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Block chain and AI Convergence in Financial Technology: A WASPAS-Based Analysis

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Abstract

The fusion of blockchain technology and artificial intelligence (AI) is transforming the fintech sector, opening up a new era marked by improved security, efficiency, and innovation. Blockchain's decentralized ledger guarantees transparent and unalterable transactions, helping to minimize fraud and build user trust. At the same time, AI offers sophisticated data analysis, machine learning, and automation that enhance decision-making, tailor financial services, and provide predictive capabilities. Combined, these technologies tackle major fintech challenges like cybersecurity risks, regulatory adherence, and the complexity of transaction management. For instance, AI can scrutinize blockchain data to identify fraud in real time, while blockchain ensures a secure framework for AI applications with reliable data. Furthermore, blockchain-powered smart contracts automate and enforce agreements, cutting down the reliance on intermediaries, and AI further streamlines these operations for greater speed and precision. This integration also promotes financial inclusion by offering safe, affordable financial services to underserved populations globally. As both technologies evolve, they are poised to redefine traditional financial systems, encourage the development of innovations like decentralized finance (DeFi), and change how financial organizations function. In essence, the collaboration between blockchain and AI is ushering fintech into a new age of transparency, intelligence, and accessibility.

Keywords: Block chain, Artificial Intelligence, Innovation, Fintech, Security, Automation, Decentralization, Data, Efficiency, and Transformation.

Introduction

This research adds to the existing literature by examining the integration of blockchain technology, smart contracts, and machine learning within the realm of financial technology (fintech). It underscores the transformative impact of these innovations on enhancing efficiency, security, and transparency in financial operations. Specifically, the study investigates how blockchain's decentralized and tamper-resistant features can help mitigate the vulnerabilities of centralized systems, thereby enhancing stakeholder trust. Additionally, it analyzes how smart contracts facilitate automation, leading to substantial reductions in both transaction time and operational expenses.[1] Blockchain is an innovative technology that allows transactions to be recorded securely and in a decentralized fashion across a distributed network. By removing the reliance on central authorities, it fosters trust and transparency among users. This advancement has significantly transformed the financial sector, leading to the emergence of cryptocurrencies like Bitcoin and Ethereum, and enabling smart contracts—automated agreements with conditions embedded directly in code. [2] The shift toward digital financial services has created an exceptional demand for technologies that increase efficiency, bolster security, and promote transparency. In meeting this demand, innovations like blockchain, smart contracts, and machine learning have proven to be transformative.

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These technologies are tackling persistent issues within the financial industry while simultaneously introducing novel operational approaches that are redefining how financial transactions and services are conducted. [3] In today's dynamic financial landscape, FinTech innovation has driven a significant transformation, redefining the foundations of traditional finance. Representing the blend of "financial technology," FinTech involves the application of advanced digital solutions to financial services, marking the beginning of a new era characterized by enhanced efficiency, broader accessibility, and stronger financial inclusion.[4] In today's digital era, investigating the evolving landscape of banking entails analyzing the influence of emerging technologies on the sector, the obstacles they bring, and the approaches banks are adopting to respond and drive innovation. This research seeks to deliver an in-depth exploration of these developments, emphasizing the effects of digitalization on competitive advantage, operational transformation, and customer interaction within the banking industry. [5] The halal economy spans multiple industries such as ritual slaughtering, food manufacturing, retail, dining establishments, transportation, and shipping. It also involves halal certification to guarantee that goods and services adhere to Islamic principles, representing a wide-ranging market that caters to Muslim consumers globally. [6] The innovative applications of blockchain technology have drawn considerable interest and funding within the expansive FinTech industry. Its fast adoption and expansion are primarily due to its ability to tackle two key issues in online business transactions: ensuring secure exchanges and establishing trust. Through the use of decentralized and tamper-proof ledgers, blockchain effectively addresses these challenges while also streamlining business operations to enhance efficiency, security, and transparency. [7] This provides an excellent summary of the development of online payment systems! It has transformed how individuals and businesses manage financial transactions. Would you like assistance in elaborating on this topic, refining the tone to be more formal, including examples of widely used online payment methods, or exploring the technology that powers these systems. [8] Small and medium-sized

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enterprises (SMEs) form a key pillar of the global economic ecosystem, driving innovation, creating jobs, and fostering social development. Despite their vital role, SMEs often face significant challenges in accessing adequate finance due to their small size, limited networks, information asymmetry, and restricted access to traditional financial channels.

These constraints frequently hinder their growth potential and long-term sustainability. [9] The emergence of financial technology (fintech) has brought transformative changes to the financial landscape, offering more flexible, efficient, and innovative financial solutions tailored to the unique needs of SMEs. Fintech platforms leverage cutting-edge technologies—including big data analytics, distributed ledger systems, artificial intelligence, and digital lending models—to bridge information gaps and streamline capital access. [10] This introduction, through a thorough review of existing academic literature, aims to provide a comprehensive understanding of fintech's impact on SME financing. By integrating theoretical insights with empirical findings, this review seeks to establish a solid foundation for further research and offer practical guidance for policymakers, financial institutions, and SME stakeholders. As we navigate this new era of finance, exploring strategies to harness fintech's potential will be essential for helping SMEs overcome financing barriers and achieve sustainable growth. [11]The expanding focus on financial technology, blockchain, and digitalization within Islamic finance has given rise to a novel and swiftly advancing domain of academic inquiry. Conducting a systematic review of existing scholarly works is crucial to gain a comprehensive understanding of the progression and trends in this area.

This review will concentrate exclusively on journal articles indexed in reputable academic databases, with the goal of mapping the current knowledge landscape and identifying emerging themes in the literature. [12] Supply chain finance consists of receivables financing and payables financing. Receivables financing typically takes place between dominant (core) companies and their subordinate partners. Because subordinate companies often lack financial strength, they usually make advance payments to the core companies prior to receiving goods. This arrangement supports cash flow management and facilitates smoother operations. [12] "Artificial intelligence is a highly impactful technology that is revolutionizing both the business world and everyday living. It provides major advantages, such as improved efficiency, economic advancement, and smarter data utilization. Still, it brings up concerns, particularly regarding the replacement of human roles and the possible dangers that may result."[13] Digital transformation serves as a key catalyst for helping businesses adjust, rebound, and thrive in the future. In Vietnam's banking sector, the workforce is unavoidably impacted by the shift toward digitalization—an evolution shaped by macroeconomic elements such as labor market developments, employment patterns, wage structures, and social disparities. As the push for digital innovation continues to grow, banks will increasingly require a workforce equipped with advanced technological skills and expertise to stay competitive and align with new industry demands. [14] Artificial intelligence and blockchain hold the potential to revolutionize healthcare, although they introduce obstacles that require innovative approaches. The discussion then moves to the financial sector, describing it as a wide-ranging field that includes activities and institutions like banking, insurance, and both formal and informal systems offering financial services to individuals, companies, and other organizations. [15]

Materials and Method

Alternatives:

Smart Contracts: Smart contracts are automated digital agreements with terms encoded directly into the software. They carry out and uphold contract conditions without the need for third parties, promoting transparency, security, and efficiency. Primarily utilized on blockchain networks, they accelerate transactions by minimizing fraud and removing the need for manual intervention.

Fraud Detection Systems: Fraud detection systems are tools developed to identify and stop fraudulent actions by examining data for unusual patterns and irregularities. They employ algorithms, machine learning, and rule-based approaches to recognize suspicious activities instantly, assisting organizations in minimizing financial damage and safeguarding against fraud or unauthorized actions.

Decentralized Finance (DeFi): Decentralized finance (DeFi) is a financial network based on blockchain technology that functions without conventional middlemen like banks. It allows direct peer-to-peer transactions, including lending, borrowing, and trading, using smart contracts, which offer users increased transparency, accessibility, and control globally.

AI-driven Credit: AI-driven credit scoring leverages artificial intelligence to evaluate an individual's creditworthiness by examining extensive financial and behavioral information. This approach enhances both accuracy and efficiency over conventional techniques, enabling lenders to make smarter decisions, minimize risk, and deliver more equitable credit evaluations to a wider range of applicants.

Personalized Financials Advisors: Personalized financial advisors are specialists who customize financial recommendations and plans based on the distinct goals, needs, and situations of each client. They offer tailored support in areas like investments, budgeting, retirement planning, and risk management, making sure clients get suitable and effective financial strategies that fit their specific circumstances.

Evaluation Parameters:

Security: Security involves the strategies and measures put in place to safeguard individuals, assets, data, and systems from damage, danger, or unauthorized use. It encompasses defense against risks like theft, cyber threats, and physical injury, while maintaining safety, privacy, and reliability across different settings such as homes, offices, and digital spaces.

Efficiency: Efficiency means reaching a goal with the least amount of resources, time, or effort. It focuses on performing tasks correctly while reducing waste and increasing output. In any process, efficiency guarantees the best results by balancing quality and productivity, conserving energy, lowering costs, and saving time without sacrificing performance.

Analytics: Analytics involves gathering, examining, and interpreting data to identify patterns, trends, and valuable insights. It enables organizations to make well-informed decisions by converting raw data into useful information. This process utilizes statistical methods and technology to enhance performance, forecast results, and efficiently address complex challenges.

Accessibility: Accessibility means designing environments, products, and services so that everyone, including people with disabilities, can use them easily. It ensures equal access to information, physical spaces, and technology, removing barriers that might exclude people. This promotes inclusion, independence, and participation for all in everyday life.

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WASPAS Method:

This study seeks to create a hierarchical model to determine the optimal site for Turkey's inaugural ocean current power plant. It is the first to integrate the decision-making techniques SWARA and WASPAS within the field of renewable energy, specifically targeting the extraction of energy from ocean currents. [16] The integration of the CRITIC-WASPAS technique with spherical fuzzy sets offers a robust and sophisticated means to manage the intrinsic uncertainties involved in decision-making. Utilizing this cutting-edge methodology, our study seeks to enable urban planners and policymakers to make more insightful decisions that surpass conventional methods. In the long run, this strategy aims to influence the development of urban spaces by encouraging sustainable growth that aligns with the changing and complex characteristics of modern cities. [17] This research focuses on the challenge of recovering used cell phones by applying several decision-making techniques. The SWARA method is employed to assign weights to the criteria, while MOORA and WASPAS are used to rank the alternatives. Combined, these approaches efficiently identify the optimal recovery solution. [18] Multidimensional decision-making problems are commonly addressed using different MCDM techniques. The WASPAS approach integrates several criteria to determine the most suitable alternatives through a combined scoring framework. Within WASPAS, two key criteria are applied to assess the alternatives. The first utilizes the Weighted Sum Method (WSM), a well-established and widely accepted MCDM technique. WSM computes a weighted average score from the criteria, offering a straightforward yet effective means of evaluating options. [19] In Indonesia, the Single Tuition Fee Scholarship (UKT) is a program initiated by the Ministry of Education and Culture (Kemendikbud) to support both public (PTN) and private (PTS) universities by streamlining student expenses. Rather than being charged separately for tuition, thesis examinations, graduation, and other. [20] The competitiveness of a company is strongly influenced by the effectiveness and productivity of its operations. As a result, enhancing operational efficiency—such as through the selection of capable and dependable suppliers—can greatly boost overall performance and strengthen competitive positioning. [21] Cross-competition in the transportation sector describes the rivalry both across various transport modes—like airlines, buses, and high-speed rail—and among different providers within the same mode. This type of competition typically focuses on attracting and keeping passengers or freight clients by offering competitive pricing, enhancing service quality, and driving innovation.

A vibrant competitive landscape can greatly influence how efficient and effective the transportation system is, fostering improved services and infrastructure growth. [22] To identify and prioritize the key factors contributing to construction crises, this study employs a Multi-Criteria Decision-Making (MCDM) framework. The Weighted Aggregated Sum Product Assessment (WASPAS) method is applied to rank the crisis-related factors based on their relative significance. To assign objective weights to these factors, the CRITIC (Criteria Importance Through Intercriteria Correlation) method is utilized, as it accounts for both the intensity of variation and the degree of conflict among the criteria. Lastly, correlation analyses are performed to validate the consistency of the results and to confirm the relationships between the weighted and ranked factors. [23] Inventory applications are essential tools in the modern business landscape, enabling organizations to efficiently oversee and control their stock of products and materials. These software-based systems are built to tackle numerous inventory-related challenges, such as monitoring item quantities and storage locations, automating restocking procedures, and minimizing inconsistencies. By enhancing accuracy, operational efficiency, and transparency, inventory applications play a significant role in reducing costs, boosting customer satisfaction, and optimizing overall business performance. [24] Enterprise resource planning (ERP) systems offer substantial advantages such as enhanced operational efficiency, greater data accuracy, and better decision-making. However, these benefits are generally achieved only when the implementation strategy is closely aligned with the organization's business process performance indicators.

This ensures the ERP system enhances key business operations instead of merely automating inefficient processes.[25]Information Technology (IT) and Decision Support Systems (DSS) can be utilized to select high-quality content creation staff by applying the WASPAS method, which integrates the Weighted Sum Model (WSM) and the Weighted Product Model (WPM).[26] The WASPAS method for ranking countries integrates the Weighted Sum Model (WSM) and the Weighted Product Model (WPM) into a single framework. This combined approach enhances the reliability and precision of the rankings. Rankings are then generated by varying the λ (lambda) parameter, which adjusts the weighting between WSM and WPM in the WASPAS method. Lastly, the outcomes are compared with those from the ARAS method to assess their robustness.[27] The Weighted Aggregated Sum Product Assessment (WASPAS) method is a hybrid multicriteria decision-making approach that integrates both the Weighted Sum Model (WSM) and the Weighted Product Model (WPM). [28] This study leverages sophisticated frameworks like Dempster-Shafer Fuzzy Sets (DSFS) and the WASPAS approach, integrating AI-based optimization to methodically investigate and reconcile competing design objectives.[29] Software reliability represents a key quality attribute, indicating the likelihood that a system will operate without failure over a defined time frame. With the rising complexity of modern systems, evaluating and enhancing reliability is increasingly difficult, influenced by both technical constraints and management-related challenges. In addressing these issues, fuzzy sets and their extensions have emerged as effective tools for managing the ambiguity and uncertainty that often arise in software engineering processes. [30]

Analysis and Discussion

Table 1: Blockchain and AI Creating the New Frontier in Fintech

	Security	Efficiency	Analytics	Accessibility
Smart Contracts	41.08000	239.53000	40.15000	33.05000
Fraud Detection Systems	54.12000	342.97000	39.69000	44.30000
Decentralized Finance (DeFi)	43.17000	322.58000	49.18000	43.10000
AI-powered Credit Scoring	53.33000	328.28000	44.60000	37.59000
Personalized Financial Advisors	61.08000	286.41000	47.96000	38.89000

Table 1 Applying the WASPAS methodology, personalized financial advisors demonstrate strong performance in security, whereas fraud detection systems stand out in efficiency. DeFi takes the lead in analytical capabilities, with fraud detection also performing best in accessibility. This assessment highlights how Blockchain and AI technologies drive fintech innovation by balancing security, efficiency, intelligence, and user access.

Table 2: The WASPAS method evaluates the performance of financial technology innovations

	Performance value			
Smart Contracts	0.67256	0.69840	0.98854	1.00000

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Fraud Detection Systems	0.88605	1.00000	1.00000	0.74605
Decentralized Finance (DeFi)	0.70678	0.94055	0.80704	0.76682
AI-powered Credit Scoring	0.87312	0.95717	0.88991	0.87922
Personalized Financial Advisors	1.00000	0.83509	0.82756	0.84983

Table 2 The WASPAS method evaluates the performance of financial technology innovations. Personalized financial advisors achieve the top score, with AI-powered credit scoring and fraud detection systems following closely. Smart contracts and decentralized finance (DeFi) receive moderate ratings. The results are based on a multi-criteria decision-making approach, considering factors like accuracy, reliability, and innovation impact.

Table 3: The table presents the use of the WASPAS method				
	Weight			
Smart Contracts	0.25	0.25	0.25	0.25
Fraud Detection Systems	0.25	0.25	0.25	0.25
Decentralized Finance (DeFi)	0.25	0.25	0.25	0.25
AI-powered Credit Scoring	0.25	0.25	0.25	0.25
Personalized Financial Advisors	0.25	0.25	0.25	0.25

Table 3 The table presents the use of the WASPAS method, a multi-criteria decision-making technique, to assess five fintech innovations: smart contracts, fraud detection systems, decentralized finance (DeFi), AI-driven credit scoring, and personalized financial advisors. Each alternative is given equal weighting (0.25) across four WASPAS criteria, suggesting an unbiased evaluation where all options and criteria are regarded as equally important. This approach may reflect an initial analysis phase or a scenario where no single factor or technology is prioritized. Subsequent steps typically include computing WASPAS scores to rank the alternatives.

Table 4: Weighted normalized decision matrix (WSM)				
Smart Contracts	0.16814	0.17460	0.24714	0.25000
Fraud Detection Systems	0.22151	0.25000	0.25000	0.18651
Decentralized Finance (DeFi)	0.17669	0.23514	0.20176	0.19171
AI-powered Credit Scoring	0.21828	0.23929	0.22248	0.21981
Personalized Financial Advisors	0.25000	0.20877	0.20689	0.21246

Table 4 The WASPAS (Weighted Aggregated Sum Product Assessment) method assesses different options by merging weighted normalized values through the Weighted Sum Model (WSM). In the given table, personalized financial advisors achieve the top score in the first WSM column (0.25000), reflecting strong overall effectiveness. Fraud detection systems and AI-driven credit scoring also perform well across the board, showing reliability and significance. In contrast, smart contracts and DeFi display greater variation in scores, indicating promise but less consistency. This evaluation aids in ranking financial technologies using several weighted criteria.

Table 5: Weighted normalized decision matrix(WPM)				
Smart Contracts	0.90559	0.91417	0.99712	1.00000
Fraud Detection Systems	0.97021	1.00000	1.00000	0.92938
Decentralized Finance (DeFi)	0.91690	0.98479	0.94781	0.93578
AI-powered Credit Scoring	0.96665	0.98912	0.97126	0.96833
Personalized Financial Advisors	1.00000	0.95595	0.95378	0.96014

Table 5 The WASPAS method table presents weighted normalized scores for five financial technologies evaluated against four criteria. Personalized financial advisors achieved the highest overall scores, demonstrating strong performance. Fraud detection systems performed notably well in the second and third criteria. Smart contracts maintained consistent but somewhat lower scores. Decentralized finance and AI-powered lending displayed moderate results, indicating a balance of strengths and weaknesses.

Table 6: Preference Score(WSM)(WPM)		
	Preference Score(WSM)	Preference Score(WPM)
Smart Contracts	0.83988	0.82548
Fraud Detection Systems	0.90803	0.90169
Decentralized Finance (DeFi)	0.80530	0.80087
AI-powered Credit Scoring	0.89985	0.89924
Personalized Financial Advisors	0.87812	0.87542

Table 6 The WASPAS approach assesses options through two preference metrics: WSM (Weighted Sum Model) and WPM (Weighted Product Model). Fraud detection systems achieved the highest scores, 0.90803 (WSM) and 0.90169 (WPM), making them the top choice. AI-powered credit scoring and personalized financial advisors came next, while decentralized finance scored the lowest.

Table7: WASPAS Coefficient	
Smart Contracts	0.83268
Fraud Detection Systems	0.90486
Decentralized Finance (DeFi)	0.80308
AI-powered Credit Scoring	0.89955
Personalized Financial Advisors	0.87677
lambda	0.5

Table 7 The WASPAS method evaluates financial technology alternatives using a combination of weighted sum and product approaches. In this case, fraud detection systems achieve the top score (0.90486), reflecting superior overall performance. AI-powered credit scoring and personalized financial advisors rank just behind, while decentralized finance (0.80308) ranks the lowest. The lambda value (0.5) equally weights both criteria.

Table 8: The WASPAS method evaluates financial technologies using weighted factors	
Smart Contracts	4
Fraud Detection Systems	1
Decentralized Finance (DeFi)	5
AI-powered Credit Scoring	2
Personalized Financial Advisors	3

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Table 8 The WASPAS method evaluates financial technologies using weighted factors. Fraud detection systems top the list at rank 1, reflecting their highest importance. AI-powered credit scoring and personalized financial advisors come next at ranks 2 and 3. Smart contracts are ranked 4th, with decentralized finance (DeFi) placed last at 5, showing lower preference.

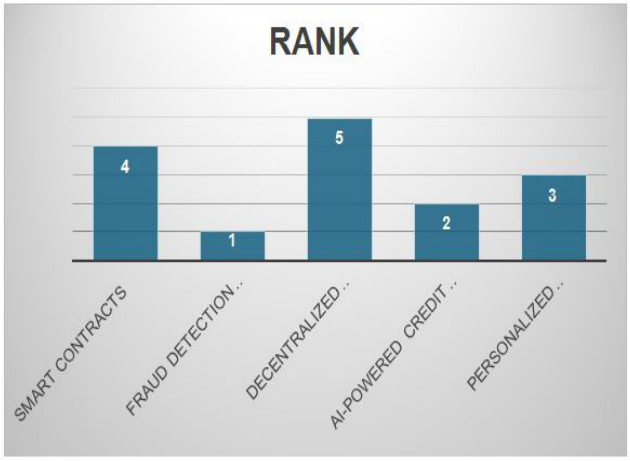

Figure 1: Rank

Figure 1 The WASPAS approach evaluates financial technology solutions based on several factors. Fraud detection systems hold the top position at rank 1, reflecting their highest importance or efficiency. AI-powered credit scoring and personalized financial advisors follow at ranks 2 and 3. Smart contracts are placed 4th, while decentralized finance (DeFi) ranks 5th, the lowest.

Conclusion

This study explores how blockchain technology, smart contracts, and machine learning are integrated within financial technology (FinTech), emphasizing their significant impact on financial operations. The decentralized and immutable characteristics of blockchain help resolve weaknesses found in centralized financial systems, enhancing transparency and building trust among stakeholders. Smart contracts facilitate the automatic execution of agreements, leading to notable reductions in transaction duration and operational expenses. The research underscores blockchain as a groundbreaking innovation that eliminates dependence on central authorities, promoting trust and openness, which has contributed to the emergence of cryptocurrencies like Bitcoin and Ethereum. The swift digital transformation of financial services has driven a growing need for solutions that are efficient, secure, and transparent—areas where blockchain, smart contracts, and machine learning are pivotal. Collectively, these technologies tackle persistent financial industry challenges and introduce novel operational frameworks that reshape transaction workflows. Additionally, the study highlights the wider influence of FinTech advancements in enhancing financial inclusion, operational efficiency, and market competitiveness. As financial institutions undergo digital transformation, they encounter challenges requiring sophisticated technological skills and innovative strategies to leverage these new tools effectively.

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