A Study into Opportunities and Challenges of Blockchain Adoption for Sustainable Nonfinancial Sector Micro, Small, Medium Enterprises— Case Studies in Indonesia

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ABSTRACT: Blockchain, as an emerging technology, has disrupted many industry sectors, not only the financial sector but also other potential sectors such as manufacturing, logistics, and education. While the application of Blockchain is mostly related to the financial sector, many issues arise in the non-financial sector. To frame the Blockchain in non-financial sectors, it requires an enterprise-ready infrastructure which is challenging for micro, small, and medium enterprises (MSMEs). This study attempts to explore the opportunities and challenges on the application of Blockchain for the sustainability of non-financial sector MSMEs. Nine factors are discussed as essential aspects for industries before the adoption of Blockchain. The results are likely being insights for MSMEs to consider how to apply Blockchain for the competitive advantage.

Keywords: blockchain, non-financial sector, micro small medium enterprises

1 INTRODUCTION

Blockchain, as an emerging technology, is now "sexy" to be studied because it is now getting rapidly popular for individuals until global corporations from many industry sectors, both financial and non-financial sectors. A study that compiles quarterly figures for three years conducted by Statistica shows that the number of blockchain wallet users worldwide has soared from 6.7 million in Q1 2016 to over 40 million in Q2 2019 [1]. Meanwhile, Forbes released 50 global corporations with valuations of $1 billion that have been deploying Blockchain, including Amazon, Facebook, Google, IBM, Maersk, Mastercard, Microsoft, Nestle, and Visa [2]. Talking about blockchain spending, International Data Corporation (IDC), through its Worldwide Semiannual Blockchain Spending Guide, shows that worldwide spending has jumped 88.7% from the $1.5 billion spent in 2018 to be nearly $2.9 billion in 2019 [3]. The questions then may arise, what is blockchain and what are the benefits that have been able to attract individuals to global corporations to deploy it.

According to Verhoeven et al., the Blockchain is essentially a technology to store and access data in which each "block" stores a finite set of data and transactions, while the "chain" connects all the blocks in a fixed order."[4] Data is stored, time-stamped—and automatically distributed to many servers at once [5]. For corporations, blockchain generally offers various benefits of greater transparency, enhanced security, improved traceability, increased efficiency and speed, and reduced costs [6]. First, transparency of data and transaction on a blockchain is higher because all participants who have permission access are able to see the data and transaction. Second, transactions on a blockchain are more secured as they must be agreed upon before they are recorded as well as they are stored across a network of computers instead of on a single server, makes it very difficult for hackers to compromise the transaction data. Third, when transactions are recorded on a blockchain, people can easily trace where the product came from. Fourth, as all participants have access to the same information, then clearing and the settlement may take place quicker. Fifth, using blockchain intermediaries can be reduced or even eliminated, meaning the fewer intermediaries, the lower the cost needs to be paid [6].

Besides supporting the operations of a global corporation, Blockchain is expected to support non-financial Micro, Small, and Medium Enterprises (MSMEs) worldwide. In fact, MSMEs also contribute a significant role in most economies, particularly

in developing countries. In general, formal MSMEs contribute up to 60% of total employment and up to 40% of national income (GDP) in emerging economies [7]. According to European commission, Micro-sized enterprises are commonly companies that employ less 10 employees with less than 2 million annual turnovers, small-sized enterprises are companies that employ less 50 employees with less than 10 million annual turnovers, and medium-sized enterprises are companies that employ less 250 employees with less than 50 million annual turnovers [8].

In Indonesia, Indonesian Act No. 20 Year of 2008 about MSMEs classifies micro-sized enterprises as are enterprises with less than IDR 300 million annual turnovers, small-sized enterprises as enterprises with less than IDR 2.5 billion annual turnovers, and medium-sized enterprises are with IDR 2.5 - 50 billion annual turnovers [9]. In 2017, the Ministry of Cooperatives and MSMEs of the Republic Indonesia data showed that there are 61,900 million MSMEs in Indonesia that contribute 60% to the Indonesian market [10]. As a novel-technology, there have been few previous studies concerning the application of Blockchain for non-financial sector MSMEs. The readiness of MSMEs to adopt this new technology is still in question. Meanwhile, some companies attempt to build a marketplace to leverage services for MSMEs. Thus this paper aims to study the opportunities and challenges of Blockchain adoption for sustainable non-financial sector MSMEs through multiple case studies, particularly in Indonesia. This paper is also a response to future research suggestions by Ibiz et al. (2019) to study the nine factors and their suitability in MSMEs. Based on the background described earlier, this study used nine factors proposed by Ibiz, E et.al (2018) to elaborate opportunities and challenges of Blockchain for MSMEs; reduction of cost, internalization, digital representation of assets, unalterable data recording, network size, transparent and synchronized ledger, scalability, fair trade, and financing.

Reduction of Cost. MSMEs are expected to minimizing its operational cost where it can be done by deploying Blockchain that allows MSMEs to eliminate intermediaries and reducing transaction costs. On the other hand, having no intermediaries also results in challenges for MSMEs as they need to compare the costs of using intermediaries that sometimes important in assisting transactions and reducing conflicts with other entities and the cost of having an enterprise-ready infrastructure for Blockchain. Another challenge is how to ensure all entities within the Blockchain efficiently using this technology.

Internalization. In order to increase its market share, MSMEs need a profitable business with more partners. However, choosing trustable partners are sometimes challenging for MSMEs as they do not know each other before. As a solution to that, Blockchain offers a smart contract that allows encoding pre-determined conditions (scripts) for value transactions between two or more parties. The challenge related to internalization is if the MSMEs have trusted each other, Blockchain might not be necessary as MSMEs need to allocate their resources to other things than Blockchain.

Digital Representation of Assets. As the Blockchain ledgers are comprised of digital codes, all assets are recorded and traceable. The challenge is that if there is a change in the assets' form, the data will be incompatible in the Blockchain ledger.

Unalterable Data Recording. Blockchain is very secured because once a transaction is validated, none can change the record. However, unalterable data recording gives a challenge for MSMEs not to make a mistake when inputting transactions considering that MSMEs have a less formal business process and lower human resources capabilities.

Network Size. Blockchain is a decentralized technology and network size must be large in order to maximize Blockchain use. If entities within the blockchain are limited, then it is not maximized and easy to be attacked.

Transparent and Synchronized Ledger. All transactions and prices within a Blockchain can be seen by all entities within the blockchain, which is good as it allows high transparency and enables MSMEs to look for other entities offering a lower price. Knowing prices may sometimes endanger business relationships because one may feel they are paying too much to other companies.

Scalability. Weinstock et al. study scrutinized scalability as the ability to handle the increased workload, wherein the context of blockchain meaning, the more the transaction, the slower the transaction speed and latency. This condition is inferior to MSMEs that need a speedy transaction. To deal with this condition, consortium and private type blockchains that offer a quick payment system can be the options.

Fair Trade. The use of Blockchain demonstrates that MSMEs are complying with WFTO's fair trade principles, which will increase customer trust and competitive edge.

Financing. Commonly, MSMEs are challenging to get funding from the third party. Using BC enables the enterprises to have a fundraising opportunity called Initial Coin Offerings (ICO). Implementing ICO, the MSMEs are able to get funding from investors by providing services, creating a certain amount of digital token, and selling it to potential investors. Seeing Ibiz, E et al. (2018) study limitation that only explored the nine-suitability-to-MSMEs factors, this study focused on studying these nine factors and their suitability in non-financial MSMEs. Two use cases of Tokoin and Hara Token were used to accommodate the focus mentioned above.

2. RESEARCH METHODOLOGY

The methodology of this study is design science (i.e., theory-building) from multiple case studies, which is becoming increasingly popular in social science. Multiple case studies are used to provide a stronger base for theory building (Kshetri et al. 2018). This study used a representative type case to represent a broader population of cases in some relevant respect and typical sub-type case to represent descriptive features of a broader set of cases (Gerring et al., 2015). When selecting the use cases, the authors ensured the use cases are current and not obsolete. In realizing that, we followed the latest news items that were related to the cases chosen and visited the websites of the relevant companies (Kshetri et al. 2018).

3. RESULT AND DISCUSSION

In this section, we describe two representative cases by looking at the relevance of this study. In addition, the case studies appear in the latest news for some consecutive times this year in Indonesia were Tokoin and Hara Token. The profile of both companies can be seen in Table 1.

3.1 Case 1: Tokoin

Initiated in 2018, Tokoin is a platform that utilizes blockchain technology to build digital business identity and digital bookkeeping systems for Micro, Small, and Medium Enterprises (MSMEs) in Indonesia. As an MSME, the enterprises typically have limited business access, low credibility, low reputation, and challenging to get a loan from financial institutions. Responding this limitation, Tokoin is committed to building credibility and reputation of

MSMEs through access to Tokoin ecosystem compromising financial intermediaries that consist of financial institutions, investors, government; suppliers that consist of brand companies, the marketplace, logistic partners; and service providers that consist of property agent, data miners, advertisers, and research companies.

Table 1. Description of the Selected Company Use Cases

Characteristics	Tokoin	Hara Token
MSME sectors	Any MSME	Farmers
Ecosystem	Financial intermediaries, investors, government, Suppliers, and Service Providers	Governments, banking, insurance, data analytics, academics, business, big sellers, non-profit organizations.
Solutions	Quicker and Secure Transaction	Micropayment
Business process	MSMEs make a trusted data- the data is publicly available for Tokoin ecosystem	Farmers supply data – Data qualifier validate the data-Hara ecosystem buy the data

Moreover, Tokoin helped its MSME members to reduce the cost related to expensive and time-consuming money transfer fees abroad as well as getting a lower price through aggregated buying. In order to support its infrastructure, Tokoin teamed up with Tomochain, a company focusing on building efficient Blockchain infrastructure for decentralized applications, token issuance, and integration.

Tokoin encouraged its members to make a trusted profile to improve security for all entities in the ecosystem. All transactions and data recorded in the Blockchain are publicly available, ensuring transparency and reputation. Through the use of smart contracts, Tokoin ensures the transparency of products and services by providing correct information and monitoring the status of ongoing processes. Partners will be absolutely confident about secure delivery, quality, and payment transactions. [23]

Every transaction in the Blockchain can be directly validated. When receiving a transaction, the user has an encryption code that must be verified to confirm the user's identity on the Blockchain, which allows quicker and more securely transaction

3.2 Case 2: Hara Token

Hara Token is a company that provides a data exchange platform in the food and agriculture sectors and connects all entities related to the agriculture sector compromising data providers, data qualifiers, and data buyers. The company now has approximately 8,700 farmers that function as data providers.

As data providers, farmers supply agriculture data of farmers' identity, geo-tagging data related to land area and location, data farming, ecological data such as weather and soil characteristics, and price and transaction data. Every time farmers supply the data, the data will be accessed by data qualifier and once the data are validated, farmers receive Hara loyalty points that can be used to by any necessities in Hara Kiosks like groceries and phone balances.

The data that has been validated is then bought and accessible to data buyers and all Hara ecosystem governments, banking, insurance companies, data analytics companies, academics, business people, big sellers, and non-profit organizations.

Hara token offers sustainable solutions that benefit all stakeholders within the Hara ecosystem. For farmers, they can more easily get micropayment loans from banks that are within the Hara ecosystem and increase their productivity due to better agricultural knowledge they learned from Hara data. For companies or banks as data buyers, they can make a better decision based on Hara data.

Table 2 shows a qualitative analysis of the nine factors for the selected two use cases. For each factor, we attempt to see the opportunities and challenges regarding the current situation

The analysis of the nine factors shows the positive aspects of Blockchain adoption for sustainable MSMEs. While the readiness of IT infrastructure for MSMEs is still in question, the establishment of the marketplace by using Blockchain technology could accelerate the Blockchain adoption to MSMEs. Most of the advantages of Blockchain adoption in six factors, the cost of reduction, internationalization, digital representation of assets, unalterable data recording, and network size, could bring an improvement on MSMEs. By looking at the popularity of cryptocurrencies in Indonesia, there is a hope to bring this positiveness into MSMEs. In addition, the rising of micro-financing such as micro-finance institutions, branchless bank, and so on, would assist MSMEs to accelerate Blockchain adoption.

Among the nine factors, scalability and fair trade are two factors that might be the challenges for Blockchain adoption. While the analysis shows the positiveness of most of the factors, there is still a necessity to see the way of the two leading players address the scalability and the fair trade. Technology illiteracy of Indonesia MSMEs could be one of the factors of the challenges. In addition, human factors (i.e., middleman) still play an essential role in the economic MSMEs' society. By focusing on solving the issues on the two factors, the Blockchain adoption for sustainable MSMEs could become a reality in the near future.

4. CONCLUSION

This study presented a factor analysis on the opportunities and challenges on Blockchain adoption for sustainable MSMEs with two case studies; Tokoin and Hara Token. Nine factors have been explored to see opportunities and challenges.

Looking at the growth and the popularity of cryptocurrencies communities in Indonesia, the seven factors (cost of reduction, internationalization, digital representation of assets, unalterable data recording, network size, and financing) are the opportunities on Blockchain adoption for sustainable MSMEs. On the other hand, technology illiteracy and human factors could be the challenges on the two factors (scalability and fair trade).

This prior study has adopted the qualitative data from multiple case studies extracted from various reliable and relevant sources. However, there is still room for improvement. Applying comprehensive analysis such as exploratory factor analysis could enhance the results as well as the interpretation of the analysis with better representation.

REFERENCES

M.Szmigiera. 2019. Number of Blockchain wallet users worldwide from 3rd quarter 2016 to 3rd quarter 2019. https://www.statista.com/statistics/647374/worldwideblockchain-wallet-users/ accessed on October 1, 2019.

Castilo, Michael Del. 50 Billion Dollars Babies. https://www.forbes.com/sites/michaeldelcastillo/2019/04/16/blockchain-50-billion-dollar-babies/#7ea76ca557cc. Accessed on October 1, 2019.

Worldwide Blockchain Spending Forecast to Reach $2.9 Billion in 2019, According to New IDC Spending Guide. https://www.idc.com/getdoc.jsp?containerId=prUS44898819, accessed on October 1, 2019.

Verhoeven P., Sinn F., & Herden T.T. 2018. Examples from Blockchain Implementations in Logistics and Supply Chain Management: Exploring the Mindful Use of a New Technology.

Queen, Karen Haywood. The technology behind the rise ofcryptocurrencies is widely expected to bring 'a common source of truth' to manufacturing. https://www.sme.org/smemedia/sme-media/in-blockchain-we-trust/accessed on October 1, 2019.

Hopper, Matthew. Top 5 blockechain benefits transoforminng you industry. www.ibm.com/blogs/blockchain/2018/02/top-five-blockchain-benefits-transforming-your-industry/ accessed on October 1, 2019.

Mall and medium enterprises (smes) finance. https://www.worldbank.org/en/topic/smefinance accessed on October 1, 2019.

https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/. accessed on October 1, 2019.

Indonesian Act No. 20 Year of 2008 about MSMEs, accessed on October 1, 2019.

Gerring J. & Cojocaru L. 2015. Case-Selection: A Diversity of Methods and Criteria. to represent descriptive features of a broader set of cases.

Ibiz, E & Durst, S. 2019. The Appropriation of Blockchain for Small and Medium-sized Enterprises, *Journal of Innovation Management* 7 (1), 26-45.

Kshetri. 2018. 1 Blockchain's roles in meeting key supply chain management objectives, *International Journal of Management* 39, 80-89**.**

Vara C. R., Prieto J., Prieta D. F., & Corchado M.J. 2018. How blockchain improves the supply chain: case study alimentary supply chain, *Procedia Computer Science* 134, 393- 398.

Viriyasitavat W. & Hoonsopon D. 2019. Blockchain character-istics and consensus in modern business processes*, Journal of Industrial Information Integration* 13, 32-39**.**

https://www.bps.go.id/statictable/2014/01/30/1322/tabelperke mbangan-umkm-pada-periode-1997--2013.html. Accessed on October 2, 2019.

https://www.blockchainno1.io/news/14551, accessed on Octo-ber 3, 2019.

https://duniacrypto.net/2019/08/21/tokoin-project-blockchain-indonesia-untuk-pertumbuhan-umkm/, accessed on October 3, 2019.

https://www.duniafintech.com/tokoin-startup-blockchain-	in-donesia/, accessed on October 3, 2019.

https://medium.com/@tokoin/tokoin-and-tomochain-team-up-to-build-blockchain-infrastructure-for-msme-5d497e29f5a6, accessed on October 3, 2019.

https://nextbillion.net/the-distributed-economy-four-ways-blockchain-can-transform-msmes-in-emerging-markets/, ac-cessed on October 1, 2019.

https://medium.com/@tokoin/what-is-tokoin-why-is-it-so-	im-portant-for-the-msmes-business-ecosystem-	28bbed07c863, accessed on October 3, 2019.

https://steemit.com/steemauto/@humblemee/how-to-enhance-your-business-and-growth-opportunities-for-msme-using-tokoin-platform, accessed on October 3, 2019.

https://asia.nikkei.com/Business/Technology/Blockchain-helps-businesses-to-profit-from-social-progress, accessed on October 3, 2019.

https://medium.com/@tokenomy/hara-token-hart-on-the-tokenomy-exchange-alternative-board-35c2bcb1bbd8accessed on October 3, 2019.

http://coindaily.co.id/blockchain/hara-kembangkan-pertukaran-data-pertanian-dengan-blockchain/accessed on October 3, 2019.

Table 2. Analysis of the nine factors for the selected two use cases

	Cost Reduction	Internalization	Digital Representation of Assets	Unalterable Data Recording	Network Size	Transparent and Synchronized Ledger	Scalability	Fair Trade	Financing
Tokoin	Helps MSMEs to reduce the cost related to expensive and time-consuming money transfer fees abroad as well as getting a lower price through aggregated buying.	As Tokoin provides Blockchain infrastructure, it helps MSMEs to allocate their resources to other things than Blockchain.	As Tokoin data is only about MSMEs' information, meaning the assets' form is not changed, the data will always be compatible with the Tokoin Blockchain ledger.	Tokoin helps facilitate MSMEs through application	Tokoin helps MSMEs to connect with 50,000 entities on its ecosystem	All data and transaction are transparent to the Tokoin ecosystem	Collaboration with Tomochain enables Tokoin to provide a comprehensive infrastructure to ensure stable and speedy data exchange	The use of Blockchain demonstrates that MSMEs are complying with WFTO's fair trade principles, which will increase customer trust and competitive edge.	Connection with financial institutions helps MSMEs to get funding easier
Hara Token	Farmers earn Hara points to buy daily needs and more income through productivity	Farmers just need to supply farmers' identity, geo-tagging data related to land area and location, data farming, ecological data.	As Hara Token data is only about farmers' information, meaning the assets' form is not changed, the data will always be compatible with the Hara Blockchain ledger.	Data qualifier will suggest data changes if the data is incorrect or inaccurate	Helps farmers to connect with 19,500 other farmers and entities on its ecosystem	All data and transaction are transparent to the farmers that help them to increase productivity from the learned data	Hara Token provides farmers with application	NA	Connection with financial institutions helps farmers to get micro-payment loans easier. On April 19, a total micro-payment amount of IDR 1.7 B was loaned to farmers