Blockchain and Machine Learning Driven Financial Technologies and Decisions: Study from Indonesian Financial Communities

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ABSTRACT
The aim of this study is to investigate the role of blockchain technology, machine learning and financial decision-making which are increasingly recognized as transformative across various sectors, particularly in financial technology. This study conducted as initial study which will gather more research in the role of Artificial Intelligence impacted many decisions become more effective through combining many dimensions especially in financial sector in Indonesia. Total sample of 31 respondents with specific background as investors or people who has experienced financial decision processes are expected to sharpen the result and give deeper understanding in this topic. Analysis taken with Smart-PLS, the result show that the existence of blockchain technology are give big impact to financial technology and machine learning algorithm also give positive impact to financial decision making while another relation has no significant effect.

Keywords: *Financial technology, Financial decision making, Blockchain technology, Machine learning algorithm.*

1. INTRODUCTION

In the last five years, Indonesia has experienced significant developments in the adoption of Blockchain technology in the Financial Technology (FinTech) sector, which has a direct impact on the financial decision-making process. Blockchain technology, with its transparent, secure, and decentralized characteristics, has been integrated into a wide range of financial applications, from payment systems to digital asset management. This application enhances operational efficiency and influences the financial decision-making of individuals and institutions (Qatawneh et al., 2024).

Indonesia, recognised as one of the rapidly developing nations in Southeast Asia, has experienced a rise in the implementation of blockchain technology within the banking sector. Primary applications encompass Digital Payment Systems. Companies including OVO, GoPay, and Dana are investigating the application of blockchain to enhance transaction security and efficiency. Blockchain enhances transaction transparency and mitigates the risk of fraud. Peer-to-Peer (P2P) lending platforms, such as KoinWorks and Modalku, utilise blockchain technology to establish a more secure and transparent lending environment, enabling direct interaction between lenders and borrowers without intermediaries.

Several Indonesian businesses have launched blockchain-based systems for asset and investment management, facilitating more safe and accessible access to diverse financial instruments for investors (Toufaily et al., 2021). The integration of blockchain in the financial sector has impacted financial decision-making through transparency and trust, operational efficiency, and risk management. Blockchain's transparent nature facilitates the recording and verification of all transactions by relevant parties, hence enhancing trust in the financial system. The advantages of operational efficiency By automating processes using smart contracts, the necessity for middlemen is diminished, enabling swifter financial decision-making at reduced costs. Ultimately, with relation to risk management, immutable and transparent data facilitates a more precise evaluation of hazards, enabling more informed decision-making.

While blockchain adoption offers many benefits, there are several challenges that need to be addressed, namely a lack of clear regulations that can hinder the adoption of this technology. However, the Indonesian government has begun

to formulate policies to support this technological development, low literacy on the use of technology is a big task that has not been able to be improved in Indonesia. The importance of education for the public and industry players about the benefits and risks of blockchain technology to ensure effective adoption (Fatima & Dey, n.d.)

Looking at the current trend, blockchain adoption in Indonesia's financial sector is predicted to continue to increase. Integration with other technologies, such as Artificial Intelligence (AI) and Internet of Things (IoT) such as blockchain technology can open up new opportunities in financial services innovation. The adoption of blockchain technology in the FinTech sector in Indonesia has brought significant changes in the way financial services are provided and how financial decisions are made. While there are challenges to overcome, the potential benefits offered by this technology make it an important component in the digital transformation of Indonesia's financial sector.

2. LITERATURE STUDY

The linkage between blockchain technology and financial decision-making is increasingly recognized as transformative across various sectors, particularly in finance. Blockchain's decentralized nature enhances transparency, reduces costs, and improves efficiency, which collectively influence financial decision-making processes. The following sections elaborate on key aspects of this relationship. Financial institutions are exploring blockchain to innovate products and services, although many view it as a lower priority due to unclear value pathways (Dozier & Montgomery, 2020). Organisations employ a systematic review process—comprehend, arrange, and examine—to assess blockchain's potential, culminating in a proof-of-value model.

Blockchain enhances decision-making in supply chain finance by augmenting advantages for all stakeholders and improving centralised decision-making frameworks. The incorporation of blockchain mitigates conventional finance obstacles, including expenses and inaccuracies, therefore facilitating financial transactions ((Topcu et al., 2024; Wamba & Queiroz, 2020)).

The technology facilitates automated financial decision-making by verifying transaction legitimacy, which is essential in trade finance (Fatima & Dey, n.d.; Toufaily et al., 2021). Numerous case studies demonstrate that established organisations have effectively implemented blockchain, resulting in substantial enhancements in their financial operations. Conversely, although blockchain offers various benefits, its adoption is frequently impeded by legislative ambiguities and the requirement for significant initial investments, complicating financial decision-making for particular organisations. The amalgamation of blockchain technology with financial technology (FinTech) markedly improves financial decision-making processes. This collaboration enhances efficiency, transparency, and security in financial transactions, ultimately revolutionising conventional banking and finance operations. The subsequent sections delineate the major elements of this connection (Dozier & Montgomery, 2020; Fatima & Dey, n.d.).

Blockchain's decentralized nature ensures secure, tamper-proof record-keeping, reducing fraud and enhancing trust in financial transactions (Qatawneh et al., 2024; Vats & Samdani, n.d.)). The system facilitates automated financial decision-making by validating transaction authenticity, hence optimising procedures in trade finance. The integration of blockchain and AI facilitates real-time data analysis, enhancing risk assessment and tailored financial solutions (Madhoun et al., n.d.). The integration of AI and blockchain in FinTech leads to improved customer experiences through tailored services and efficient transaction processes. Blockchain facilitates better compliance with regulations by providing transparent and immutable transaction records.

While the benefits of blockchain and machine learning in financial decision-making are substantial, some organizations still view its adoption as a lower priority due to unclear paths to value, indicating a need for clearer frameworks and incentives to encourage widespread implementation(Dozier & Montgomery, 2020).

In modern dynamic business environments, the integration of machine learning (ML) and artificial intelligence (AI) into financial services and investment decisions has significantly reshaped the financial landscape. This comprehensive literature review explores AI tools, including predictive analytics, algorithmic trading, and robo-advisors, enable data-driven insights and real-time automation of investment strategies and fundamentals. Additionally, it was highlighted that these technologies enhance the accuracy, speed, and scalability of decision-making in asset management, risk modeling, and portfolio optimization considering the dynamic and uncertainty of the organization's environment. However, their application also presents challenges, such as data privacy concerns, algorithmic biases, and regulatory compliance issues. This study explores the transformative impact of Blockchain Technology and Machine Learning in financial analysis dan decision making while addressing the role of financial technology that accompany their use. Understanding these results is crucial for optimizing financial decision strategies. Below are mapping previous study about Blockchain, Financial Technology and Financial Decision based on 70 data from litmap, data taken at 15 March 2025.

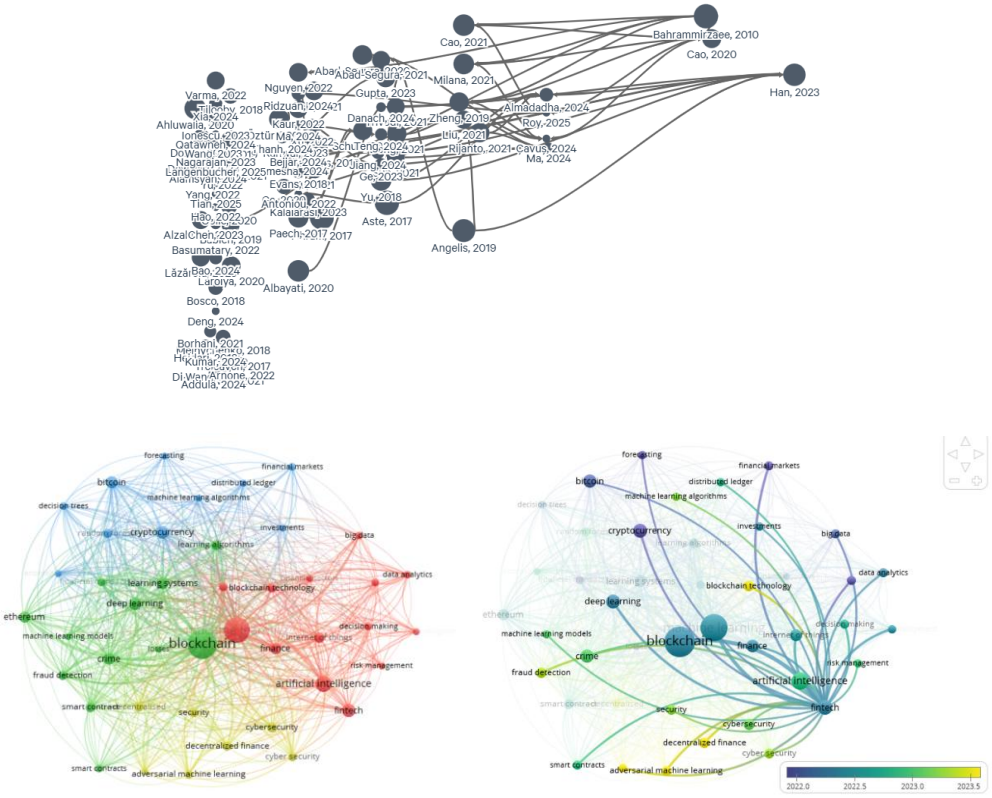

Figure 1 Mapping previous study about blockchain, financial technology and financial decision

It appears that in the results of the literature processing through Vos Viewer, topics related to AI and Fintech are still leading topics that will continue to be discussed and developed in the next 10 years. In accordance with the mapping of the latest study, this study investigates the relationship between blockchain technology, the use of machine learning algorithms that affect the existence of financial technology and lead to financial decision-making made by investors in Indonesia. This study is a preliminary study so that the sample design taken is still relatively small to see various relationships and the possibility of developing concepts and test relationships in the next study.

3. RESEARCH FRAMEWORK

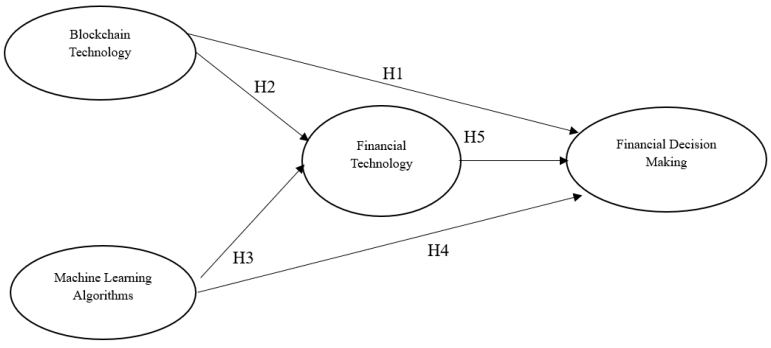

Figure 2 Research Framework

4. RESEARCH METHOD

This study took samples from 31 respondents of active investors in Indonesia, both those who are in the community, and those who study financial technology and investment independently. The data was processed using Smart-PLS to examine the feasibility of measurement and the potential for correlation tests that provide input for the research team in continuing the investigation with different variables.

5. RESULT AND DISCUSSION

Table 1. Demographic

	Qty	%
Gender		
Male	16	51.6%
Female	15	48.4%
Age		
17-23 yo	12	38.7%
24-39 yo	12	38.7%
40-55 yo	7	22.6%
Last Education		
Highschool	8	25.8%
S1	16	51.6%
S2	4	12.9%
S3	3	9.7%

Table 2. Validity and Reliability Test

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
BCT	0.922	0.930	0.938	0.685
DEC	0.938	0.941	0.950	0.732
FTC	0.925	0.934	0.941	0.727
MLA	0.927	0.932	0.945	0.775

From the table above, the AVE value is above 0.5 which means that all indicators are declared valid. Cronbach's Alpha values are above 0.6 and Composite Reliability is above 0.5 which means that all indicators are declared reliable.

5.1. Outer Model Test

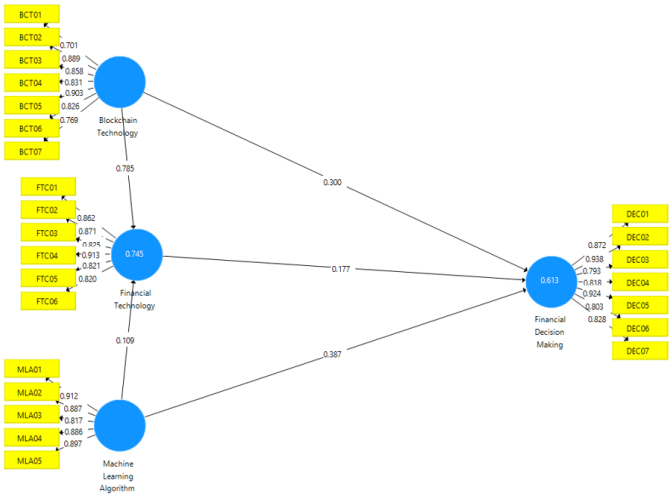

Figure 3 Outer Model

In the Outer Model test, there is an indicator whose outer model value is less than 0.7 so the indicator must be removed. The indicators that were removed were FTC07 and MLA06.

5.2. Inner Model Test

Table 3. Inner Model Result

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
MLA -> FTC	0.109	0.121	0.147	0.739	0.460
MLA -> DEC	0.387	0.379	0.125	3.098	0.002
FTC -> DEC	0.177	0.247	0.242	0.732	0.465
BCT -> FTC	0.785	0.779	0.124	6.328	0.000
BCT -> DEC	0.300	0.255	0.220	1.360	0.174

Table 4. Hypothesis Result

Hypothesis		P Values	Rejected/Accepted
H_1:	BCT -> DEC	0.217	Rejected
H_2:	BCT -> FTC	0.000	Accepted
H_3:	MLA -> FTC	0.492	Rejected
H_4:	MLA -> DEC	0.003	Accepted
H_5:	FTC -> DEC	0.473	Rejected

In the inner model and hypothesis test, it appears that all relationships have positive values but only 2 significant relationships among the 5 hypotheses are proposed. The strongest relationship can be seen from the existence of blockchain technology and its influence on financial technology. Meanwhile, the next positive and significant relationship is shown through the relationship of machine learning algorithms that directly affect financial decision-making. This result is particularly interesting because it finds a different relationship from previous research.

Blockchain technology, while often heralded as revolutionary, may not be as significant to financial decision-making as initially thought. Several factors contribute to this skepticism, including scalability issues, economic inefficiencies, and the lack of a clear path to value. These challenges suggest that blockchain may not fundamentally alter financial decision-making processes, especially when compared to existing systems that have evolved to address similar issues as key arguments supporting this perspective (Fatima & Dey, n.d.; Madhoun et al., n.d.). Financial service organisations regard blockchain innovation as a secondary priority owing to the absence of a definitive value proposition, rendering substantial investment difficult to attain (Dozier & Montgomery, 2020). Machine learning (ML) algorithms are acclaimed as revolutionary instruments in financial technology (fintech), although there are persuasive arguments indicating that their importance may be exaggerated. These arguments arise from the distinct obstacles and constraints associated with the application of machine learning in financial markets, together with overarching issues regarding algorithmic bias and equity. In this study, found that there are insignificance relationship between machine learning algorithm influence financial technology, this is likely due to other factors that affect financial technology. The existence of various changing regulations, financial market conditions that are not easy to predict and complex cause unstable and unreliable data quality and give rise to the potential for biased algorithms to raise various ethical issues (Becerra-Vicario et al., 2024; Vats & Samdani, n.d.)

The last insignificant finding is the relation between financial technology and financial decision making. The significance of financial technology (fintech) in financial decision-making is frequently challenged, with some claiming that its impact is not as considerable as commonly perceived. While fintech has created novel tools and platforms that enhance accessibility and efficiency, several factors suggest that its impact on financial decision-making may be overstated. These arguments highlight the limitations and challenges intrinsic to fintech, raising questions about its potential to alter the financial industry. The digitisation of personal finance through fintech may contradict traditional values and perceptions related to money. This discrepancy may lead to challenges in adopting fintech solutions, as they do not align with customers' financial values and behaviours. The application of fintech in financial management relies on human proficiency and knowledge of these instruments. A lack of understanding may impede the complete realisation of fintech's benefits, hence limiting its impact on financial decision-making. Consumers' financial decision-making is affected by elements like as financial literacy and behaviour, which may operate independently of fintech utilisation. This indicates that fintech is not an essential element for proficient financial decision-making. (Pena et al., 2022).

6. CONCLUSION

The study identifies two notable correlations among five presented hypotheses: the influence of blockchain technology and machine learning algorithms on financial decision-making. Blockchain technology, although lauded as revolutionary, may not substantially alter financial decision-making due to scalability issues, economic inefficiencies, and an ambiguous value proposition; yet, its connection to financial technology demonstrates the most important influence. Machine learning algorithms, celebrated as revolutionary instruments in financial technology, may be exaggerated due to distinct obstacles and constraints in their application. The presence of machine learning algorithms directly influences financial decision-making. The study identified a negligible correlation between machine learning

algorithms and their impact on financial technology, potentially attributable to other influencing factors. The influence of financial technology on financial decision-making is frequently debated, with some contending that its significance may be exaggerated due to its capacity to challenge conventional norms and preconceptions. The implementation of fintech depends on human expertise and understanding, which may not correspond with consumers' financial values and behaviours.

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