Unveiling the Dynamics of Blockchain Technology Adoption in the Malaysian Supply Chain: An Extended TOE Framework

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Abstract – Digital transformation has led to the integration of blockchain into business processes. Blockchain technology which acts as a decentralized transaction and data management technology plays a pivotal role in helping organizations maintain a public ledger. Essentially, the advent of digital transformation has made a significant impact in the diverse socio-economic sector, compelling supply chain enterprises to harness the power of digital innovations to reap the optimal business efficiency in the contemporary digital age. This study intends to utilize an extended TOE framework to examine the technological, organizational, and environmental dimension of blockchain adoption in supply chains in Malaysia. A conceptual model which incorporates cybersecurity and blockchain adoption factors is proposed. This research model will be tested using Structural Equation Modeling (SEM) to identify the important factors in all contexts, garnering an understanding on factors which could impact the substantial boost of blockchain adoption. Besides, blockchain adoption serves as an underlying motivation to improve security of the supply chain ecosystem and business efficiency. Ultimately, the theoretical and practical implications will be discussed.

Keywords: Adoption Model; Blockchain; TOE; Malaysia Supply Chain; Supply Chain Management

1. Background

The global supply chain industry which manages the complex process of converting raw materials into finished goods and shipping them to consumers has been facing constant problems with regards to information flow, security, and trust [1, 2]. Blockchain technology operates as a decentralized and tamper-proof distributed ledger that can offer functionalities which counter the problems by improving transparency, security, and traceability of the supply chain. In this context, the background of this research is derived from a few aspects. The first being that supply chain accounts for a market size of 26.35 billion USD are facing an annual RM8.7 billion losses annually due to supply chain woes [3]. Therefore, it needs the supply chain industry to improve the current operation process to restrict the losses. Even though the [4] has acknowledged that supply chain could help tackle the transparency and security of supply chain participants and has since launched 20 initiatives and 10 government led core programs since 2021, the incorporation of such technology in the industry is slow paced. This denotes that despite the consistent push and support from the government in adopting blockchain technology, the supply chain players in Malaysia are still far behind global competitors.

2. Problem Background and Research Gap

The problem of the shallow adoption rate of blockchain in the supply chain focuses on two main concerns which need to be addressed. First, the shallow adoption rate of blockchain in the process of supply chain results in inefficiency caused by lack of information sharing [5]. Information sharing is a crucial part of the supply chain process as it allows companies to improve in operating decisions which leads to more optimized resource utilization as well as reducing the overall cost of the supply chain. Without blockchain technology efficiency of the supply chain is compromised when matched with current global standards [6]. Subsequent concerns denote that organizations in Malaysia are still hesitant when adopting newer technologies like blockchain since its companies still lack trust without sufficient proof on the cost benefit of such investment [7]. In regards to the problems, a clear research gap surfaces on how barriers such as organizational understanding, trust, perceived value & data transparency and

proper guidelines lead to the low adoption rate of blockchain technology [8]. Additionally, there is also a gray area on the knowledge and guidelines necessary for the successful implementation of blockchain technology to establish operational efficiencies in Malaysia's supply chain industry.

3. Research Questions and Research Objectives
Based on the background and problem statement, the research questions are posted as shown:
- How does the organization in the supply chain industry perceive the barriers towards the adoption of blockchain technology in Malaysia?
- How do supply chain organizations in Malaysia leverage the underlying resources and capabilities to ensure the successful implementation of blockchain technology in the supply chain process?
- How to theorize the most suitable framework to adopt blockchain technology in supply chain organizations in Malaysia?

4. Underlying Theory
Through the literature review, it is decided that TOE is the primary framework since it relates to the adoption of new technology towards organizations in Malaysia. The research aims to create a model that acts as a guideline that underpins the successful implementation of blockchain technology in Malaysia supply chain organizations. This will match with the context of the organizational analysis level whilst tackling factors that lead to improving operational efficiency based on the suggested model.

5. Method
This research will utilize quantitative measurement via survey distribution. The techniques employed for data collection will be survey distribution with a sampling frame being managerial employees. Purposive sampling is used to select the sample which is most suitable for this research. The data analysis technique employed is Structural Equation Modeling (SEM).

6. Conclusion
The expected contribution of this research is to provide new knowledge for supply chain organizations in Malaysia on the guidelines to optimize their supply chain using blockchain technology. Additionally, this research will propose a developed organization model that serves as knowledge to guide organizations to focus on the key factors that lead to the successful adoption of blockchain in the supply chain process. The limitation of this study is the model proposed is highly restrictive towards specific industries, where its findings cannot be applied to different industries without major alterations.

References

[1] N. Rajah, H. Musa, V. Nipis, P. K. Krishnan, S. Suppiah and A. F. N. Ahmad, "Global Supply Chain Management: Challenges and Solution," *International Journal of Engineering & Technology,* vol. 4, no. 34, pp. 447-454, 2019.

[2] C. Gibson, "Supplt Chain as Kill Chain: Security in the Era of Zero Trust," Trend Micro Research, 2022.

[3] Mordor Intelligence, "Malaysia Freight and Logistics Market Size," Mordor Intelligence, 2023.

[4] MOSTI, "National Blockchain Roadmap 2021-2025," Ministry of Science, Technology and Innovation (MOSTI), 2021.

[5] S. Khan, A. Haleem, Z. Husain, D. Samson and R. D. Pathak, "Bararies to Blockchain Technology Adoption in Supply Chains: The Case of India," *Operations Management Research,* vol. 16, no. 2, pp. 668-683, 2023.

[6] V. Gaur and A. Gaiha, "Building a Transparent Supply Chain," Harvard Business Review, 2020.

[7] B. P. C. Teoh and B. A. Teoh, "Blockchain Adoption Among Malaysian SMEs: A Critical Review on the Supply Chain Implications," *Journal of Education and Social Sciences,* vol. 17, no. 1, pp. 48-55, 2021.

[8] A. A. Alsmadi, N. Alrawashdeh, A. Al-Gasaymeh, L. N. Alhawamdeh and A. M. Al_Hazimeh, "Adoption of Blockchain Technology in Supply Chain," *SAGE Open,* vol. 13, no. 1, 2023.