Research Review on Blockchain Adaptation to VAT

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ABSTRACT

Blockchain technology may provide a solution for the tax industry. It is a distributed ledger that makes it possible to trade anything of value securely, openly, and with less threat of fraud. People might find it simpler to pay their taxes, and governments might find it easier to close the tax gap. But getting from theory to practice is a long journey that also presents challenges, which needed to be discussed. This paper reviewed previous research specifically on the adaptation of blockchain to Value-Added System (VAT). Apart from the theoretical framework and proposed prototype, the majority of research used a qualitative approach, according to the findings. The decentralized network was mostly used as the blockchain structure and design for VAT, with a private block. The consensus that's mainly used among the articles is PoA, PoA, and PBFT.

INTRODUCTION

Automation, execution framework integration, and ERP are the three main foci of Industry 4.0. Data collecting, asset management, supply chain management, healthcare, and financial transactions are a few sectors where blockchain has proven useful. Additionally, it offers a rising level of security and privacy protection. There is a lot of discussion and innovation centered around using blockchain in financial markets, but tax risks falling behind (Migai et al., 2018). In Vienna, Austria, a global program has been established to investigate how blockchain technology may affect taxation. To create a global tax policy for the digital era, the Vienna University of Economics and Business' Global Tax Policy Center (WU GTPC) is collaborating with specialists from all over the world.

It is clear that using blockchain technology for the exchange of information on a global and national scale is a promising area for future growth (Price waterhouse coopers, 2016). Blockchain technology could be used to streamline the provision of pre-filled tax returns by tax authorities using a database powered by the technology. Blockchain technology may allow for real-time tax collection without the involvement of middlemen by the government, which would also aid in VAT collection. Tax administrations that have access to the blockchains of large corporations may soon be able to perform real-time tax audits (Yalaman & Yıldırım, 2019). To create such a system, a blockchain would be created, giving a tax administration access to information on all activities that result in VAT revenues.

A tax system built on a blockchain could have cheaper operational expenses and no privacy or security issues because of its decentralized structure. A transaction that has been recorded on a blockchain is considered to be safe and unchangeable, meaning that it cannot be altered after being done. Another issue is that the present payment system integration, which is still cumbersome and relies on conciliations, makes real-time tax settlement difficult. This prohibition opens the door to fraud because it encourages dishonest taxpayers to create fictitious tax documents that don't reflect actual transactions. By 2025, taxes will be first collected using a blockchain, according to 73,1% of survey participants at the World Economic Forum in Davos in 2015. As a potent instrument to overcome persistent obstacles, this evidence demonstrates that Blockchain technology merits the attention of tax authorities. A more productive system, able to increase government

revenue and provide better services to taxpayers, may be sparked by its capacity to deliver accurate real-time information (Mazur, 2022). Because it offers reliable information that can be shared and may enable earlier payment and oversight of transaction-related taxes, blockchain is expected to be useful to tax authorities and regulators. Some papers suggested some caution should be exercised before believing that blockchain will improve the tax industry. For instance, a tax authority would require information from each taxpayer. It will be a huge step to need digital data from, let's say, every VAT trader in the nation, even those who don't have computers and save their receipts in plastic bags.

Numerous researchers have highlighted studies with relevant situations and trends to the general adoption of blockchain technology in taxation. This literature review differs in that it sought to specifically identify the models or scenarios and trends of Blockchain in value-added tax (VAT) in order to get a more thorough background and serve as a roadmap for future research and/or adoption. The review is structured as follows: method employed, results and discussion, and conclusion.

METHODS

This study employs a thorough literature review approach to examine the advantages that can be afforded by implementing Blockchain technology, particularly in Value Added Tax, from the growing body of academic articles on this topic. By summarizing pertinent concepts from prior research, the chosen papers will be thoroughly reviewed utilizing this approach.

The research questions in this article are, "What methodology, design structures and types of blockchains adaptation for VAT are often proposed in previous research?" and "What design structures and types of blockchains can be developed for VAT in future research?" In line with this, the search strings are performed using the words "blockchain" and/or "VAT" or "e-invoicing".

The study search was carried out using the search string application, so that there were more than 30 scientific studies. However, not all of these studies are in accordance with the research questions, so the researchers carry out a filter process until the most suitable articles are found for review. Figure 1 shows the search and selection process in this study.
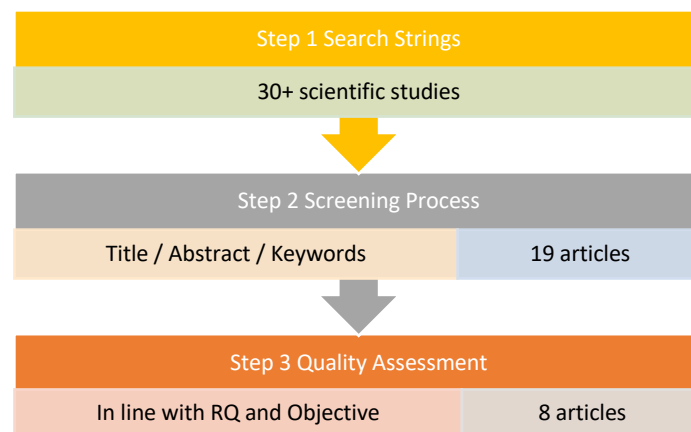

Step 1 Search Strings
30+ scientific studies

Step 2 Screening Process	
Title / Abstract / Keywords	19 articles

Step 3 Quality Assessment	
In line with RQ and Objective	8 articles

Figure. 1 Search and selection process

A total of eight articles have been selected to be analyzed and reviewed more specifically in this study. As for the articles, four came from the Q1 journal, one from the Q3 journal, one from international journal and two were the results of international seminar dissemination. These articles have been published in the 2017–2022 period and will be discussed in the Results and Discussion section.

RESULTS

According to the articles chosen in the quality assessment, it is found that apart from in-depth qualitative research, the majority of the articles only reach the Conceptual Framework, System Architecture, Game Theoretical Model, and Design Science Research phases; very few of them make it to the prototype stage. Although they construct a conceptualization, these works do not put the frameworks they suggested into practice. Technical aspects are therefore missed, and the concepts' feasibility analyses don't materialize. The

Prototype phase, which has only been applied to some of the articles and only a handful reach the Observe and Evaluation phase, concludes the entire scenario. The adoption of blockchain in VAT appears to reflect a more theoretical perspective than a practical one, which is a trend that was already noted by the paper, according to this analysis. Figure 2 shows most method approach in the selected articles.
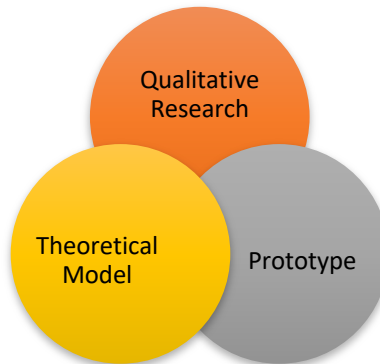

Figure. 2 Most Methodology Approach

In terms of structure and design as well as the type of blockchain on VAT adaptation, almost all selected articles tend to use a Decentralized Storage Network (DSN). This might be due to the fact that blockchain reduces a variety of dangers associated with central data storage by storing the data across its peer-to-peer network (Hughes et al., 2019). The decentralized blockchain may make advantage of distributed networking and ad hoc message passing. A so-called "51% attack," in which a central organization gains control of more than half of a network and may alter that particular blockchain record at will, enabling double-spending, is one risk of a lack of decentralization (Roberts, 2018). Peer-to-peer blockchain networks don't have any centralized points of failure or weakness that hackers may take advantage of. Public-key cryptography is one of the security measures used in blockchain technology.

Compared to some conventional ownership records, which are accessible to the public but still involve physical access to view, open blockchains are easier to use. There is debate regarding the concept of a blockchain because all initial blockchains were permission less (Bakos et al., 2021). Whether such a private system with validators assigned and permitted (permissioned) by a centralized authority should be regarded as a blockchain is a topic of continuing discussion. Hence why most the articles used permissioned or private blockchain using mainly stamping schemes such as Proof-of Authority (PoA) and Proof-of-Work (PoW). Apart from that couple of authors also gave a model system of blockchain using Practical Byzantine Fault Tolerance (PBFT). The benefits of the pBFT consensus algorithm are as follows: Unlike PoW, a PBFT does not necessitate complex mathematical calculations. It is a consensus model that uses little energy. Here, a block of events does not need to adhere to numerous node confirmations. With regard to blockchain adaptation to VAT, there are still many structural and design developments as well as types of consensus that might be researched or proposed as models for application. So far, developed countries that have implemented blockchain can serve as a source of information and comparative data for developing countries in addition to furthering research knowledge.
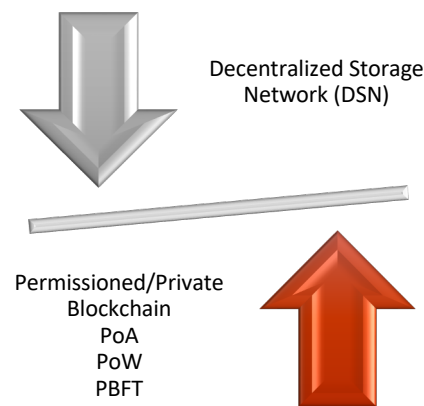
Figure. 3 Design and Types of Blockchain Structure proposed

DISCUSSION

Businesses must have each other's trust in order to deal with each other with assurance (Alkhodre et al., 2019). Centralized business models are the only established techniques for carrying out transactions over the Internet. They have a lot of drawbacks, such as the fact that they clog up servers and necessitate the employment of trustworthy third parties, among others. Recent years have seen a considerable increase in future enterprises' acceptance and favor of decentralized solutions. Undoubtedly, the basis for such systems' widespread acceptance is the maintaining of trust among various unreliable business stakeholders. Numerous solutions have been offered in this field in order to provide decentralized infrastructure for various business models. There is still a demand for a standard, business-acceptable solution. Because of their efficient and pluggable nature, the Hyperledger umbrella blockchain initiatives—which are supported by IBM and many other significant market players—are growing in popularity. The author of this report raises the possibility of employing blockchain technology to build a value-added tax (VAT) system for Saudi Arabia's recently enacted tax system. The decision to use this VAT business model has two justifications. A distributed ledger that hasn't been tampered with and can't be tricked by anyone is provided first. Every transaction that occurs within the network must be visible to the smart contract. Second, it provides an open record of all actions taken by stakeholders and informs all parties. The novel proposed system would provide a transparent database of VAT transactions, and tax would be deducted and recorded on a peer-to-peer network via a consensus method at each step in the supply chain, according to the smart contract design. According to the author, the suggested method will have a big impact on Saudi Arabia's ability to collect VAT. A blockchain-based approach to more effective and efficient VAT collection is described in this article as a contribution. The author offers a proof-of-concept Hyperledger Composer implementation, which is a command execution architecture, to please Blockchain's effective transaction processors. Smart contract transactions can be started by employees of a company to withhold and post VAT amounts from system invoices to the distributed ledger. The VAT amount is then updated on behalf of the organization and receiver through a new automatic transaction that is carried out (Alkhodre et al., 2019).

Nguyen, et al., (2019) in their research has said that authentication process for transactions is still cumbersome today, and the Value Added Tax (VAT) administration system now in use operates as a centralized server that is vulnerable to high-risk hacker attacks. In spite of their advantages, digital technologies are only used by a small number of countries to calculate and manage the VAT payment. In this research, researchers present a new model based on blockchain technology to authenticate the transaction, compute value-added tax, and authorize VAT payment. They do this by merging the decentralized storage network (DSN) with the smart contract (SC). For data encryption and decryption, this system is installed on a host computer (host PC). In Remix's Integrated Development Environment (IDE), which is built on the Ethereum platform, the smart contract is implemented. According to empirical findings, the new model not only reduces the cost of transaction authentication but also secures data against hacker intrusions thanks to the consensus property of Blockchain technology. The solution described in this article uses blockchain smart contracts to digitize invoices and calculate VAT automatically. The Ethereum platform and the Solidity programming language were

used to develop the smart contract on the Remix IDE. According to empirical findings, digitizing invoices and computing VAT using the new technique is inexpensive. Additionally, the suggested approach reduces the risk of data loss attacks, enhancing the reliability of the execution of VAT collection (Nguyen et al., 2019).

The use of new technology, specifically blockchain technology, for the added-tax (VAT) acceptance system is still relatively new and is not yet very common (Setyowati et al., 2020). In particular, for electronic invoices, this study examines how blockchain technology might be incorporated into a VAT system (e-Invoice). Blockchain technology models that might be employed in a VAT system were examined in this study using a qualitative methodology. The findings of this study show that, because of its limitations, blockchain technology can only be used to apply to taxpayer data that is not required to be deemed secure when disseminated to nodes in the blockchain technology network. This includes the Tax Invoice Serial Number (TISN). The TISN system will be quicker and more effective if it is built on blockchain technology. Direct monitoring and tracking of TISN transactions in Indonesia is also possible by the Directorate General of Taxation (DGT). By utilizing a permissioned private blockchain type, blockchain technology can be integrated into the TISN system. The study's conclusions show that blockchain technology is the only way to store taxpayer data that doesn't need to be confidential.

In collaboration with the Danish Business Authority and Deloitte, and with a strong commitment to avoiding administrative constraints, the project developed and evaluated an IT artifact for VAT settlement, as shown in the article (Søgaard, 2021). From a purely technological standpoint, the current analysis has found that DLT is useful for nearly real-time VAT settlement. The study offers four design guiding principles and one prototype instantiation as a contribution to design knowledge, expanding the sources of knowledge for VAT and AIS with a focus on DLT. The publication can also be useful to the government and other ecologists. But in the article, the researcher emphasizes Klein and Meyers (1999) remark that researchers and practitioners should understand that" (design) principles are not analogous to bureaucratic rules of conduct because the application of one or more of them still involves considerable creative effort." The design guidelines offered by this study should be considered contextual guidelines and not explicit rules for implementation.

In the article by Cho, et al., (2021) specify that by enhancing data integrity, raising transaction transparency, and lowering transaction costs, blockchain technology can aid inter-organizational interactions. The results imply that the model may be easily extended to assess how well blockchain handles various tax compliance difficulties, such as sales tax for online sellers and buyers operating in many jurisdictions, as well as how blockchain effects data integrity for inter-organizational activities. The game theoretical model presented in this paper is crucial for blockchain application methods when asymmetric information and conflicting interests have an impact on an entity's decision-making. A shop will adopt the technology and entice vendors to join the blockchain if the VAT rate and adaption costs are minimal, according to a management implication. If the retailer decides to exclusively engage with suppliers who join the blockchain, vendors will be willing to pay higher adoption fees. The paper also cautions that governments may encourage suppliers and merchants to adopt blockchain due to the potential consequence connected with wrongly reported VAT (note, the decision criteria for policymakers are less stringent than those for retailers and vendors). Politicians could consider financing the adoption if shops and suppliers are hesitant to use blockchain because of the expense.

This article uses a quasi-experimental variation in the implementation of VAT e-invoicing in Peru to assess the effects of transitioning from paper to electronic invoicing on business tax compliance and performance (Bellon et al., 2022). E-long-term invoicing's impacts take time to manifest, suggesting that the full impact of the shift is still being felt. At the conclusion of the research period, the tax authority had not yet implemented any significant adjustments to its risk management strategy to make advantage of the information flow produced by the invoicing system. The findings show that firms alter their conduct in reaction to a perceived rise in audit risk, which is most likely a lower bound for the total impact of an e-invoicing reform if stronger monitoring and enforcement are put in place based on this new technology. According to the article's findings, upstream industries appear to have benefited more from the adoption of e-invoicing in terms of VAT collections.

Value-Added Tax, or VAT, is a significant contributor to Indonesia's national income. Despite its significance, effectively administering it necessitates a complicated process. Due to the intricacy of tax

administration, dishonest individuals may be able to reduce the amount of tax they are required to pay by taking advantage of these loopholes. The current system does not stop dishonest people from fabricating tax invoices, which causes the government to lose money in taxes (Wijaya et al., 2017). In an effort to simplify the administrative processes for VAT, particularly those related to tax invoicing, DGT introduced the E-Faktur system. E-Faktur helps the TPVP transition from paper-based administration to paperless administration. However, the system cannot stop enemies from creating fraudulent tax invoices. Transfers of tax credit are implemented using the proposed protocol in a blockchain system. Transferring tax credits ensures that no tax is payable at the end of the reporting period since the tax due must be paid before a tax invoice is generated. The suggested protocol reduces the risk of tax fraud by integrating the systems for tax payment and tax crediting and facilitating the submission of taxpayers' necessary VAT reports. The suggested procedure lowers the risk of fraud by giving the tax authority more control over the tax crediting system. The transaction information provided by taxpayers who followed the recommended process may eventually be utilized to support executive decisions on the tax that are more accurate after further research.

Tax evasion is the failure to pay taxes in full or in part by taxpayers using fraudulent methods. The country's GDP (Gross Domestic Product) decreased as a result of these implications. The country's economic growth and population expansion are both hampered by tax evasion. The basis of this work's attention in Cameroon is the collection of VAT, or value-added tax, which is not protected by this illicit activity (Bitjoka & Edoa, 2020). A consortium blockchain was built as part of this technique to serve as a basis for a virtual currency called "TVACoin." The in-use blockchain uses Raft, one of the most powerful consensus algorithms, which is improved by Byzantine fault tolerance to create the BFT Raft algorithm, which is simple, efficient, and understandable. We also showed how the TVACoin currency works by simulating transactions that take place during the VAT collection process, which moves from the company that buys the raw resources to the customer, who is the end user and the main VAT payer because the companies only collect it for the tax authorities and restore the one they ended up spending on their own purchases.

CONCLUSION

Although blockchain is not a panacea for the tax system, technology might be used in a variety of ways to ease administrative burdens and minimize the cost of tax collection, which would assist close the tax gap. As a result of this research, blockchain is increasingly being used in the realm of taxation. Articles that focus explicitly on the adaptation to VAT are still lacking realm of taxation. Articles that focus explicitly on the adaptation to VAT are still lacking. This paper studies and thoroughly reviews works that look at how blockchain technology might be applied to the VAT system and discovers that the authors frequently use qualitative research, theoretical models, and prototypes. While the decentralized type of openness, namely permissioned or private blockchains, is frequently proposed as a design structure and type, the consensus that is often chosen in modeling and analysis mostly uses proof-of-authority, proof-of-work, and practical Byzantine fault tolerance.

Articles in general have certain limitations, and this article only reviews a small number of articles with limited research questions. Future researchers can systematically research and review related studies that discuss blockchain adaptation to VAT and conduct in-depth research on submitting blockchain adaptation models to VAT using different design structures such as a centrally managed network, permission less blockchain with consensus, Proof of Stake (PoS), Proof of Capacity (PoC), Proof of Burn (PoB), or other types so that the proposed prototype results can be compared with models that have been studied before. Researchers can also try to research the needs of related developing countries if they want to adapt blockchain technology to the VAT collection system, because so far there has been a lot of research on developed countries

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