great characteristic of blockchain is disintermediation which eliminate third parties roles for validating, securing, and providing trust and reliability of the information (Khaldoon et al., 2019). With this capability, blockchain will reduced roles of management accountant to validate the transaction or record.

Disintermediation, traceability, immutability, decentralized, and other capabilities of blockchain improve a streamlined accounting practice. For example, smart contract can ensure compliance on accounting information processing (Wu et al., 2019), traceability and immutability capabilities can improve audit and control practices by enhancing data acquisition (Moll & Yigitbasioglu, 2019; Wang & Kogan, 2018; Wu et al., 2019), and blockchain can enhance corporate governance by enabling a streamlined business process (Enrique & Michaela, 2019; Wu et al., 2019).

Implementation of blockchain and other technologies (e.g. IoT and Smart Contract) also enable a real-time accounting in which executing contract term, recording transaction, updating information, and retrieving information can be done in a real-time manner (Moll & Yigitbasioglu, 2019; Wang & Kogan, 2018; Zhang et al., 2020). Real-time accounting information in blockchain-based accounting enable user (e.g., management accountant or auditor) to monitor continuously (Enrique & Michaela, 2019; Wang & Kogan, 2018). We also found that real-time accounting information help user to analyse performance organisation (Moll & Yigitbasioglu, 2019). With the help of IoT, it's possible to update inventory and financial information in a real-time and secure manner (Wu et al., 2019).

Beside real-time accounting, implementation blockchain with other technologies (e.g. smart contract and IoT) enabled administration activities (e.g. payable, receivable, and tax filling), contract execution, bookkeeping or transaction recording to be automated (Enrique & Michaela, 2019; Mauricio & James, 2019; Wu et al., 2019). We also found that

smart contract could record and provide financial report in a real-time and comprehensive manner. These capabilities could impact bookkeeping's role of management accountant (Frizzo-Barker et al., 2020; Harjit et al., 2019).

We also found that blockchain can improve quality of accounting information and records. Blockchain with decentralized environment enabled shared and integrated information among users (Enrique & Michaela, 2019; Khaldoon et al., 2019). According to (Enrique & Michaela, 2019), these capabilities enabled Distributed Consensual Accounting Records (DCAR) in which every transaction and financial record are verified by participants and stored in multiples node. The impacts of this system are transparency of accounting data (Enrique & Michaela, 2019; Mauricio & James, 2019; Moll & Yigitbasioglu, 2019c; Wang & Kogan, 2018), integrity of accounting records which replaces traditional separated accounting records (Enrique & Michaela, 2019; Harjit et al., 2019), and enabled user to access blockchain-based accounting data depending on their level of access. Blockchain with immutability of data, transparency, and self-verifying features provide management accountant with accuracy and reliability of the data (Enrique & Michaela, 2019; Khaldoon et al., 2019; Mauricio & James, 2019; Wu et al., 2019). Information in blockchain network are authentic and free from modification which enhance the quality of accounting information and data (Wang & Kogan, 2018; Zhang et al., 2020).

Management Accountant as Business Partner Role

Management accountant is a person who can be business partner for management and people around him. There were six roles of business partner identified in this research, namely support decision making and integrated thinking, perform value added, provide corrective actions, performance monitoring and controlling, and provide advice and analysis.

Bookkeeping's role identified as task to record, collect, and provide valuable information and related data to management or decision maker (Frizzo-Barker et al., 2020; Holotiuk, Pisani, & Moormann, 2017). Bookkeeping's role also defined to be more traditional back-office oriented role of management accountant (Mauricio & James, 2019). Beside bookkeeping's role, management accountant is also perceived as a financial and non-financial information provider for decision maker.

Management accountant is also expected to be more than the provider of information. There are two roles which are not related to information provider, e.g. that are providing corrective actions and performing value added. Providing corrective action is done by management accountant when the strategy or previous plan is not relevant with current condition (Moll & Yigitbasioglu, 2019c). Management accountant is also expected to perform more value added task such as financial management and data-driven decision making (Zhang et al., 2020).

As a business partner, management accountant monitor and control the organisation's performance. Management accountant is perceived as a person who ensure compliance of regulation within organisation or companies (Lambert & Pezet, 2011). We also found that management accountant provide financial planning and analysis as the tool to control performance (Khaldoon et al., 2019; Zhang et al., 2020).

One special role in business partner is becoming an advisor and give insight to management. Management accountant as business partner are responsible to provide

insight, take a role as advisor, and provide predictive analysis. According to Moll, management accountant's focus remain on descriptive analysis and develop management accounting data analytics (Moll & Yigitbasioglu, 2019c). Information from analysis process must be descriptive, predictive, and prescriptive. These information used to provide insight and advise for management (Khaldoon et al., 2019; Mauricio & James, 2019; Zhang et al., 2020).

Blockchain disruption on management accountant's roles as a business partner

We found that "Immutability of data" is blockchain capabilities which has impact on "Bookkeeping", "Support decision making and integrated thinking", "Performance monitoring and controlling", and "Provide advice and analysis" as management accountant's role. Data and information in blockchain cannot be modified, altered, and tampered. This feature could help management accountant by enhancing authenticity and reliability of accounting record. Immutability in blockchain enables management accountant to trace and extract data in previous years to support decision making process. Immutability also give assurance that information for analysis are authentic, reliable, and free from modification. This will enhance performance of management accountant in monitoring performance, providing analysis, and providing information for decision making.

Also, we figured that "traceability" would affects how management accountant perform monitoring and controlling. Blockchain enable the user to trace data or information from its original source. Management accountant can use this capability to trace original transactions that are linked with figure or table in financial report. This will enhance qualities of performance analysis by management accountant.

Blockchain capability in streamlining accounting process has an impact on as management accountant's roles that are "Perform value added" and "Performance monitoring and controlling". Efficiency and streamlined accounting process would enhance management accountant's role to monitor continuously and ensure compliance of procedure execution. With efficiency in gathering information, management accountant is expected to perform a more value-added tasks such as financial management and data-driven decision-making (Zhang et al., 2020).

We also found that blockchain capability which enables a real-time accounting would disrupt the process of "Bookkeeping", "Support decision making and integrated thinking", "Provide corrective actions", "Performance monitoring and controlling", and "Provide advice and analysis". Blockchain-based accounting enable management accountant to collect real-time data which can be used to support decision making, analyse organisation's performance (Moll & Yigitbasioglu, 2019c), and provide corrective actions. Real-time data would enable management accountant to continuously monitor performance and control strategy execution. We also found that real-time accounting provides record and update transaction based on smart contract automatically and real-time. This capability might reduce the role of "bookkeeping" for management accountant.

Blockchain also enables "risk mitigation" that affect how management accountant perform monitoring and controlling function. Implementation of blockchain enables management accountant to mitigate risk with its capabilities, e.g. real-time data, immutability of data, triple entry-record to prevent biased record, and decentralize

Table 3. Relation between Blockchain Capabilities that Might be Disrupt Accountant Profession and Management Accountant's Role as Business Partner

Axial Coding		Management Accountant as a Business Partner					
		Bookkeeping	**Support decision making and integrate thinking**	**Perform value added**	**Provide corrective actions**	**Performance monitoring and controlling**	**Provide advice and analysis**
Blockchain capabilities in management accountant or accountant profession	**Immutability**	X	X			X	X
	Traceability					X	
	Cost reduction						
	Streamlined accounting process			X		X	
	Real-time accounting	X	X		X	X	X
	Automation	X					
	Risk mitigation					X	
	Processing speed				X	X	
	Disintermediation	X					
	Integration	X	X			X	X
	Enhancing quality		X			X	X
	Blockchain application						X

characteristic. With these capabilities, management accountant is able to prevent and detect fraud within organisations or companies and reduce human error by doing continuous monitoring on performance and compliance of execution procedure.

"Processing speed" has an impact on management accountant role in providing corrective actions and performance monitoring. With its capabilities to streamlined process, blockchain enables user to retrieve and collect information almost in real-time manner. This capability improves the speed of management accountant in analysing and providing corrective action when it shows that execution do not comply with regulation or procedures.

Consensus mechanism and decentralise environment enable blockchain to validate information (e.g. transaction or financial record) without a third or trusted party. This will have an impact on management accountant role as the "bookkeeper" of integrity and validity of accounting information which can be replaced by blockchain technology.

Blockchain with decentralized environment enabled shared and integrated information among users. From "Bookkeeping" perspective, these capabilities will replace traditional separated accounting record and transaction record procedure to be more integrated. The impacts of integration of accounting records are transparency of accounting data and enabled user to access blockchain-accounting's data depend on level of his access. This will impact on how management accountant extract and analyse data for support decision making process, provide insight, and performance evaluation

We also found that management accountant will take the role as an advisor when organisation or company decide to implement new system or technology, e.g. smart contract and cryptocurrencies for payment process. They are responsible to provide benefits, risks, and adaption of the new technologies.

5. Conclusions

This study investigated the current blockchain research trend in management accountant and accountant domain in order to identify its potential in enhancing and improving management accountant's role as a business partner. To achieve this objective, we have defined research questions and utilized a rigour systematic literature review methodology. We conducted a search on eight online academics databases for manuscripts that were published between 2008 and 2020. We have screened and selected seventeen manuscripts as the primary studies for further analysis. The result of this study has shown that majority of the selected manuscripts used systematic literature review and the topic relates to blockchain for accounting and auditing. Our findings have shown a relationship between blockchain capabilities on management accountant's role as business partner. It can be concluded from the selected manuscripts that blockchain could improve accounting practices and enhance accounting information qualities which is also a great potential for management accountant in improving their performance. On other hand, several capabilities e.g. disintermediation and automation of routine activities can reduce or even eliminate bean-counter role of management accountant. However, those capabilities also came with several challenges, namely big energy consumption, organisational barriers, and system maturity issues.

ACKNOWLEDGEMENT

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APPENDIX

Code	Title	Citation	Code	Title	Citation
D1	A Fair Blockchain Based on Proof of Credit	(Han, Yuan, & Wang, 2019)	D10	Designing confidentiality-preserving Blockchain-based transaction processing systems	(Wang & Kogan, 2018)
D2	An innovative RegTech approach to financial risk monitoring and supervisory reporting	(Petros, Harald, Wolfgang, Keith, & Joseph, 2018)	D11	Exploring blockchain technology in international trade: Business process re-engineering for letter of credit	(Ernest, Yi-Chian, & Tzu-Ching, 2019)
D3	Application of Internet of Things and Blockchain Technologies to Improve Accounting Information Quality	(Wu, Xiong, & Li, 2019)	D12	Global brain-reflective accounting practices: Forms of intellectual capital contributing to value creation and sustainable development	(Khaldoon , Khaled, & Larissa, 2019)
D4	Big Production Enterprise Supply Chain Endogenous Risk Management Based on Blockchain	(Fu & Zhu, 2019)	D13	Operational efficiency effects of blockchain technology implementation in firms: Evidence from China	(Raihanul, Deng, Aminul, & Zakir, 2020)
D5	Blockchain and its implications for accounting and auditing	(Enrique & Michaela, 2019)	D14	The disruptive and transformative potential of new technologies for accounting, accountants and accountability: A review of current literature and call for further research	(Mauricio & James, 2019)
D6	Blockchain as a disruptive technology for business: A systematic review	(Frizzo-Barker et al., 2020)	D15	The Impact of Artificial Intelligence and Blockchain on the Accounting Profession	(Zhang, Xiong, Xie, Fan, & Gu, 2020)

D7	Blockchain based financial case analysis and its implications	(Soonduck, 2017)	D16	The impact of the blockchain on the supply chain: a theory-based research framework and a call for action	(Horst, 2018)
D8	Blockchain innovation and framing in the Netherlands: How a technological object turns into a 'hyperobject'	(Lagendijk, Hillebrand, Kalmar, van Marion, & van der Sanden, 2019)	D17	The role of internet-related technologies in shaping the work of accountants: New directions for accounting research	(Moll & Yigitbasioglu, 2019b)
D9	Blockchain technology in corporate governance: disrupting chain reaction or not?	(Harjit, Geetika, Alka, & Sapna, 2019)			

Table 4. Code of Primary Studies

No	Terms	Definition
1	Immutability	Cannot be modified, altered, tampered, or deleted [D3, D12, D14, D15].
2	Traceability	Enable user to trace data or information from original source [D3, D7].
3	Cost Reduction	Reduce administration cost [D14] and cost related to trading with a third-party [D9].
4	Streamlined Accounting Process	Improve accounting practices by simplifying accounting process to increase efficiency and productivity [D3, D5, D10, D17].
5	Real-Time Accounting	Enable real-time accounting which facilitate continuous monitoring [D3, D5, D10, D15, D17].
6	Automation	Enable administrative activities (e.g. payable, receivable, and tax filling), contract execution, bookkeeping or transaction recording to be automated [D3, D5, D6, D14].
7	Risk Mitigation	Enable user to prevent biased record [D5], detect fraud within organisations or companies [D9], and reduce human error [D17].
8	Processing Speed	Enable user to save more time in retrieving information or recording transaction [D10].

9	Disintermediation	Eliminate the need of intermediaries by replacing their role in validating and securing transaction as well as enhancing information reliability [D3, D12].
10	Integration	Enable a shared and integrated information among users which increases transparency, integrity, and accessibility [D3, D5, D9, D10, D12, D15, D17].
11	Enhancing Quality	Blockchain's characteristics (immutability, transparency, and self-verifying) ensure accuracy and reliability of data [D3, D5, D10, D12, D14, D15].
12	Cryptocurrencies	Digital assets used as a medium of exchange that are transacted by users and implemented on smart contract [D14].
13	Smart Contract	Automatically execute tasks by translating traditional contract language into computer code [D14]

Table 5. Blockchain Disruption on Accounting Management

Open coding		**Axial coding**	
Code	Freq.	Code	Freq.
Immutable data	6	Immutable data	6
Prove audit trail	1	Enable tracing data	2
Traceable and irreversible data	1		
Cost reduction	4	Cost reduction	4
Ensure compliance of accounting practices	1	Streamlined accounting practices	2
Improve audit process	4		
Improve corporate governance	1		
Improve process efficiency	1		
Reducing redundant manual effort	1		
Enable continuous monitoring	1	Enable real-time accounting	7
Enable real-time accounting practices	3		
Update information in real-time	1		
Provide data for analysis	1		
Provide real-time data	5	Automate routine process	6
Automate administration process	2		
Automate bookkeeping process	2		
Process automation	1		
Comprehensive and safe reporting	1		
Data recording	3		
Programmable	1		
Risk mitigation	4	Risk mitigation	4

Reduce human error	2	Processing speed	2
Increase processing speed of decision making	2		
Increase speed of transaction settlement	1		
Save time	1		
Disintermediation	2	Disintermediation	2
Access management	2	Integration of accounting records	7
Enable information sharing	2		
Integration of accounting data	3		
Provide transparent records	6		
Enhance information integrity	3	Increase accounting information quality	7
Enhance information quality	1		
Enhance information accuracy	1		
Increase reliability of data	6		
Cryptocurrencies	1	Application of blockchain	1
Smart contract	1		

Table 6. Blockchain Disruption on Management Accountant

REFERENCES

Alketbi, A., Nasir, Q., & Talib, M. A. (2018). Blockchain for government services — Use cases, security benefits and challenges. *2018 15th Learning and Technology Conference (L&T)*, 112–119. https://doi.org/10.1109/LT.2018.8368494

Avdelidou-Fischer, N. (2013). Handbook of Qualitative Research Methods in Entrepreneurship. *Gender in Management: An International Journal*, *28*(7), 441–444. https://doi.org/10.1108/GM-04-2013-0043

Broom, A. (2005). Using qualitative interviews in CAM research: A guide to study design, data collection and data analysis. *Complementary Therapies in Medicine*, *13*(1), 65–73. https://doi.org/10.1016/j.ctim.2005.01.001

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics*, *36*, 55–81. https://doi.org/10.1016/j.tele.2018.11.006

Christensen, C. M. (1997). The Innovator's Dilemma. In *President and Fellows of Harvard College*. Boston.

Christensen, C., McDonald, R. M., Altman, E. J., & Palmer, J. (2017). Disruptive Innovation: Intellectual History and Future Paths. In *Academy of Management Proceedings* (Vol. 2017). https://doi.org/10.5465/ambpp.2017.14218abstract

Deloitte. (2017). *Blockchain Technology and Its Potential Impact on the Audit and Assurance Profession*.

Dutta, S. K., & Lawson, R. A. (2009). Analysis of accounting academe's response to structural changes in the profession using the disruptive technology framework. *International Journal of Critical Accounting*, *2*(1), 19. https://doi.org/10.1504/ijca.2010.030336

Enrique, B., & Michaela, B. (2019). Blockchain and its implications for accounting and auditing. *Meditari Accountancy Research*, *27*(5), 725–740. https://doi.org/10.1108/MEDAR-11-2018-0406

Equisoft. (2017). *Blockchain A disruptive technology with the power to revolutionize financial services*.

Ernest, C. S., Yi-Chian, C., & Tzu-Ching, W. (2019). Exploring blockchain technology in international trade: Business process re-engineering for letter of credit. *Industrial Management & Data Systems*, *119*(8), 1712–1733. https://doi.org/10.1108/IMDS-12-2018-0568

Frizzo-Barker, J., Chow-White, P. A., Adams, P. R., Mentanko, J., Ha, D., & Green, S. (2020). Blockchain as a disruptive technology for business: A systematic review. *International Journal of Information Management*, *51*, 102029. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2019.10.014

Fu, Y., & Zhu, J. (2019). Big Production Enterprise Supply Chain Endogenous Risk Management Based on Blockchain. *IEEE Access*, *7*, 15310–15319. https://doi.org/10.1109/ACCESS.2019.2895327

Han, X., Yuan, Y., & Wang, F. (2019). A Fair Blockchain Based on Proof of Credit. *IEEE Transactions on Computational Social Systems*, *6*(5), 922–931. https://doi.org/10.1109/TCSS.2019.2938841

Harjit, S., Geetika, J., Alka, M., & Sapna, R. (2019). Blockchain technology in corporate governance: disrupting chain reaction or not? *Corporate Governance: The International Journal of Business in Society*, *20*(1), 67–86. https://doi.org/10.1108/CG-07-2018-0261

Holotiuk, F., Pisani, F., & Moormann, J. (2017). The Impact of Blockchain Technology on Business Models in the Payments Industry. *13. Internationale Tagung Wirtschaftsinformatik*, 912–926. Retrieved from https://www.wi2017.ch/images/wi2017-0263.pdf

Horst, T. (2018). The impact of the blockchain on the supply chain: a theory-based research framework and a call for action. *Supply Chain Management: An International Journal*, *23*(6), 545–559. https://doi.org/10.1108/SCM-01-2018-0029

Horton, K. E., & Araujo, C. De. (2016). Identity conflict and the paradox of embedded agency in the management accounting profession: Adding a new piece to the theoretical jigsaw. *Management Accounting Research*. https://doi.org/10.1016/j.mar.2016.06.002

Janin, F. (2017). When being a partner means more: The external role of football club management accountants. *Management Accounting Research*, *35*, 5–19. https://doi.org/https://doi.org/10.1016/j.mar.2016.05.002

Khaldoon, A.-H., Khaled, H., & Larissa, von A.-A. (2019). Global brain-reflective accounting practices: Forms of intellectual capital contributing to value creation and sustainable development. *Journal of Intellectual Capital*, *20*(6), 733–762. https://doi.org/10.1108/JIC-01-2019-0016

Kilkki, K., Mäntylä, M., Karhu, K., Hämmäinen, H., & Ailisto, H. (2018). A disruption framework. *Technological Forecasting and Social Change*, *129*(September), 275–284. https://doi.org/10.1016/j.techfore.2017.09.034

Kitchenham, B., & Charters, S. (2007). Guidelines for performing Systematic Literature Reviews in Software Engineering. EBSE Technical Report Nr. EBSE-2007-01. In *EBSE Technical Report*.

Kitchenham, B., Pearl Brereton, O., Budgen, D., Turner, M., Bailey, J., & Linkman, S.

(2009). Systematic literature reviews in software engineering - A systematic literature review. *Information and Software Technology*, *51*(1), 7–15. https://doi.org/10.1016/j.infsof.2008.09.009

Kshetri, N. (2017). Blockchain's roles in strengthening cybersecurity and protecting privacy. *Telecommunications Policy*, *41*(10), 1027–1038. https://doi.org/https://doi.org/10.1016/j.telpol.2017.09.003

Lagendijk, A., Hillebrand, B., Kalmar, E., van Marion, I., & van der Sanden, M. (2019). Blockchain innovation and framing in the Netherlands: How a technological object turns into a 'hyperobject.' *Technology in Society*, *59*, 101175. https://doi.org/https://doi.org/10.1016/j.techsoc.2019.101175

Lambert, C., & Pezet, E. (2011). The making of the management accountant – Becoming the producer of truthful knowledge. *Accounting, Organizations and Society*, *36*(1), 10–30. https://doi.org/https://doi.org/10.1016/j.aos.2010.07.005

Lindman, J., Tuunainen, V. K., & Rossi, M. (2017). Opportunities and Risks of Blockchain Technologies: A Research Agenda. *Proceedings of the 50th Hawaii International Conference on System Sciences (2017)*, 1533–1542. https://doi.org/10.24251/hicss.2017.185

Mauricio, M., & James, H. (2019). The disruptive and transformative potential of new technologies for accounting, accountants and accountability: A review of current literature and call for further research. *Meditari Accountancy Research*, *27*(5), 677–694. https://doi.org/10.1108/MEDAR-06-2019-0508

Moll, J., & Yigitbasioglu, O. (2019a). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *The British Accounting Review*. https://doi.org/10.1016/j.bar.2019.04.002

Moll, J., & Yigitbasioglu, O. (2019b). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *The British Accounting Review*, 100833. https://doi.org/https://doi.org/10.1016/j.bar.2019.04.002

Moll, J., & Yigitbasioglu, O. (2019c). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *The British Accounting Review*. https://doi.org/https://doi.org/10.1016/j.bar.2019.04.002

Morales, J., & Lambert, C. (2013). Dirty work and the construction of identity. An ethnographic study of management accounting practices. *Accounting, Organizations and Society*, *38*(3), 228–244. https://doi.org/10.1016/j.aos.2013.04.001

Okoli, C. (2015). A Guide to Conducting a Standalone Systematic To cite this version : A Guide to Conducting a Standalone Systematic Literature Review. *Communications of the Association for Information Systems*, *37*, 879–910.

Petersen, K. J. (2017). *Blockchain in Supply Chain* (IT University of Copenhagen). Retrieved from https://medium.com/coinmonks/blockchain-in-supply-chain-an-inevitability-cd5afb9ab198

Petros, K., Harald, S., Wolfgang, B., Keith, S., & Joseph, G. F. (2018). An innovative RegTech approach to financial risk monitoring and supervisory reporting. *The Journal of Risk Finance*, *19*(1), 39–55. https://doi.org/10.1108/JRF-07-2017-0111

Pietrzak, Ż., & Wnuk-Pel, T. (2015). The Roles and Qualities of Management Accountants in Organizations – Evidence from the Field. *Procedia - Social and Behavioral Sciences*,

213, 281–285. https://doi.org/https://doi.org/10.1016/j.sbspro.2015.11.538

Raihanul, H. M., Deng, S., Aminul, I. M., & Zakir, H. M. (2020). Operational efficiency effects of blockchain technology implementation in firms: Evidence from China. *Review of International Business and Strategy*, *30*(2), 163–181. https://doi.org/10.1108/RIBS-05-2019-0069

Soonduck, Y. (2017). Blockchain based financial case analysis and its implications. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(3), 312–321. https://doi.org/10.1108/APJIE-12-2017-036

Taylor, P. J., Dargahi, T., Dehghantanha, A., Parizi, R. M., & Choo, K.-K. R. (2019). A systematic literature review of blockchain cyber security. *Digital Communications and Networks*. https://doi.org/https://doi.org/10.1016/j.dcan.2019.01.005

Thomé, A. M. T., Scavarda, L. F., & Scavarda, A. J. (2016). Conducting systematic literature review in operations management. *Production Planning and Control*, *27*(5), 408–420. https://doi.org/10.1080/09537287.2015.1129464

Vecchiato, R. (2017). Disruptive innovation, managerial cognition, and technology competition outcomes. *Technological Forecasting and Social Change*, *116*, 116–128. https://doi.org/10.1016/j.techfore.2016.10.068

Wang, Y., & Kogan, A. (2018). Designing confidentiality-preserving Blockchain-based transaction processing systems. *International Journal of Accounting Information Systems*, *30*, 1–18. https://doi.org/https://doi.org/10.1016/j.accinf.2018.06.001

Wu, J., Xiong, F., & Li, C. (2019). Application of Internet of Things and Blockchain Technologies to Improve Accounting Information Quality. *IEEE Access*, *7*, 100090–100098. https://doi.org/10.1109/ACCESS.2019.2930637

Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where Is Current Research on Blockchain Technology?-A Systematic Review. *PloS One*, *11*(10), e0163477. https://doi.org/10.1371/journal.pone.0163477

Yoo, S. (2017). Blockchain based financial case analysis and its implications. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(3), 312–321. https://doi.org/10.1108/APJIE-12-2017-036

Zainuddin, Z. N., & Sulaiman, S. (2016). Challenges Faced by Management Accountants in the 21st Century. *Procedia Economics and Finance*, *37*, 466–470. https://doi.org/https://doi.org/10.1016/S2212-5671(16)30153-8

Zhang, Y., Xiong, F., Xie, Y., Fan, X., & Gu, H. (2020). The Impact of Artificial Intelligence and Blockchain on the Accounting Profession. *IEEE Access*, *8*, 110461–110477. https://doi.org/10.1109/ACCESS.2020.3000505