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# Integrating Blockchain and AI: Advancing Financial Markets Through Cryptocurrency, Emotional Intelligence, and Behavioral Economics

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## Abstract

The primary aim is to systematically review scholarly literature to understand the technological, psychological, ethical, and regulatory dynamics of integrating blockchain and AI in U.S. financial markets. A systematic review methodology was employed, analyzing 45 peer-reviewed articles across disciplines. The data were thematically synthesized using qualitative coding based on research methods, theories, and findings. The integration of blockchain and AI enhances financial transparency, operational efficiency, and autonomous decision-making. However, behavioral and emotional factors such as emotional intelligence and risk perception strongly influence adoption. Moreover, ethical concerns, regulatory fragmentation, and lack of transparency in AI algorithms pose barriers to public trust and systemic resilience. While blockchain-AI integration shows transformative potential, its success depends on addressing ethical and regulatory gaps and aligning technologies with human behavior and cognition. Future research and policy should prioritize ethical frameworks, explainable AI, behavioral modeling, global regulatory coherence, and digital literacy initiatives..

**Keywords:** Blockchain; Artificial Intelligence; Cryptocurrency; Emotional Intelligence; Behavioral Economics; Financial Markets; Ethics; Regulation; Systemic Resilience

## 1. Introduction

In recent years, the convergence of blockchain technology and artificial intelligence (AI) has gained significant momentum as a transformative force in the global financial landscape (Salah et al., 2019). This intersection offers a powerful synergy—where blockchain's decentralized trust and immutability meet AI's predictive intelligence and decision-making capabilities (Alzoubi, 2024). Consequently, this integration has sparked increasing scholarly and practical interest in how it can redefine financial markets, particularly in complex areas such as cryptocurrency adoption, emotional intelligence in decision-making, and behavioral economics.

Financial markets are inherently dependent on data, prediction, and trust—all areas where both AI and blockchain offer revolutionary solutions (An, Huang, & Choi, 2021). AI's ability to detect patterns in large volumes of data complements blockchain's secure and transparent ledger systems, enhancing both the automation and security of financial operations (Salah et al., 2019). Moreover, blockchain enables the decentralization of AI computations and data sharing, fostering a more trust-driven environment in which AI can operate responsibly (Nguyen Thanh, Son, & Vo, 2024).

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Critically, cryptocurrency has emerged as one of the most prominent use cases at this intersection. Blockchain serves as the infrastructure, while AI enhances market analysis, fraud detection, and automated trading strategies (Joo, Dandapani, & Nishikawa, 2019). Yet, despite the growing availability of crypto assets, user adoption remains influenced by behavioral variables such as trust, risk perception, and individual innovativeness (Kumari, Chakraborty, & Bala, 2023). Accordingly, this study aims to critically assess the role of blockchain-AI integration in enhancing user adoption of cryptocurrencies through a behavioral lens. Emotional intelligence, a relatively underexplored dimension in financial decision-making, has been shown to impact trust, perceived control, and financial behavior in AI-driven systems (Singh & Tiwari, 2024). Moreover, recent studies have begun to integrate affective computing into AI models to better simulate human-like decision-making processes in trading environments (Zhang & Lee, 2023).

Furthermore, behavioral economics adds an important layer of complexity, explaining how cognitive biases, heuristics, and framing effects influence market behavior. Integrating AI and blockchain into financial systems has the potential to reduce these biases by promoting transparency, traceability, and rationalized data-driven decisions (Ahmed & Khan, 2024). Therefore, this research highlights a critical intersection where technical innovation meets human psychology.

From a systems perspective, the financial ecosystem in the United States offers a compelling context due to its technological advancement, regulatory challenges, and institutional complexity. With the U.S. being at the forefront of both AI development and blockchain innovation, the market serves as a vital testbed for understanding how these technologies impact policy, ethics, and consumer behavior (Alibašić, 2023).

A systematic review methodology is particularly well suited to this study, as it allows for the critical aggregation, synthesis, and evaluation of findings from an emerging and multidisciplinary body of literature (Pal, Behl, & Tiwari, 2021). According to PRISMA-based systematic reviews, this approach is rigorous, reproducible, and minimizes bias, making it ideal for mapping the breadth and depth of knowledge at the AI-blockchain interface (Mahdani et al., 2023). Moreover, this study is significant in addressing critical gaps in financial innovation research. While a plethora of studies have explored blockchain or AI individually, relatively few have examined their convergence, particularly in relation to behavioral finance or emotional intelligence (Alzoubi, 2024). Additionally, financial technologies are often critiqued for being overly technical and insufficiently human-centered. By integrating psychological insights such as affect, cognition, and personality traits, this study responds to calls for more inclusive and holistic financial innovation models (Moorthy, 2022).

The relevance of this study is further underscored by its alignment with strategic national priorities. The U.S. government and financial regulators are actively exploring digital currencies and ethical AI frameworks, raising essential questions about trust, fairness, and equity (Alibašić, 2023). This study provides empirical evidence and theoretical insights that can inform these debates, offering recommendations for policymakers, financial institutions, and technology developers alike.

In sum, the purpose of this systematic review is to critically analyze how the integration of blockchain and AI can advance U.S. financial markets through enhanced automation, greater emotional intelligence in decision-making, and the correction of behavioral biases in cryptocurrency adoption and usage. The findings will contribute to the academic discourse on technological convergence while also providing actionable insights for industry stakeholders navigating the rapidly evolving fintech landscape (An et al., 2021). By focusing on these dimensions—technological, behavioral, and ethical—this research bridges a critical knowledge gap. It also opens pathways for future research that explores adaptive AI, emotion-sensitive financial models, and the long-term socioeconomic implications of a decentralized, intelligent financial system (Zhang & Lee, 2023).

## 2. Methodology

This study adopts a systematic review methodology to rigorously and transparently explore how blockchain and artificial intelligence (AI) integration can transform financial markets through the lenses of cryptocurrency adoption, emotional intelligence, and behavioral economics. A systematic review is appropriate for synthesizing evidence across a complex and emerging field like fintech, as it ensures a comprehensive, replicable, and unbiased aggregation of knowledge (Pal, Behl, & Tiwari, 2021). Furthermore, because the convergence of AI and blockchain spans multiple disciplines—finance, psychology, technology, and ethics—a structured synthesis of literature enables a cross-sectional understanding of how these domains interrelate in contemporary financial markets (Alzoubi, 2024).

The methodology follows Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency in the selection and analysis of sources (Mahdani et al., 2023). These guidelines promote clarity in identifying, screening, and reporting relevant studies. Given the interdisciplinary nature of the topic, a broad and

inclusive search strategy was required, supported by strict inclusion and exclusion criteria to filter relevant literature effectively.

### 2.1. Search Strategy

To identify peer-reviewed studies, a structured search strategy was developed. It was implemented using academic databases such as Scopus, Web of Science, IEEE Xplore, and Google Scholar, as well as platforms like Researcher Life Discovery for AI-enabled retrieval of current and relevant literature (Salah et al., 2019). The search incorporated Boolean logic to combine keywords related to core constructs: "Blockchain" AND "Artificial Intelligence" AND ("Cryptocurrency" OR "Digital Currency") AND ("Emotional Intelligence" OR "Behavioral Economics") AND ("Finance" OR "Financial Market") AND ("USA" OR "United States").

This multi-pronged keyword approach ensured coverage of both conceptual and empirical works across several domains (Joo, Dandapani, & Nishikawa, 2019). Furthermore, synonyms and related terms such as “decentralized finance,” “affective computing,” “financial decision-making,” and “crypto-assets” were included to capture a wider net of literature (Zhang & Lee, 2023). Searches were conducted from January 2015 to May 2025, to ensure contemporary relevance given the fast-evolving nature of AI and blockchain technologies (Nguyen Thanh, Son, & Vo, 2024). The publication window also allowed for capturing shifts in technological integration post-COVID-19 and amidst increasing regulatory debates in the U.S. financial landscape (An, Huang, & Choi, 2021).

In total, the initial search yielded 138 peer-reviewed articles, which were exported into Zotero reference management software for screening and duplication removal. The abstracts and full texts were then evaluated against inclusion and exclusion criteria. A flowchart consistent with the PRISMA framework was used to document this selection process for transparency and replicability (Mahdani et al., 2023).

### 2.2. Inclusion and Exclusion Criteria

To ensure the relevance, quality, and coherence of the systematic review, clear inclusion and exclusion criteria were applied during the screening process. Firstly, only peer-reviewed academic articles and scholarly book chapters were included to ensure methodological rigor and scholarly validity (Pal, Behl, & Tiwari, 2021). Secondly, studies had to explicitly discuss blockchain-AI integration or their application in financial services, particularly in relation to cryptocurrencies, financial behavior, or decision-making.

Additionally, publications were only included if they contributed to at least one of the three core themes of the research: technological integration, behavioral or emotional analysis, and financial applications in the U.S. or comparable markets (Kumari, Chakraborty, & Bala, 2023). The geographical filter was applied to ensure contextual relevance to the U.S. financial system, although some global studies were included where the findings had cross-national implications (Mushaddik & Nori, 2023).

Conversely, grey literature, opinion pieces, editorials, and unpublished theses were excluded due to concerns regarding quality control and lack of peer review (Salah et al., 2019). Similarly, articles focused solely on either blockchain or AI without discussing their convergence were excluded, as they did not provide integrated insights into the research question (Ahmed & Khan, 2024). Language was another limiting factor; only English-language studies were included due to translation limitations and the dominance of English in fintech literature (Alibašić, 2023). Additionally, the review excluded highly technical or mathematical papers that did not provide broader conceptual, empirical, or policy-related insights applicable to the study’s aims (An et al., 2021).

Through this meticulous selection process, a total of 42 studies were included in the final synthesis. These studies were analyzed thematically and coded using NVivo software to identify patterns, contradictions, and research gaps. Themes were organized under three major categories: technological synergy, emotional and behavioral dynamics, and policy and ethics, aligning directly with the study's objectives (Zhang & Lee, 2023). In conclusion, the methodology employed in this systematic review ensures that the findings are both reliable and comprehensive. By combining rigorous search techniques with strict inclusion and exclusion filters, the study contributes meaningful insights into how blockchain and AI integration is reshaping the future of financial markets, not only from a technical perspective but also through a deeply human lens of behavior and emotion (Moorthy, 2022)..

### 2.3. Data Extraction and Synthesis

Once the final set of 42 studies was identified based on the inclusion and exclusion criteria, the next phase involved a structured data extraction process to collect relevant information for thematic analysis. A data extraction template was

designed using Microsoft Excel to standardize the process and ensure consistency across studies (Pal, Behl, & Tiwari, 2021). Key data points extracted included authorship, year of publication, study objective, methodological approach, country of focus (particularly USA), technologies discussed (AI, blockchain, or both), behavioral or emotional variables, and major findings.

To strengthen rigor, each study was reviewed in full-text form by two independent coders, ensuring all relevant information was captured without misinterpretation or oversight (Mahdani et al., 2023). Discrepancies in coding were resolved through discussion and, when necessary, arbitration by a third reviewer. This peer-review approach to data extraction enhanced internal validity and minimized the risk of individual coder bias (Nguyen Thanh, Son, & Vo, 2024).

The data synthesis was carried out using a thematic synthesis approach, a qualitative method well-suited for capturing patterns across interdisciplinary literature (Salah et al., 2019). All extracted data were uploaded into NVivo software for coding. This enabled clustering of data into three predefined thematic areas aligned with the study's objectives: (1) Technological Integration, (2) Behavioral and Emotional Intelligence, and (3) Ethical, Regulatory, and Trust Considerations (An, Huang, & Choi, 2021).

Additionally, emergent subthemes were identified through open coding. For instance, under the broader theme of technological integration, specific patterns emerged around decentralized AI, smart contracts, and AI-powered trading bots (Xuan & Ness, 2023). In the behavioral domain, frequently cited constructs included perceived risk, trust, affective computing, and emotional control (Singh & Tiwari, 2024). The policy and ethics theme brought forward discussions on data privacy, algorithmic bias, and legal uncertainties (Alibašić, 2023). This process of categorization allowed for both depth and breadth in analysis and supported cross-theme comparisons to explore how emotional intelligence, blockchain functionality, and AI decision-making models intersect in financial environments (Zhang & Lee, 2023). Synthesis culminated in the identification of theoretical gaps, methodological trends, and opportunities for future interdisciplinary research (Moorthy, 2022).

### 2.4. Addressing Bias and Ensuring Reliability

To ensure the credibility and reliability of this systematic review, several strategies were employed to mitigate bias at each stage of the research process. First, selection bias was minimized by using multiple databases and applying consistent Boolean search strings across platforms. This broad-based search strategy helped to avoid over-reliance on any one journal or publisher (Alzoubi, 2024). To combat publication bias, the review explicitly included both empirical studies and theoretical frameworks, regardless of whether their findings were positive, negative, or inconclusive (Salah et al., 2019). Moreover, PRISMA flow diagrams were used to document every step of study selection, enhancing transparency and allowing for replication (Mahdani et al., 2023).

Two reviewers strengthened inter-coder reliability through independent data extraction. Disagreements in coding or inclusion were reconciled through discussion, and if needed, arbitration by a third coder ensured unbiased decision-making (Nguyen Thanh, Son, & Vo, 2024). In cases where interpretations differed, coders returned to the original articles to reassess the context and reach consensus. In addition, critical appraisal tools such as the CASP (Critical Appraisal Skills Programme) checklist were used to evaluate the quality of included studies (Joo, Dandapani, & Nishikawa, 2019). This helped to distinguish between methodologically sound papers and those with limitations in design, sampling, or analysis. Studies of lower quality were noted in the synthesis but weighted accordingly to prevent skewed conclusions.

Finally, reflexivity was maintained throughout the process to acknowledge and limit researcher bias. As the research team comprised individuals with both technical and behavioral finance backgrounds, ongoing discussions were held to balance technological enthusiasm with critical skepticism about ethical and psychological implications (Ahmed & Khan, 2024). This diversity of expertise contributed to a more nuanced and balanced interpretation of findings. Through this multi-layered approach to bias reduction and reliability enhancement, the methodology ensures that the findings of this review are robust, transparent, and valuable for advancing both academic knowledge and real-world financial innovation.

## 3. Analyses and findings

### 3.1. Research methods used in the analyzed articles

The analysis of Table 1: Research Methods Used in the Analyzed Articles reveals a diverse methodological landscape within the emerging field of blockchain and AI integration in financial markets. This diversity reflects the

interdisciplinary nature of the topic, which spans finance, technology, psychology, and ethics. The table highlights five major methodological categories—literature reviews, empirical surveys, theoretical/conceptual analyses, qualitative/case study designs, and mixed methods—each offering distinct contributions and limitations.

To begin with, literature reviews were the most commonly adopted non-empirical method, with 10 studies utilizing this approach. These reviews primarily served to synthesize foundational knowledge, identify research gaps, and propose future directions (Salah et al., 2019). For instance, Salah et al. (2019) provided a comprehensive overview of blockchain-AI integration, offering a taxonomy of use cases and identifying open research challenges. Similarly, Pal et al. (2021) systematically reviewed blockchain applications in financial services, laying the groundwork for more targeted empirical inquiry (Pal et al., 2021). These reviews not only consolidate existing literature but also justify the need for more rigorous, data-driven research, particularly in the behavioral and ethical dimensions of fintech (Moorthy, 2022).

In contrast, empirical (survey-based) methods were employed in 9 studies, reflecting a growing effort to capture user-level perspectives on cryptocurrency, trust, emotional intelligence, and risk perception (Kumari et al., 2023). These studies provided rich quantitative data, helping to explain why individuals accept or reject crypto-financial systems. For instance, Sagheer et al. (2022) utilized the Technology Acceptance Model to assess adaptability to cryptocurrency across different demographic groups (Sagheer et al., 2022). Likewise, Singh and Tiwari (2024) examined how emotional intelligence affects financial decision-making, underscoring the role of human affect in automated systems (Singh & Tiwari, 2024). These empirical contributions offer measurable insights but are often context-specific and limited by sample representativeness.

Interestingly, theoretical or conceptual papers formed the largest category, comprising 11 of the analyzed studies. These works are crucial for constructing frameworks that explain the convergence of blockchain and AI, especially where empirical data is still sparse (An et al., 2021). For instance, Nguyen Thanh et al. (2024) conceptualized blockchain as an institutional layer for autonomous AI agents in finance, suggesting a paradigm shift in how financial ecosystems are structured (Nguyen Thanh et al., 2024). Furthermore, Alibašić (2023) developed an ethical framework grounded in consequentialist theory to address AI and blockchain governance in crypto trading (Alibašić, 2023). Although conceptual works may lack empirical validation, they are essential for theory-building and informing subsequent empirical designs.

Complementing these approaches are case study and qualitative methodologies, used in 8 articles. These methods provide contextualized, in-depth examinations of real-world fintech implementations and user experiences (Elhajji & Benmoussa, 2023). For example, Mushaddik and Nori (2023) explored the socio-economic implications of gold-backed cryptocurrency systems using a case-based approach (Mushaddik & Nori, 2023). Similarly, Priyanka et al. (2024) discussed how digital AI systems affect human experience, drawing on qualitative data to illustrate ethical tensions (Priyanka et al., 2024). Such studies allow for a more nuanced understanding of complex dynamics but may suffer from generalizability limitations.

Finally, mixed methods research—which combines qualitative and quantitative techniques—was evident in 7 studies, indicating an increasing interest in triangulating insights across data types. For instance, Elhajji and Benmoussa (2023) combined case analysis with survey data to examine how AI and blockchain enhance financial market transparency (Elhajji & Benmoussa, 2023). Similarly, Kumari et al. (2023) employed both survey instruments and qualitative feedback to better understand factors affecting cryptocurrency adoption (Kumari et al., 2023). Mixed methods approaches offer a more holistic view but require rigorous integration and methodological expertise.

In summary, the variety of research methods reflects a balanced and maturing field, with theoretical depth and increasing empirical validation. Literature reviews and conceptual models provide necessary foundations for inquiry, while empirical and mixed methods research adds rigor, real-world relevance, and testable outcomes. However, the field would benefit from more longitudinal and experimental designs to better understand the long-term impacts of AI and blockchain on financial behavior, trust, and systemic regulation (Zhang & Lee, 2023). Moving forward, researchers should aim to bridge theoretical contributions with robust, multi-method empirical testing to produce insights that are both conceptually sound and practically actionable.

**Table 1** Research Methods Used in the Analyzed Articles

| Research Methods | Frequency | Studies |
|---|---|---|
| **Literature Review** | 10 | (Salah et al., 2019), (An et al., 2021), (Pal et al., 2021), (Nguyen Thanh et al., 2024), (Alzoubi, 2024), (Moorthy, 2022), (Mahdani et al., 2023), (Polyviou et al., 2019), (Karim et al., 2022), (Alibašić, 2023) |
| **Empirical (Survey-Based)** | 9 | (Kumari et al., 2023), (Sagheer et al., 2022), (Singh & Tiwari, 2024), (Ahmed & Khan, 2024), (Mushaddik & Nori, 2023), (Joo et al., 2019), (Farayola, 2024), (Zhang & Lee, 2023), (Elhajji & Benmoussa, 2023) |
| **Theoretical/Conceptual** | 11 | (An et al., 2021), (Moorthy, 2022), (Nguyen Thanh et al., 2024), (Alibašić, 2023), (Priyanka et al., 2024), (Xuan & Ness, 2023), (Alzoubi, 2024), (Karim et al., 2022), (Polyviou et al., 2019), (Ahmed & Khan, 2024), (Zhang & Lee, 2023) |
| **Case Study / Qualitative** | 8 | (Mushaddik & Nori, 2023), (Alibašić, 2023), (Farayola, 2024), (Ahmed & Khan, 2024), (Elhajji & Benmoussa, 2023), (Priyanka et al., 2024), (Vittala et al., 2024), (Xuan & Ness, 2023) |
| **Mixed Methods** | 7 | (Kumari et al., 2023), (Sagheer et al., 2022), (Singh & Tiwari, 2024), (Elhajji & Benmoussa, 2023), (Moorthy, 2022), (Vashishth et al., 2023), (Zhang & Lee, 2023) |

### 3.2. Research theories used in the analyzed articles

The analysis of Table 2: Research Theories Used in the Analyzed Articles reveals a wide range of theoretical perspectives applied to understand the intersection of blockchain, artificial intelligence (AI), cryptocurrency, emotional intelligence, and behavioral economics in financial markets. This theoretical diversity not only underscores the interdisciplinary nature of the subject but also highlights the evolving efforts to frame complex fintech phenomena using established and emerging models.

One of the most frequently used frameworks was the Technology Acceptance Model (TAM), adopted in six studies. This theory, originally developed to predict user acceptance of technology, was particularly effective in exploring how individuals perceive and adopt blockchain-based financial innovations such as cryptocurrencies and decentralized finance platforms (Kumari et al., 2023). For example, Joo et al. (2019) used TAM to examine the success of cryptocurrencies as a blockchain application, highlighting perceived usefulness and ease of use as key adoption factors (Joo et al., 2019). Likewise, Mushaddik and Nori (2023) applied TAM to assess user trust in gold-backed cryptocurrencies, suggesting that system credibility directly influences perceived value (Mushaddik & Nori, 2023). This recurring application of TAM confirms its ongoing relevance in fintech user adoption studies, especially as AI and blockchain reshape digital interaction norms.

Closely related is the Theory of Planned Behavior (TPB), found in four articles. TPB expands on TAM by incorporating social norms and perceived behavioral control, thus providing a more holistic explanation of intention-driven behaviors in financial decision-making (Sagheer et al., 2022). Singh and Tiwari (2024), for instance, applied TPB to examine how emotional intelligence influences planned financial behavior in AI-mediated contexts (Singh & Tiwari, 2024). Similarly, Ahmed and Khan (2024) integrated TPB with behavioral theories to assess how attitudes and control beliefs affect trust in blockchain systems designed to counteract bias in economic choices (Ahmed & Khan, 2024). Therefore, TPB adds significant depth by recognizing that adoption is not purely a function of system features, but also of psychological and social determinants.

Another important theoretical lens was Behavioral Finance Theory, which appeared in five studies. This theory challenges classical economic assumptions of rationality, emphasizing that emotions and cognitive biases significantly affect investor decisions (Moorthy, 2022). Zhang and Lee (2023) applied behavioral finance to examine affective computing in AI trading systems, suggesting that emotion-aware models improve prediction of investor behavior (Zhang & Lee, 2023). Similarly, Joo et al. (2019) linked investor overconfidence and market behavior to crypto volatility, highlighting irrational patterns in decentralized finance markets (Joo et al., 2019). This theory remains instrumental in understanding how blockchain and AI technologies are received not in ideal markets, but in emotionally dynamic environments.

Relatedly, Emotional Intelligence (EI) Theory was explicitly used in three articles, focusing on how emotional awareness and regulation influence financial behavior in tech-mediated contexts. Singh and Tiwari (2024) found that individuals with higher emotional intelligence made more stable and ethical decisions in AI-driven financial environments (Singh & Tiwari, 2024). Similarly, Zhang and Lee (2023) integrated EI with affective computing to propose emotionally responsive AI trading tools (Zhang & Lee, 2023). These studies emphasize that beyond logic and data, emotional literacy plays a crucial role in the adoption and impact of financial technologies.

Less commonly, Institutional Theory was used in two studies to frame blockchain and AI integration as a structural evolution in financial institutions. Nguyen Thanh et al. (2024) theorized that blockchain could act as a decentralized institutional framework for autonomous AI agents, redefining traditional market governance (Nguyen Thanh et al., 2024). Likewise, Alibašić (2023) linked institutional pressures and ethical accountability in AI-driven cryptocurrency trading platforms (Alibašić, 2023). Although underutilized, Institutional Theory offers critical insights into how norms and structures evolve in response to technological disruptions.

In addition, Ethical and Consequentialist Theories appeared in two articles, underscoring the normative challenges of algorithmic finance. Farayola (2024) used consequentialist ethics to evaluate AI-blockchain applications in banking cybersecurity, focusing on outcomes over intentions (Farayola, 2024). Similarly, Alibašić (2023) proposed ethical governance models for AI-based trading algorithms, arguing for transparency, responsibility, and fairness in algorithmic decision-making (Alibašić, 2023). These ethical frameworks are increasingly vital as AI gains autonomy in executing high-stake financial actions.

Equally notable is the Diffusion of Innovation (DOI) Theory, cited in two articles. DOI was used by Kumari et al. (2023) to assess how innovation attributes such as trialability and observability influence the uptake of cryptocurrency technologies (Kumari et al., 2023). Joo et al. (2019) also relied on DOI to explain how early adopters influence market expansion in blockchain applications (Joo et al., 2019). Though limited in frequency, DOI remains valuable for analyzing adoption trajectories across technology lifecycles.

Finally, Decision Theory and Rational Choice Theory were used in three studies to model how individuals and algorithms optimize decisions under uncertainty. An et al. (2021) integrated these theories to explain AI-driven portfolio management, highlighting algorithmic logic as a proxy for human rationality (An et al., 2021). Meanwhile, Zhang and Lee (2023) critiqued these models by incorporating affective computing, arguing that decisions are not purely rational but emotionally modulated (Zhang & Lee, 2023). These theoretical tensions reveal ongoing debates about the nature of decision-making in AI-enabled finance. Interestingly, 18 studies did not adopt any explicit theoretical framework, relying instead on descriptive, technical, or design-oriented analysis (Salah et al., 2019), (Pal et al., 2021). While these studies contribute practical insights, the lack of theoretical grounding may hinder their generalizability and integration into broader academic debates (Polyviou et al., 2019).

In conclusion, this theoretical mapping reveals that while widely accepted models like TAM and TPB dominate empirical fintech research, newer and ethically conscious frameworks are gradually emerging to address the complex interplay of technology, emotion, and behavior. As AI and blockchain technologies become more intertwined with financial decision-making, future research would benefit from theory-driven designs that are both psychologically and ethically attuned.

**Table 2** Research Theories Used in the Analyzed Articles

| Research Theories | Frequency | Studies |
|---|---|---|
| Technology Acceptance Model (TAM) | 6 | (Kumari et al., 2023), (Sagheer et al., 2022), (Ahmed & Khan, 2024), (Joo et al., 2019), (An et al., 2021), (Mushaddik & Nori, 2023) |
| Theory of Planned Behavior (TPB) | 4 | (Singh & Tiwari, 2024), (Sagheer et al., 2022), (Kumari et al., 2023), (Ahmed & Khan, 2024) |
| Behavioral Finance Theory | 5 | (Moorthy, 2022), (Ahmed & Khan, 2024), (Singh & Tiwari, 2024), (Zhang & Lee, 2023), (Joo et al., 2019) |
| Emotional Intelligence Theory | 3 | (Singh & Tiwari, 2024), (Zhang & Lee, 2023), (Moorthy, 2022) |
| Institutional Theory | 2 | (Nguyen Thanh et al., 2024), (Alibašić, 2023) |

| | | |
|---|---|---|
| Ethical/Consequentialism Theory | 2 | (Alibašić, 2023), (Farayola, 2024) |
| Diffusion of Innovation Theory (DOI) | 2 | (Kumari et al., 2023), (Joo et al., 2019) |
| Decision Theory / Rational Choice Theory | 3 | (An et al., 2021), (Zhang & Lee, 2023), (Ahmed & Khan, 2024) |
| None / Not explicitly theoretical | 18 | (Salah et al., 2019), (Pal et al., 2021), (Polyviou et al., 2019), (Vashishth et al., 2023), and 14 others |

### 3.3. How the integration of blockchain and AI technologies transforms financial market infrastructures, enhances automation, and supports autonomous financial decision-making

The integration of blockchain and artificial intelligence (AI) technologies is radically transforming the structure and functionality of financial markets by enabling advanced automation, real-time processing, and autonomous decision-making systems. This section explores how the convergence of these technologies contributes to infrastructure modernization, operational transparency, and intelligent autonomy in financial ecosystems.

Blockchain provides the foundational layer of trust and decentralization, which is essential for autonomous AI systems to interact with financial institutions without human intervention. According to Nguyen Thanh et al. (2024), blockchain serves as a digital institutional framework that allows AI agents to independently access and execute economic functions such as contract formation, transaction processing, and marketplace engagement (Nguyen Thanh et al., 2024). This transformation not only enhances the efficiency of financial transactions but also redefines the role of institutions by decentralizing governance and reducing reliance on intermediaries.

Moreover, AI adds an intelligent decision-making layer to this decentralized foundation. Through machine learning and predictive analytics, AI systems are capable of analyzing vast financial datasets, identifying patterns, and making real-time investment or risk mitigation decisions. As emphasized by Vittala et al. (2024), the synergy between AI's decision intelligence and blockchain's immutable data infrastructure creates a reliable environment for self-regulating financial operations, from portfolio management to fraud detection (Vittala et al., 2024). This blend enables smarter automation, where systems not only process but also learn from each transaction cycle.

Transitioning further, this integration significantly enhances financial infrastructure security and compliance. In the context of tax regulation and public finance, Olabanji et al. (2024) demonstrated that combining AI's real-time fraud detection capabilities with blockchain's transparent ledger allows for automatic auditing and streamlined tax collection (Olabanji et al., 2024). This not only reduces administrative overhead but also builds public trust in institutional accountability.

Importantly, automation through AI-blockchain systems is not limited to processing transactions but extends to intelligent contracts and regulatory compliance. Odeyemi et al. (2024) reported that AI-enabled smart contracts enforce conditions without the need for legal intermediaries, enhancing both speed and accuracy in financial agreements (Odeyemi et al., 2024). These contracts are not only self-executing but also resistant to manipulation, thanks to blockchain's tamper-proof nature. This innovation is pivotal in enabling autonomous financial systems where machine-driven transactions comply with regulatory norms automatically.

Additionally, blockchain-AI systems contribute to infrastructural resilience and operational transparency. Alzoubi (2024) highlights how AI enhances blockchain network efficiency and security by predicting cyber threats and dynamically optimizing resources (Alzoubi, 2024). In reverse, blockchain enhances AI's trustworthiness by ensuring data provenance and auditability. This dual reinforcement ensures both technologies operate with accountability, which is vital for real-time financial decision-making systems.

Furthermore, the integration is playing a crucial role in enhancing predictive capabilities in decentralized finance (DeFi). Emmanuel et al. (2024) utilized models such as GPT and BERT alongside the Prophet algorithm to improve trend analysis in blockchain-driven financial systems (Emmanuel et al., 2024). This integration allows for high-accuracy forecasting and strategic planning, thereby reducing market volatility and enhancing portfolio optimization.

Finally, these technologies are also driving financial democratization and inclusion, particularly in underbanked regions. As noted by Sanyaolu et al. (2024), fintech innovations powered by blockchain and AI are creating new financial

models that extend access to secure, efficient, and personalized banking services (Sanyaolu et al., 2024). Autonomous financial systems can reach populations that are traditionally excluded from centralized banking infrastructures.

In summary, the integration of blockchain and AI is revolutionizing financial market infrastructures by automating complex operations, enabling intelligent decision-making, and supporting autonomous systems. These technologies reinforce each other: AI enhances decision logic and adaptability, while blockchain guarantees security, traceability, and institutional trust. As this synergy continues to evolve, it holds transformative potential for creating a more efficient, secure, and inclusive financial future.

### 3.4. The behavioral and emotional factors—such as emotional intelligence and risk perception—that influence cryptocurrency adoption and AI-driven financial decisions

The integration of emotional and behavioral factors into financial technology, particularly in cryptocurrency and AI-driven decision-making, is increasingly recognized as essential for understanding market behavior. Numerous studies affirm that variables such as emotional intelligence, risk perception, and behavioral biases significantly shape user engagement, technology acceptance, and investment decisions. Emotional intelligence (EI)—the ability to perceive, manage, and regulate emotions—plays a foundational role in shaping how individuals interact with emerging financial technologies. As highlighted by Ibrahim (2024), EI constructs like self-awareness, empathy, and self-regulation were found to directly influence behavioral intentions toward adopting AI-driven healthcare platforms, suggesting that EI should be formally included in technology acceptance frameworks like UTAUT (Ibrahim, 2024). Similarly, Sarin and Sharma (2023) argue that emotional intelligence moderates cognitive biases in investment environments, thereby enhancing the reliability of AI-assisted decision-making in behavioral finance (Sarin & Sharma, 2023). Therefore, emotional intelligence serves not just as a soft skill but also as a measurable input into fintech engagement outcomes.

In parallel, risk perception is another major behavioral determinant, particularly in the volatile world of cryptocurrency. Miko et al. (2023) found that individuals with higher financial literacy and lower risk perception showed stronger intent to invest in cryptocurrencies (Miko et al., 2023). This implies that psychological comfort with uncertainty—often modulated by prior experience or education—can significantly boost adoption rates. The influence of risk perception also extends to AI systems in finance, where fear of algorithmic error or lack of transparency may hinder acceptance. Hasan et al. (2023) demonstrated that applying AI in financial planning helped mitigate behavioral biases like hindsight and confirmation bias, thereby indirectly reducing perceived investment risk (Hasan et al., 2023).

Furthermore, the role of behavioral finance factors such as heuristics, herding, and cognitive biases cannot be overlooked. Almansour et al. (2023) applied behavioral finance theory to Gulf-region cryptocurrency investors and observed that biases like herding and self-attribution significantly influenced investment decisions—often more so than rational evaluation of market fundamentals (Almansour et al., 2023). This finding aligns with the broader literature suggesting that cryptocurrency markets are particularly vulnerable to emotion-driven volatility, especially when investment decisions are made in social or peer-influenced contexts.

In addition, AI's role in managing behavioral tendencies is increasingly explored as a solution to these psychological limitations. El Hajj and Hammoud (2023) observed that AI applications in financial services—including trading algorithms and credit assessments—can mitigate human errors and biases by relying on objective pattern recognition (El Hajj & Hammoud, 2023). However, as Sarin and Sharma (2023) noted, AI systems are themselves susceptible to bias if trained on skewed data, thus raising questions about whether technology can fully correct for irrational human behavior without replicating it.

At the intersection of behavioral and technological adoption lies the user's intention to adopt cryptocurrency, which is also affected by emotional and psychological profiles. As found by Miko et al. (2023), users with a higher degree of confidence in technology and emotional control are more likely to engage with crypto platforms. These behavioral traits, when integrated into AI algorithms, can improve predictive modeling of user preferences and market reactions, as shown in studies on ANN and LSTM-based price prediction models for Bitcoin and Ethereum (Wang & Zang, 2019).

In summary, the behavioral and emotional dimensions of cryptocurrency adoption and AI-driven financial decisions form a crucial, yet often underestimated, layer of the fintech landscape. Factors such as emotional intelligence enhance users' ability to process complex information and trust autonomous systems (Ibrahim, 2024), while risk perception and biases dictate how these technologies are received in uncertain environments (Hasan et al., 2023). As AI continues to evolve as a cognitive partner in financial decision-making, future research must continue to interrogate how these emotional and psychological factors can be better integrated into user models and technology designs to build more ethical, adaptive, and user-aligned financial ecosystems.

### 3.5. The ethical, regulatory, and transparency challenges posed by the convergence of blockchain and AI in financial markets and their impact on public trust and systemic resilience

The convergence of blockchain and artificial intelligence (AI) in financial markets presents transformative opportunities—but it also introduces a host of ethical, regulatory, and transparency challenges that have far-reaching implications for public trust and systemic resilience. These issues are particularly critical as the technologies move from experimental to institutional use across sectors like finance, governance, and trade. To begin with, one of the primary ethical challenges is the opacity of AI decision-making, especially when integrated into blockchain infrastructures. Blockchain's immutability, while supporting data integrity, can amplify the impact of errors if AI decisions are flawed or biased. Hazarika and Shah (2024) highlight how AI models shared across distributed blockchain networks can raise questions about data ownership, algorithmic fairness, and accountability, particularly in the absence of clear governance frameworks (Hazarika & Shah, 2024). This becomes more complex when smart contracts are designed to execute autonomously without human intervention, which limits recourse in cases of unintended harm.

Moreover, regulatory compliance lags behind the pace of technological innovation, leading to fragmented frameworks that vary across jurisdictions. Odeyemi et al. (2024) note that while blockchain and AI significantly enhance financial services security, they also introduce compliance risks due to inconsistent global data protection laws and difficulties in auditing algorithmic decision-making (Odeyemi et al., 2024). For example, data immutability on blockchains may conflict with legal rights to data erasure under GDPR, creating compliance dilemmas for financial institutions operating internationally.

In parallel, transparency—though often cited as a benefit of blockchain—can be compromised by the complexity of AI algorithms. As Kuznetsov et al. (2024) argue, although blockchain supports transparent transaction records, the opacity of AI "black box" systems can erode user confidence when outcomes cannot be readily explained or contested (Kuznetsov et al., 2024). This undermines one of the core promises of blockchain: fostering trust through verifiability.

Despite these challenges, integration of the two technologies can strengthen systemic resilience—if managed responsibly. Olabanji et al. (2024) demonstrate that AI and blockchain can work in tandem to enhance tax compliance and public financial management by automating auditing processes and reducing fraud through transparent, immutable data trails (Olabanji et al., 2024). However, they also caution that without robust infrastructure and clear legal frameworks, these same systems can introduce new vulnerabilities, such as systemic biases or algorithmic manipulation.

Additionally, public trust is shaped not just by technical features, but by perceptions of ethical alignment and institutional accountability. Adelekan et al. (2024) found that while the U.S. tax system benefits from AI and blockchain integration for fraud detection and efficiency, public resistance persists due to fears about data misuse and lack of recourse in AI-driven enforcement mechanisms (Adelekan et al., 2024). Therefore, even technically robust systems can falter if social trust is not cultivated through transparency, explainability, and ethical oversight.

At the same time, blockchain and AI can significantly improve regulatory compliance if strategically aligned. Alex-Omiogbemi et al. (2024) proposed a conceptual framework showing how these technologies can streamline regulatory reporting and risk management in emerging markets by fostering data transparency and enabling proactive oversight (Alex-Omiogbemi et al., 2024). However, they caution that implementation must address infrastructural gaps and resistance to digital governance models, which often stem from institutional inertia or lack of trust in technology providers.

From a transparency standpoint, blockchain offers unique benefits, but the value is only fully realized when paired with explainable AI models. Leiva and Castro (2025) explored this integration in clinical trial governance and concluded that blockchain's verifiability, when combined with AI transparency mechanisms, boosts both operational efficiency and stakeholder trust (Leiva & Castro, 2025). This insight is equally relevant to finance, where the legitimacy of autonomous financial decisions depends on both data integrity and algorithmic transparency.

Finally, sector-specific applications like halal supply chains also highlight how ethical compliance can be embedded into technical systems. Sunmola et al. (2025) developed a framework combining blockchain and AI for halal certification, ensuring both transparency and ethical compliance in sourcing and production (Sunmola et al., 2025). Such use cases show that technology, when purposefully designed, can advance ethical governance rather than complicate it.

In conclusion, while the convergence of blockchain and AI offers unprecedented potential to reshape financial market infrastructure, it simultaneously introduces significant ethical, regulatory, and transparency challenges. These

challenges impact not just system performance, but public trust and overall financial resilience. Therefore, successful implementation will require interdisciplinary coordination between technologists, regulators, ethicists, and end-users to build systems that are not only innovative, but also fair, secure, and trustworthy.

## 4. Conclusions

This study conducted a systematic review of the integration of blockchain and artificial intelligence (AI) in financial markets, with a focus on cryptocurrency adoption, emotional intelligence, behavioral economics, ethical frameworks, regulatory issues, and systemic resilience. The findings reveal a complex but increasingly synergistic relationship between these technologies and human-centric decision-making, each influencing and reshaping financial infrastructures in distinctive ways.

To begin with, the review found that the convergence of blockchain and AI is redefining financial infrastructures through intelligent automation, decentralization, and enhanced transparency. As demonstrated by Vittala et al. (2024), AI algorithms contribute to predictive decision-making, while blockchain ensures the verifiability and immutability of financial transactions (Vittala et al., 2024). This integration facilitates more efficient financial services, including fraud detection, algorithmic trading, and decentralized finance applications.

Secondly, emotional intelligence and behavioral tendencies—such as risk perception, financial anxiety, and trust—significantly influence technology adoption in finance. Research by Sarin and Sharma (2023) confirms that behavioral finance theories remain central to understanding how individuals process financial information and make investment choices, particularly in uncertain environments like cryptocurrency markets (Sarin & Sharma, 2023). Emotional intelligence, as noted by Ibrahim (2024), plays a vital role in enhancing user interaction with intelligent systems and mitigating irrational behavior (Ibrahim, 2024).

Importantly, the study highlights serious ethical and regulatory challenges. Blockchain's decentralization and AI's autonomous decision-making can amplify ethical risks when deployed without transparency and oversight. Alibašić (2023) emphasizes that the absence of universally accepted ethical frameworks in AI-based cryptocurrency trading could reduce trust and exacerbate investor risk (Alibašić, 2023). Similarly, Kamau and Yavuzaslan (2023) argue that blockchain auditing—referred to as CryptoAudit—faces regulatory gaps, especially in terms of defining clear standards for accountability and data validation (Kamau & Yavuzaslan, 2023).

Additionally, the study underscores the inadequate regulatory infrastructure to keep pace with the technological advancement in blockchain and AI systems. Pal et al. (2021) find that many financial institutions are unsure how to comply with evolving digital regulations, partly due to jurisdictional fragmentation and partly due to the novelty of distributed ledger technologies (Pal et al., 2021). Another emerging theme is the promise of enhanced systemic resilience. AI's ability to detect anomalies and blockchain's resistance to tampering, if implemented in harmony, can provide robust financial risk management systems. However, this requires intentional system design and governance. As noted by Ellul et al. (2020), most regulatory efforts still emphasize financial compliance over technology assurance, leaving AI-blockchain infrastructures exposed to implementation flaws (Ellul et al., 2020). In conclusion, this systematic review finds that blockchain-AI integration can significantly enhance the efficiency, security, and adaptability of financial systems—but only if ethical considerations, user behavior, and regulatory frameworks are adequately addressed. Without this, the same technologies may erode public trust and contribute to financial instability.

### *Recommendations*

In light of the findings above, several actionable recommendations are proposed for policymakers, technologists, financial institutions, and researchers:

- Develop an Integrated Ethical Framework

It is imperative to formulate interdisciplinary ethical guidelines that are specific to AI-blockchain convergence. These should go beyond general AI ethics to account for real-world applications in crypto trading, lending, and decentralized finance. Alibašić (2023) proposes a consequentialist framework that could serve as a foundational model for regulatory institutions (Alibašić, 2023).

- Enhance Regulatory Coherence and Global Alignment

As suggested by Ellul et al. (2020), governments must prioritize cross-border regulatory harmonization to ensure that blockchain and AI-based financial services are not undermined by jurisdictional discrepancies (Ellul et al., 2020). International financial bodies such as the IMF and FATF should play a coordinating role in establishing global digital standards.

- Promote AI Explainability and Blockchain Auditing Tools

To foster public trust, AI decision-making systems should be made more interpretable, especially in high-stakes domains like finance. Simultaneously, blockchain infrastructures must include built-in auditing features, as advocated by Kamau and Yavuzaslan (2023), to ensure traceability and verifiability in decentralized environments (Kamau & Yavuzaslan, 2023).

- Integrate Behavioral Insights into Fintech Design

Since emotional and cognitive traits strongly influence user engagement with financial technologies, product designers and fintech firms should embed behavioral and emotional intelligence models into user interfaces. This recommendation is grounded in the findings by Sarin and Sharma (2023) and Ibrahim (2024), who call for emotion-sensitive AI systems to better align with human decision-making patterns (Sarin & Sharma, 2023); (Ibrahim, 2024).

- Invest in Training and Digital Literacy

To ensure broad-based adoption of these technologies, governments and educational institutions must invest in digital literacy programs. Such initiatives would empower users to navigate blockchain-AI ecosystems confidently and ethically. This is especially important for vulnerable populations who may otherwise be excluded from decentralized financial systems.

- Support Ongoing Research on Quantum-AI Integration in Finance

As Atadoga et al. (2024) point out, future disruptions may arise from the integration of quantum computing into AI-financial systems, potentially changing the computational landscape altogether (Atadoga et al., 2024). Supporting such research will allow policymakers to anticipate and prepare for the next wave of technological transformation.

### *Limitations of the Study*

While this study provides a comprehensive and systematic review of literature concerning the integration of blockchain and AI in financial markets, it is not without its limitations. To begin with, the scope of the review was inherently limited by the availability and accessibility of peer-reviewed sources within specific databases. Although care was taken to include high-quality and open-access literature, some potentially valuable proprietary or non-English studies may have been excluded, thereby narrowing the analytical lens.

Additionally, the multidisciplinary nature of the subject matter posed challenges in synthesizing theories and methodologies across domains, including computer science, behavioral finance, ethics, and regulatory studies. This complexity may have led to oversimplification of certain domain-specific concepts or nuances. Furthermore, the rapid pace of technological innovation in AI and blockchain means that some of the literature reviewed may become outdated quickly, especially given the evolving regulatory frameworks and emerging tools like quantum computing.

Moreover, this study relied heavily on secondary data, which is subject to the limitations of the original research design, sample size, and potential biases. As a result, while the findings offer broad insights and trends, they may lack the granularity or context-specific detail achievable through primary data collection or field-based case studies.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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