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Conceptualizing the Decentralized Finance Model within the Risk Management Framework: An Application of Grounded Theory

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ABSTRACT

Deployment of decentralizing technologies, especially the DeFi environment, allows for the inclusion of risk management and financing, viewing risk as an endogenous aspect of value creation, where risk assessment and risk responding are incorporated inherently in a transaction. The purpose of current research is to identify and analyze core phenomena, causal, contextual, and intervening conditions and mechanisms shaping decentralized finance structure in Iran. Qualitative research approach was deployed based on Grounded Theory, and data was collected trough semi-structured interviews with 17 experts in financial management, fintech, accounting and economics. Data were analyzed through open coding, axial coding, and selective coding for extracting main concepts, causal relations, and operational mechanisms. The results of this study show that much of the opportunity to build trust, and thereby increase transparency and legitimacy goes through risk management and financing. In addition, the trust structure has shifted from an institutional level to a technology level. Financial control mechanism operates in a self-organized and participatory way. The main reason for the change of the trust structure included institutional pressures, market volatility, block-chain infrastructure developments, and managers' digital financial literacy.

Keywords: Decentralized Finance, Integration of Risk and Financing, DeFi, Financial Transparency, Technological Trust, Smart Contracts, Financial Sustainability

1. Introduction

In the era of digital transformation, financial ecosystems based on emerging technologies, especially decentralized finance (DeFi), have emerged as an innovative approach to redefine traditional financial structures. Relying on blockchain infrastructure and smart contracts, this new approach has enabled the provision of services such as lending, asset exchange, and decentralized governance without dependence on centralized intermediaries, which has created unprecedented potential to change global financial patterns (Arora, 2025; Weingärtner et al., 2023). Nonetheless, while the pace of development has increased in this space, and the total value locked (TVL), is also increasing in a way showing widespread acceptance the ecosystem involves a number of challenges, including technical, financial, and regulatory, which threaten the long-term sustainability and trust in this ecosystem. This reinforces the need for exhaustive solutions, especially in emerging markets such as Iran which have their own economic and infrastructural considerations.

The existing literature shows that DeFi, despite its advantages such as higher efficiency, wider access, and improved transparency over centralized financial systems, faces a wide range of inherent risks. The risks include exploitation of smart contracts due to coding errors, large liquidity swings due to a reliance on decentralized liquidity pools, and governance risks due to lack of coordination around decentralized decisions (Bertomeu et al., 2024; Okika et al., 2025; Lukianchuk, 2024; Turillazzi et al., 2023). These risks are compounded by the absence of central intermediaries that, historically, have fulfilled some semblance of an oversight function. Some reports now indicate that many hacks of smart contracts in recent years, including of important protocols, were responsible for significant financial losses and decreased public trust (Durachman and Rahman, 2024; Kurniawan et al., 2025). These incidents, including security breaches involving contract code manipulation or abuse of liquidity mechanisms, have exposed the structural vulnerabilities of DeFi and reinforced the need to design advanced protection mechanisms. In addition, the lack of standardization of risk management frameworks in the DeFi ecosystem has been identified as a major problem. Existing literature emphasizes that although DeFi significantly increases operational efficiency through automation and the elimination of intermediaries, the lack of integrated frameworks, technological challenges such as code vulnerabilities, and regulatory challenges due to the lack of centralized regulation have jeopardized its sustainability (Gramlich et al., 2022; Mada, 2025). Specifically, systemic risks linked to high market volatility, reliance on variable liquidity, and a lack of central enforcement of rules, have raised uncertainties in the prospective endurance of DeFi and instigated the call for novel approaches (Naifar, 2025; Perdana et al., 2023). While recent literature indicates that technical risks, mainly vulnerabilities in smart contract code, are rated with a risk score of 8.10, with more than 60% of DeFi incidents falling into this category in 2024, and analysis of the data suggested that protocol failure had a potential increased risk score of up to 30% without the implementation of AI-based risk assessment framework, which highlight the gap in research focused on the design of hybrid risk management models (Muralidhar & Lakkanna, 2024). On the contrary, traditional finance models show weaknesses, such as reliance on centralization, operational inefficiencies as a result of bureaucracy, and lack of transparency in transaction, which has created space for DeFi to be a worthwhile alternative (Bakare et al, 2024). Nevertheless, adopting the ecosystem, in the absence of risk management, creates additional risks, including regulatory uncertainty due to vague legal notions and technological constraints regarding the slow scalability of blockchain (Okika et al., 2025; Weingärtner et al., 2023). A literature review has rated centralized control of traditional finance at a failure score of 7.10 to facilitate contextual comparison with DeFi, which rates security weaknesses at 9.10 (Muralidhar & Lakkanna, 2024; Oranburg, 2024; Liu et al., 2024). A significant gap in the literature is the absence of a systematic adoption of risk management concepts into DeFi models. Literature has mostly studied technical aspects (e.g., smart contract security), but have yet to adopt financial (e.g., liquidity management), regulatory (e.g., regulatory compliance), and governance (e.g., decision coordination) aspects holistically (Adamyk et al., 2025; Mothukuri et al., 2024a; Sah et al., 2024). A literature review completed during 2023-2025 states that 25% of research focused on integrating AI into risk assessment, while 75% emphasized regulatory challenges, indicating a serious interdisciplinary research need (Bodo and Filippi, 2024; Gogol et al.,

2024). This is concerning in emerging economies like Iran, where such economies struggle with issues like economic sanctions, currency issues, and limited access to the global financial infrastructure. As a result, the need to develop localized risk management models to support the sustainability and adaptability of DeFi to local conditions justifies this research.

2. Theoretical Foundations and Research Background

The development of DeFi arises from the innovations in blockchain, which continue to mature from an abstract idea into a functioning ecosystem. The roots of DeFi as we know it, could be traced back to the introduction of the idea of decentralised digital money, which is found in the Bitcoin whitepaper authored by Satoshi Nakamoto in 2008, which also gave the promise of eliminating traditional intermediaries (Schär, 2021). As the document presented the idea of a distributed ledger, it opened the way to a financial system without relying on central institutions, and DeFi is thus the natural development of this process within financial services. However, in its most complete meaning, DeFi generated the most momentum with the introduction of Ethereum in 2015, whereby Vitalik Buterin and a team of developers implemented the idea of smart contracts and sort to automate financial services without central institutions (Dos Santos et al., 2022). Ethereum, through its Ethereum Virtual Machine (EVM), provided a way for the automated code execution to expand DeFi functionalities from simple financial transactions to advanced services such as lending, swaps and decentralised governance.

DeFi has entered the practical phase since 2017 with the launch of the MakerDAO protocol, which provided a framework for issuing collateralized stablecoins (like DAI) that maintain price stability in volatile price environments (John et al., 2023). Using overcollateralization, the protocol demonstrated how DeFi could recreate traditional instruments like bank loans, without being tied to banks. This time period was highlighted with the development of key protocols, such as Compound for algorithmic lending, and Uniswap for automated market-maker (AMM) exchanges which demonstrated how DeFi could function as a global financial market. Literature notes that the total value locked in the ecosystem increased from less than $1B in 2018 to over $100-150B at the start of 2020, a large portion of which was caused by the COVID-19 pandemic and a search for alternative financial instruments (Werner, et al., 2022; Mnohoghitnei et al., 2022). For instance, in 2020 total value locked in DeFi experienced a compound annual growth rate (CAGR) of over 500%, which they argue is improved through protocol driven innovation (Gudgeon et al., 2020a).

The development of DeFi is divided into three phases: the beginning (2008-2015) was focused on the blockchain foundation; the development phase (2016-2019) centered on developing the first protocols, such as lending pools; and the maturity phase (2020 to present) focuses on protocol composability and on second-layer protocols (Layer 2), such as Polygon (Durachman and Rahman, 2024). These stages are what sets DeFi apart from other technologies in Finance, such as FinTech (which often is focused using exploit-focused centralized processes). FinTech is focused on mobile applications and digital payments, while DeFi is focused on open and programmable protocols (Alamsyah & Salsabila, 2024). Blockchain for example could increase accessibility via services like PayPal, but it relied on central servers. For example, DeFi continues to develop protocols like Synthetix, which allows the production of synthetic assets without a third party. However, these developments have their problems largely due to a reliance on Ethereum and also market conditions. These implications are reviewed in later sections. Overall, the evolution of DeFi moved the concept from a theoretical idea to an ecosystem that has the potential for democratizing access to financial services and could be the example for emerging markets (Gudgeon et al., 2020b).

Lim (2024), in A Predictive Automated Market-Building Architecture for Crypto Assets for Decentralized Finance Using Deep Reinforcement Learning, introduces a LSTM-Q-learning-based AMM predictive architecture for Uniswap V3, which minimizes slippage and divergence losses in addition to improving capital efficiency by 30% in volatile markets, increasing retail access to the space. While this technical avenue does not address regulatory and local risk issues, this study may be able to offset the gap in infrastructure sustainability (e.g. lack of internet access).

Lastly, Ratnawati et al. (2025), in "How Fintech Innovation Transformed Finance," systematically review 25 articles (2015-2025) based on the PRISMA guidelines, tracing the evolution of Fintech while highlighting the increasing financial inclusion, operational efficiency, and digital transformation, while mentioning cyber, and regulatory challenges along the way. The study addresses innovation and global transformation and omits emerging market contexts such as Iran, or other markets with banking restrictions.

In terms of risks within DeFi that did not exist back in the traditional finance world, by 2025 DeFi will host over 60 percent of incidents caused by the exploitation of smart contracts via flash lending attacks, liquidity variations from decentralized pools that caused unsustainable losses, and governance problems caused by misalignment found within Decentralized Autonomous Organizations (DAOs). In these new risks it is important to note that volatility rates are typically 20-30 percent higher in DeFi than they are in the traditional systems with the potential of undermining the level of stability found in traditional finance and further observed in approximately 25 percent of studies are issues of power imbalance with DAOs.

In this context, Kong et al (2023) in DeFiTainter: Identifying Price Manipulation Vulnerabilities in DeFi Protocols suggest a framework for cross contract taint analysis with call graph reconstruction, that accurately detects vulnerabilities with a 96% accuracy and an overall call accuracy of 91.3%. The authors also identify three unknowns in Uniswap protocols, yet their technical-centric perspective of all global protocols does not factor in local situational risks such as those placed on Iran (i.e., sanctions, external auditing). Next, Okika and others (2025) in Smart Contract Vulnerabilities in DeFi: Assessing Security Risk in Blockchain-Based Lending Platforms provide an analysis of recursive attacks, oracle manipulation and flash lending, using a systematic literature review and case study evidence from Aave and Compound. In particular, they note the lack of central oversight as a pillar of exposure, advocating for continuous auditing, formal verification, and decentralized insurance as ways to mitigate security governance. Again, the article does not consider the premise of global standards or cultural-regulatory risks placed on Iran (i.e., legal adherence to Sharia law or standards placed by the banking sector).

While much work has been done to discuss DeFi, there are important and clear research gaps around the world that impede work towards a comprehensive and actionable risk management framework that incorporates risk in real time. Based on a critical review of several studies, the gaps are largely due to conceptual, empirical, and practical limitations, and cyclone which demonstrate the need for interdisciplinary work moving forward. In particular, the literature review documents these limitations, with 70% of the studies focusing on technical and short-term risk management issues, compared to only 20% that addressed long-term sustainability issues. This also demonstrates divergence in the level of agreement between studies studied and suggests a role for models (Weingärtner et al., 2023; Durachman and Rahman, 2024).

3. Research Method

In this research, using the grounded theory method, an attempt is made to identify the concept of decentralized finance in the Iranian context and extract its dimensions and components. In this method, data are collected and analyzed through in-depth interviews with experts to form a conceptual framework for the research from the data. This approach allows the researcher to develop a model that is rooted in local realities and practical experiences, rather than relying on pre-existing models.

The present research is of an applied and developmental nature, because its goal is to develop knowledge in order to solve a real problem in the field of the country's financial and economic system. Decentralized finance, as a new phenomenon, not only has a theoretical concept, but in practice, it can play an important role in improving the country's financial system. Therefore, the nature of the research is such that its findings can be applied in economic policymaking and the design of practical mechanisms. Grounded theory is an approach that uses observations made in data collection to generate a theory that comprehensively describes the processes, interactions, or actions that are part of a phenomenon. Thus, the theories generated by this approach are process oriented. Furthermore, generating theory in this way relies on systematic analysis of data. With this approach, researchers generate categories, themes, and

relationships between categories, and they offer a theory to explain the processes under study. This approach was created by Glaser and Strauss in the 1960s and was presented as an alternative to structuralist and task-based approaches.

In this research project, the population of focus includes all individuals who have expertise and/or experiences in the areas of finance, risk management, financial technology, and ideally in the area of decentralized finance. The sample may be made up of university faculty, researchers, corporate financial managers, and DeFi activists. Sampling in this section utilizes the snowball method, which means that a few key experts are identified to start the discussion, and those individuals are asked to provide recommendations for others who are also experts in this area. This process will continue until theoretical saturation is reached, meaning that new interviews do not add any new data to the conceptual model.

Overcoming the problems of snowball sampling

One of the well-known challenges in the snowball sampling method is the risk of (over-homogeneity) of the samples and limited access to people who are in similar communication networks. To overcome this problem, the present study attempted to start the initial sampling chains from several points and with people with different backgrounds and roles. In other words, a few (initial individuals) were selected from distinct groups; including fintech specialists, private bank managers, risk experts, and blockchain startup activists. This multi-source approach increased the diversity of experiences and perspectives among interviewees and prevented excessive uniformity of the data. Also, to prevent network centralization, after every two or three referral cycles, it was checked whether new participants had different characteristics than the previous group; if the characteristics were repeated too much, the sampling chain was stopped and a new chain was started.

Data analysis method

- Open coding: Qualitative data (interviews) are decomposed into primary codes and categorized according to related concepts.
- Axial coding: Primary codes are organized around a central category and relationships between categories (causal factors, intervening factors, contexts, strategies, and outcomes) are identified.
- Selective coding: Main and subcategories are integrated and a final conceptual model is developed. This process involves continuous comparison of data and validation by experts.
- Thematic analysis: Sub-themes and main themes are extracted from qualitative data and presented in the form of tables and graphs.

Ethical considerations

In conducting this research, all ethical principles are observed. Participation in interviews and answering questionnaires is completely voluntary, and before starting, the purpose of the research is clearly explained to the participants. The data is kept confidential and no personal information will be published in the final report. Also, any bias or influence on the respondents is avoided in order to maintain the scientific validity of the research.

4. Results

The population examined in this qualitative study consists of individuals with knowledge, time spent as participants, and historical scientific or professional work in the domains associated with decentralized finance (DeFi), risk management, financial economics, and new financial technologies (FinTech). The investigation was designed to include 17 experts as interview participants. Most participants were company financial manager, researchers in the area of financial technology, and university faculty. The table below displays some of the overall characteristics of the interviewees.

The selection of interviewees in this study was carried out using the snowball method. In the first stage, a number of well-known experts in the fields of financial management and new financial technologies were selected as a starting point. Each of these individuals was then asked to introduce other experts who have deep knowledge and experience in related fields, especially decentralized finance and risk management. This chain of introductions continued until the data obtained from the interviews reached theoretical saturation and no new information was obtained. The diversity and specialization of the participants was carried out in order to obtain more

comprehensive views on the multidimensional nature of decentralized finance within the framework of the risk management system. Accordingly, a combination of academic experts, executives, financial consultants, and fintech activists were present in the interviews to explore both the theoretical aspects and the practical and technological dimensions of the subject. This diversity led to the richness of the data and greater accuracy in extracting the main categories and concepts of the proposed research model.

Table 1: Characteristics of the interviewees in the qualitative part of the study

Interviewee No.	Gender	Education Level	Main Specialization	Work Experience (Years)	Field of Activity	Current Position
1	Male	PhD	Financial Management	18	Academia	Faculty Member
2	Male	Master's	Financial Engineering	10	Investment Company	Financial Manager
3	Female	Master's	Accounting	8	Financial Consulting Firm	Senior Risk Analyst
4	Male	PhD	Financial Economics	15	Academia	Visiting Professor
5	Male	Master's	Risk Management	12	Insurance and Banking	Risk Manager
6	Male	PhD	Financial Technology (FinTech)	14	FinTech Startup	CEO
7	Female	Master's	Accounting	9	Financing Company	Senior Analyst
8	Male	Master's	Industrial Engineering	11	Manufacturing Company	Financial Planning Manager
9	Male	PhD	Financial Management	21	Academia	Faculty Member
10	Male	Master's	Economics	13	Financial Institution	Economic Consultant
11	Female	Master's	Technology Management	7	FinTech Company	Blockchain Analyst
12	Male	Master's	Accounting	9	Investment Company	Audit Manager
13	Male	Master's	Financial Engineering	16	Monetary and Banking Research Institute	Senior Researcher
14	Male	Master's	Financial Economics	12	Investment Consulting Firm	Senior Expert
15	Female	Master's	Financial Management	8	Bank	Credit Officer
16	Male	PhD	Risk Management	19	Central Insurance	Director of Risk
17	Male	Master's	Financial Information Technology	10	Blockchain Technology Company	Senior Developer

Conducting the interviews

The interview process was conducted in several stages. In the first stage, the time and manner of each interview were determined in advance. Depending on the geographical location and conditions of the interviewees, some interviews were conducted in person and some via virtual communication. Each interview lasted an average of 45 to 70 minutes, and the conversations were conducted in a quiet and undisturbed atmosphere so that the interviewees could freely express their views. At the start of each meeting, individuals were informed of the purpose of the study and the ethical context in described to them that their identities would be protected, and during the interviews, in addition to audio-recording the interviews, the researcher recorded in short notes key highlights, implicit understandings, or non-verbal responses to be used in the analysis. Upon completion of the data collection phase, transcription of the interviews was undertaken in full and precise detail. This meant each individual participants speech was transcribed verbatim with no changes or omissions made to the text. Only unnecessary repetitions or filler words were removed to make the text readable for analysis. This was done very carefully and several times to ensure that no meaningful part of the interviewees' statements was omitted. The result of this process was a set of rich and coherent texts that served as the basis for the beginning of the coding stage.

Open coding process

In this stage, the researcher re-read the initial codes and grouped them into conceptual units. For example,

codes such as (lack of transparency in information), (dependence on intermediaries), and (slow decision-making in traditional financial institutions) were all placed under a higher concept titled (structural challenges of the traditional financial system). In naming the codes, an attempt was made to use words that were as close as possible to the language of the participants, but at the same time went beyond the level of mere description and had conceptual power. Synonyms and similar codes were also merged into a final title to avoid conceptual fragmentation.

Maintaining the initial code notebook

Below, Table 2 shows a list of sample codes extracted during the open coding phase. This table includes 40 selected sentences from the interviewees that were classified into several main categories.

These categories were then used as the basis for axial coding (axialization) to clarify the relationships between them and the central research topic, namely the decentralized financing model within the risk management framework.

Table 2: Example of open coding and initial concept classification

Conceptual Category	Extracted Code	Excerpts from Interviewees' Statements
Challenges of the traditional financial system	Rigidity of the banking structure toward innovation	The current banking structure is not flexible for innovation.
Challenges of the traditional financial system	Slow decision-making in traditional institutions	Decision-making in banks is very time-consuming.
Digital transparency and trust	Transparency as a factor in reducing corruption	Transparency in DeFi reduces corruption.
User participation	Users' sense of ownership	Users in decentralized platforms feel a sense of ownership.
Institutional and legal barriers	Legal ambiguity in the DeFi domain	The absence of clear regulations hinders investor attraction.
Structural transformation of finance	Replacement of trust by technology	Blockchain technology has replaced intermediaries with trust.
The role of technology in risk management	Data analytics for risk control	Data analytics in DeFi better reveal credit risks.
Social acceptance of innovation	Technology adoption among the younger generation	Young people trust technology more quickly.
Educational challenges	Users' lack of financial literacy	The lack of financial education is the biggest challenge for DeFi adoption.
Institutional and legal barriers	Institutional weakness in supervision	Regulatory bodies still do not fully understand decentralized systems.
Digital transparency and trust	Investor sensitivity to transparency	Investors pay great attention to transaction transparency.
Digital transparency and trust	Traceability of transactions	In DeFi, everything is traceable.
Institutional and legal barriers	Lack of legal framework	The absence of legal backing leads to distrust.
Structural transformation of finance	Elimination of personal trust in the system	Decentralized platforms do not require personal trust.
Operational efficiency	High financial processing speed	The transaction speed in DeFi is remarkable.
Economic benefits of DeFi	Reduction of financial costs	DeFi significantly reduces financial costs.
Challenges of the traditional financial system	Technological lag in banks	Banks have fallen behind in adopting new technologies.
Financial risk challenges	Risk arising from cryptocurrency volatility	Cryptocurrency volatility creates high risk.
Security challenges	Concern over digital security	Users are concerned about the security of digital assets.
Financial justice and economic inclusion	Universal access to financial resources	DeFi can increase access to finance for disadvantaged groups.
User participation	Active user participation	Every user in DeFi plays a more active role.
Security challenges	Lack of security standards	The absence of common security standards is problematic.
The role of technology in risk management	Data analytics for behavioral prediction	Open data can predict financial behavior.
Institutional and legal barriers	Regulatory restrictions on innovation	Strict regulation limits innovation.

Conceptual Category	Extracted Code	Excerpts from Interviewees' Statements
Digital transparency and trust	Relationship between transparency and accountability	Transparency leads to greater accountability.
Technical and infrastructural challenges	Weakness in technological infrastructure	The lack of technical infrastructure causes implementation delays.
Structural transformation of finance	Tendency toward disintermediation	Users tend to avoid intermediaries.
Economic benefits of DeFi	Increasing profitability	The profitability of DeFi projects is increasing.
Challenges of the traditional financial system	Complexity of the lending process	In the traditional system, the lending process is very complicated.
Security challenges	Cybersecurity threats	The risk of hacking is always present.
Institutional and legal barriers	Traditional policymaking	Governments still act with a traditional regulatory approach.
Educational challenges	The role of education in technology adoption	Public education can accelerate DeFi adoption.
The role of technology in risk management	Use of big data	Big data is a new tool for risk management.
Economic benefits of DeFi	Reduction of monitoring costs	In DeFi, monitoring costs are reduced.
Social acceptance of innovation	Cultural resistance to innovation	Changing organizational culture to accept technology takes time.
Digital transparency and trust	Strengthening of public trust	Blockchain has strengthened public trust.
Educational challenges	Managerial lack of awareness	Many managers lack sufficient knowledge of technology.
Digital transparency and trust	Fraud reduction through transparency	Transaction transparency reduces fraud risk.
Institutional and legal barriers	Institutional misalignment	The lack of coordination among financial institutions causes problems.
Security challenges	Weakness in wallet security	The security of digital wallets needs improvement.

Table 3: How the initial codes were aggregated into subcategories (the letter M stands for interviewee)

Subcategory	Sample Initial Codes (with Participant Codes)	Derived General Concept
Institutional Transparency Challenges	P1: Lack of open data for risk analysis; P9: Limitations of financial institutions in disclosing transactional information; P14: Incomplete and non-standard reporting in banking systems; P11: No public access to financial decision-making data; P5: Strong dependence on unverifiable internal reports.	Lack of transparency in the traditional financial system and weak data infrastructure for risk analysis.
Technological Risks in DeFi	P7: Concerns about wallet security and potential hacking; P15: Existence of bugs in smart contracts and lack of unified security standards; P10: Difficulty in identifying vulnerabilities in decentralized platforms; P16: Risk of asset loss due to technical or algorithmic errors; P4: Absence of accountability mechanisms when system errors occur.	Technological and security risks arising from the complexity of decentralized infrastructures and weak control standards.
Social and Cultural Acceptance of FinTech Innovations	P17: Lack of digital financial literacy among traditional managers; P13: Cultural resistance to eliminating intermediaries; P8: Initial user distrust of automated systems; P6: Concern about humans being replaced by algorithms; P12: Misconceptions about the nature of digital assets and blockchain.	Cultural, educational, and perceptual barriers to the widespread adoption of decentralized finance.
Institutional and Legal Constraints	P2: Ambiguity in cryptocurrency regulations; P2: Overlapping responsibilities of supervisory institutions; P5: Absence of a designated legal authority to oversee smart contracts; P11: Excessive strictness in anti–money laundering regulations; P9: Lack of a harmonized framework for aligning technology with financial law.	Weak institutional coordination and absence of a coherent legal framework for decentralized financial activities.
Role of Technology in Enhancing Risk Management	P16: Use of big data for predicting financial behavior; P6: Algorithmic analysis of credit risk in DeFi platforms; P10: Automation of risk control through smart contracts; P15: Data transparency for identifying systemic risks; P7: Real-	Technology as the key tool for improving accuracy, transparency, and speed in risk management.

Subcategory	Sample Initial Codes (with Participant Codes)	Derived General Concept
	time traceability of suspicious transactions.	
Transformation of Financial Trust Structures	P4: Replacement of personal trust with algorithmic system-based trust; P16: Elimination of traditional intermediaries in credit assessment; P9: Enhanced traceability and accountability; P14: Trust-building through data transparency; P11: Emergence of digital trust in peer-to-peer financial interactions.	Transfer of trust from institutions to technology and redefinition of control in decentralized finance.
Economic Benefits and Operational Efficiency of DeFi	P2: Reduction of transaction costs; P8: Acceleration of payment processing; P7: Increased access to financial resources for small-scale participants; P10: Reduction of monitoring costs; P12: Higher investment returns through disintermediation.	Improvement in economic efficiency and reduction of systemic costs through the elimination of centralized structures.
User Participation and Role in the Decentralized System	P15: Users' sense of ownership over assets; P12: Active participation in network decisions; P3: Performance-based reward mechanisms; P15: Increased bargaining power of users against large institutions; P17: Democratization of financial processes.	Strengthening of user roles and emergence of participatory models in decentralized financial management.
Educational and Managerial Challenges	P8: Lack of formal education on financial technologies; P5: Managers' weakness in understanding digital tools; P13: Lack of familiarity with data analytics and intelligent algorithms; P9: Shortage of skilled professionals in the fintech sector; P16: Neglect of in-service training in financial organizations.	Lack of specialized knowledge and human capacity to adapt to decentralized financial structures.

The table above shows how, from the mass of raw data obtained from the interviews, a set of initial concepts with similar themes were organized into subcategories. The goal of this stage in Corbin and Strauss's grounded theory is to create conceptual coherence among the scattered codes and gradually move from the level of description to the level of explanation. Each subcategory actually represents a cluster of common meanings that emerged from several interviews and different perspectives. For example, (institutional transparency challenges) was extracted from the combination of data from five interviewees with banking and audit records and emphasizes a fundamental weakness in the traditional financial system: the lack of open and standardized data for risk-based decision-making. This category was identified in later stages as one of the causal conditions in the formation of the new decentralized finance paradigm. On the other hand, the category (technological risks in DeFi) indicates a new dimension of vulnerability of digital financial systems. Although blockchain technology provides a platform for trust and transparency, it also creates new security and technological risks that were less common in traditional systems. In interviews, many experts emphasized the need to standardize security protocols and design technological accountability frameworks. The category of (social and cultural acceptance of financial technologies) also reflects soft resistance to innovation. Data analysis showed that even among senior financial managers, there is no deep understanding of the decentralized nature of technology, and distrust of algorithms and fear of eliminating the human role are considered the most important obstacles to the development of DeFi. This category was later analyzed as one of the cultural intervening conditions in the final model. Other categories such as "the role of technology in improving risk management" and (the evolution of the financial trust structure) are directly related to the central phenomena of the research. Interviewees repeatedly noted that DeFi's reliance on transparency and the automation of contracts is shifting the center of trust from individuals and institutions to technological systems; this transformation not only redefines financial relationships, but also changes the risk control model from human to algorithmic oversight.

Axial Coding

Axial coding is a key step in grounded theory in the Corbin and Strauss method, which aims to establish logical connections between the categories extracted from the open coding stage. In this stage, the researcher moves away from the level of fragmentation and plurality of concepts and attempts to reveal the cause-and-effect, contextual, and strategic relationships between categories by using a paradigmatic model. In other words, the data moves

from the (small and disjointed) state in open coding to a coherent and systematic structure in which causes, contexts, intervening conditions, strategies, and consequences are transformed into a coherent pattern. The method of continuous comparison was used as the main pillar of qualitative analysis in this research. In this method, each piece of data was compared with other data, each code with other codes, and each category with other categories to identify similarities and differences. These comparisons led to clearer conceptual boundaries and some codes being merged or redefined. For example, the codes (increasing financial transparency through blockchain) and (open access to transaction data) were merged into a new category titled (technological transparency) after comparison.

Examples of comparison and results

The first example of comparison was made between two different data from two interviewees: one emphasized (resistance of traditional institutions to financial innovation) and the other emphasized (need to reform the institutional structure for the adoption of DeFi). The comparison showed that both views revolve around (institutional barriers) and therefore were placed in the form of a combined category.

The second example was related to the comparison of the categories (technological risks) and (user behavioral risks). The comparative analysis showed that these two are not independent, but rather complementary to each other; because the occurrence of user behavioral errors can increase the likelihood of technological risks. Thus, a new category titled (human-technology interaction in risk management) was formed.

Theoretical saturation assessment

In this study, theoretical saturation was considered achieved when new data no longer led to the identification of new concepts or changes in the structure of relationships between categories. The main indicators for detecting saturation were: repetition of data in the final interviews, convergence of views among experts, and the absence of the need to revise the codebook in three consecutive interviews. The theoretical saturation process almost reached a point of stability after the fifteenth interview, and the two final interviews merely confirmed previous data. The categories related to (structure of blockchain technology), (risk management strategies), and (dynamics of decentralized interactions) reached saturation before other topics, because the participants had relatively similar views in this area. In contrast, the categories related to (financial policymaking and institutional supervision) reached saturation later, because the views of the interviewees in this area were more diverse and sometimes contradictory. Finally, it was ensured that the data reached a sufficient level of theoretical richness and were ready to enter the stage of selective coding and presentation of the final research model.

Selective coding

Core phenomena

1. Integration of risk and financing in a decentralized context

In traditional financial systems, risk management and the financing process were considered two relatively separate areas; one focused on controlling possible outcomes and the other on attracting and allocating resources. With the emergence of decentralized technologies, and especially the DeFi ecosystem, these two domains have become endogenously intertwined, and a new concept called (integration of risk and financing) has been formed. In this model, risk is not an external element to be controlled, but part of the value creation mechanism; because every financial transaction, through smart contracts, automatically includes risk assessment, hedging, and adjustment. This integration causes the processes of capital allocation, asset pricing, and financial supervision to operate continuously and self-regulate.

2. Evolution in the structure of trust and financial control

Trust is the foundation of all financial interactions. In traditional systems, trust was formed on the basis of intermediary institutions such as banks, brokerages and regulatory organizations that guaranteed the legitimacy of transactions by creating legal frameworks. However, the present study showed that in the decentralized structure of financing, trust has been transferred from the institutional level to the technological level. In this system, trust does not depend on human actors, but on cryptographic mechanisms, smart contracts and data transparency. This transfer has also caused a (evolution in the structure of control) because supervision from outside

the system (external control) is transferred into technological processes and codes (embedded control).

Causal Conditions

1. Institutional Pressures for Financial Transparency

In the last decade, a wave of financial crises and scandals resulting from financial data concealment and manipulation have prompted international institutions and regulators to emphasize financial transparency. In this study, institutional pressures were identified as one of the main factors in the trend towards decentralized models. DeFi has emerged as a technological response to this institutional demand by providing open access to data, full traceability of transactions, and eliminating dark spots in the financial flow. In fact, financial institutions and companies are trying to strengthen their legitimacy in the eyes of stakeholders and regulators by adopting decentralized technologies. Data analysis showed that transparency in DeFi has become not only an external requirement, but also a competitive advantage. Organizations that can share their financial information in open and encrypted environments enjoy greater public trust.

2. Market volatility and weaknesses of traditional financing models

Another causal factor influencing decentralized financing is the instability of the global economy, which we have observed is reflected through dramatic shifts in interest rates and currencies, as well as the limitations of traditional models relying on intermediation-based or agency models. The research data indicated that many of the financial stakeholders expressed frustration around the time lag with information, high transaction costs and the concentration of decision-making authority in the traditional system. These economic and systemic inefficiencies contributed to a greater emphasis on new financing models using real-time data and self-executed contracts to optimize the flow of capital. In part, the theoretical weakness of traditional economic models is attributable to dependence on human trust or faith-based models relying on bureaucratic influence. DeFi has been further able to increase relevance in the allocation of capital by removing the intermediary, automatically executing contracts, and assessing risk with real-time data analysis. In interviews most of the experts noted that in volatile conditions decentralized systems demonstrate greater robustness from instant transparency and quick adaptability to changing market conditions. As such, rather than having volatility be a barrier, volatility is an impetus to transforming underlying financing patterns.

3. Development of blockchain infrastructure and related technology

The arrival of blockchain, smart contracts, data oracles, and crypto immutable infrastructures enabled a technological platform without which decentralized finance could not be imagined. Qualitative data analysis suggests that these technologies affected the growth of finance and made the financial system no longer dependent on centralization. Given features of the blockchain such as immutability, transparency, and data distribution, the features added the foundation of DeFi, and allowed organizations to manage assets and financial flows with a more secure and trusted framework, than before. From an analytical perspective, the conceptualisation of these infrastructures regimented structural change in the business model of financial institutions. The banks, investment firms, and insurance companies were forced to rethink their agency from financial intermediary to designer of financial (service protocols). Therefore, technology is not merely a tool, but a transformative force in the structure of financial power and decisions.

4. Increasing tendency to manage risk endogenously

In current financial systems, risk management has become part of the organizational identity. Data suggests that many firms aim to institutionalize the risk management process internally within their financial frameworks, rather than relying on others to manage and protect against risk. Decentralized technologies, particularly smart contracts and chain data analytics, have enabled risk identification, assessment, and mitigations that are initiated internally and can be continually updated and adjusted in real time. This endogenous approach allows firms to be more agile in responding to market changes and take data-driven decisions independently of intermediaries. In interviews, CFOs suggested that such an approach is not only efficient, but because the risk management process is developed internally within the organization, generates accountability and transparency. It is this move to manage risks endogenously that may be a reaction to the volatile and complex financial circumstances we face today that

require organizations to act quickly by using data based intelligence to either take additional risk, or manage established risk.

Intervening Conditions

1. Regulatory and Legal Challenges

Although decentralized technologies have great potential to create transparency and reduce risk, the lack of a clear legal framework is one of the most important obstacles to their development. Interview data showed that financial managers and researchers cited "legal ambiguity" as a serious obstacle that hinders the formation of public trust and long-term investment. On the one hand, regulatory bodies do not yet have the appropriate tools to track and control decentralized financial activities, and on the other hand, the global and borderless nature of these technologies has created challenges in applying national laws. In the final analysis, it became clear that the lack of transparent legal mechanisms has a dual effect: on the one hand, it slows down institutional adoption, but on the other hand, it provides an incentive for the development of self-regulatory frameworks and standardization from within the ecosystem.

2. Technological and Security Risks

Although technology has become the backbone of DeFi's success, it simultaneously serves as a key weakness. Interviews indicated that the risk of security threats such as hacking smart contracts, cyberattacks on decentralizd technology, and weaknesses in the management of private keys were top of mind for CFOs. These challenges are prompting organizations to reconsider the widespread adaptation of these technologies. Following an analytical framework, risks originating from technology do not only reside in the technical dimension, but have both economic and reputational risks. Any breaches or successful attacks will result in a loss of trust among users and a decline in the value of the assets. As a result, in order for the decentralized ecosystem to be sustainable, an organization's cyber insurances mechanisms, vulnerability assessments, and user education are a minimum requirement.

3. Cultural and Organizational Resistance to Decentralization

One of the hidden but powerful obstacles to the spread of DeFi is the cultural and mental resistance of managers and organizations to the loss of centralized control. In interviews, many financial managers acknowledged that accepting the concept of decentralization means reconsidering the structure of power, decision-making, and organizational trust. This resistance is sometimes due to concerns about the loss of the management role and sometimes due to unfamiliarity with the real benefits of the technology. Data analysis showed that overcoming this obstacle requires a gradual process of education, culture building, and practical experience. Organizations that have been able to transfer part of their processes to a decentralized structure in an experimental format have shown greater flexibility in the long term. Therefore, cultural resistance can be considered not an absolute obstacle, but a temporary challenge that will decrease with time, experience, and proof of the effectiveness of the technology.

4. Limitations of Standardization in Financial Protocols

One of the structural impediments to the evolution of decentralized finance is a lack of uniform standards for design, security, and data interchange across protocols. Each DeFi platform may be using a different technical structure, creating incompatibility, redundancy, and higher probabilities of error. Interviewees stated that this misalignment limits scalable and international interoperability for decentralized systems. From an analytical view, standardization has a technological aspect, as well as an economic and governance dimension. That is, without agreed-upon standards, it also makes risk assessment, auditing, and regulatory compliance difficult. Alternatively, this limitation could also be considered an opportunity for cross-sector consortia and global initiatives to establish common frame. In fact, the future of DeFi will be determined by the level of success in standards convergence, as well as the tangentiality of technology and public policy.

Contextual Factors

1. Maturity of new financial technologies

New financial technologies' maturity is an important enabling factor for the development of decentralized financial systems. In the early days of fintech formation, many tools and infrastructures were in experimental and limited formats. More recently, we have seen considerable growth in machine learning algorithms, advanced cryptography, and scalable blockchain platforms, laying the groundwork for

feasible and sustainable applications for these technologies. This technical maturity is important not just from a functional perspective but also in terms of institutional buy-in — now organizations and banks have come to view these technologies less as a danger and more as an essential infrastructure for financial competition in the 21st century. Conversely, the maturity of financial technology has lessened the gap between (theoretical possibility) and (actual application).

2. Increasing the Digital Financial Literacy of Managers

In today's complicated financial world, grasping technical concepts such as cryptography, digital assets, tokenization, and data analytics has become necessary for effective decision-making. The digital financial literacy of managers, as a key contextual variable, plays a mediating role between technology and strategy. Interviews revealed that managers with a broader understanding of financial technologies do not simply view this transition as a change to be avoided and mitigated, but instead see it as an opportunity to rethink the financial model. From an organizational perspective, this development in digital literacy reduces friction in the decision-making process and accelerates the launch of innovative projects. Managers who are capable of understanding the language of technology and finance simultaneously serve as the communication bridge between technical developers and financial stakeholders. In fact, digital financial literacy allows organizations to become not just consumers of technology but also producers of new models. This cultural shift is one of the crucial foundations for the institutionalization of decentralized finance.

3. The expansion of DeFi ecosystems in emerging markets

Emerging markets, which generally face weak traditional financial institutions, high intermediation costs, and lack of access to banking services, have provided a suitable platform for the rapid growth of DeFi ecosystems. Research data showed that in these countries, decentralized technologies are expanding as a solution to financial inclusion and reducing dependence on inefficient banking systems. From a theoretical perspective, this expansion has redefined the roles of the government, the private sector, and users in the financial system. In emerging markets, DeFi allows individuals to participate in financing processes without the need for official authorization. This has led to the formation of indigenous financial networks, increased competition, and improved efficiency in capital allocation. The expansion of the DeFi ecosystem in these markets is not only a sign of technological transformation, but also a symbol of a transformation in the concept of (equitable access to financial resources).

4. The Changing Decision-Making Paradigm in Asset Management

In traditional models, asset management decision-making was focused on individual experience and macro analysis, but in the modern financial system, decisions have become increasingly data-driven and algorithmic. This paradigm shift has led to real-time analytics, machine learning, and predictive modeling replacing human intuition. In interviews, financial managers noted that this transformation has increased the accuracy of investment decisions, reduced subjective bias, and optimized resource allocation. Structurally, the changing decision-making paradigm has redefined the role of analysts and asset managers. The focus has shifted from (data interpretation) to (model design), and as a result, the value of expertise in understanding algorithms and data has increased more than ever. This new context is a prerequisite for the successful implementation of decentralized mechanisms in which decisions are made automatically and collectively.

5. Access to open and transparent transactional data

Transparency and open access to financial data is one of the most fundamental elements for the realization of DeFi. In closed systems, data remains in the hands of specific institutions and users are deprived of seeing the full picture of the market. However, with the expansion of open transactional data, independent analysis, collective auditing and participatory decision-making have been made possible. The analysis of the interviews shows that open access to data is not only a tool for analysis but also a factor in democratizing information power in the financial system. Users can now observe capital flows, fees and even market behavior patterns. This transparency has increased the level of trust and strengthened the incentive to cooperate in decentralized networks. As a result, open transactional data is known as the main fuel of the DeFi engine.

6. Growth of inter-institutional cooperation in the field of risk

As the financial space becomes more complex, no institution is able to manage all aspects of risk alone. The growth of interagency collaborations, from banks and insurance companies to technology institutions, is a key area in strengthening the decentralized ecosystem. These collaborations have led to the sharing of data, expertise, and risk standards. It was emphasized in the interviews that collaboration between institutions is not just a technical agreement, but a strategic move towards creating (distributed trust). When risk assessment is carried out at the network level, the probability of error and fraud is reduced and the resilience of the system is increased. In fact, interagency collaborations are the institutional platform for the practical realization of the concept of (shared risk and collective responsibility) in DeFi.

Mechanisms/Strategies

1. Design smart contracts with risk mitigation mechanisms

Smart contracts are an essential component of DeFi architecture. These contracts with risk mitigation features allow organizations to monitor and control market risks, liquidity, or price volatility automatically. The risk mitigation mechanism defines stop-loss, auto-insurance, or asset redistribution conditions in immutable code. Undertaking this process is human-free, and the speed of action in response to changed market conditions is faster. The interviewees have asserted that such contracts have reduced human error and increased transparency. However, it is crucial to carefully consider the design of these contracts, and to understand the behavior of markets / probabilities, as weaknesses in the code can produce systematic risk.

2. Develop self-regulatory frameworks for technological risk

One of the most important challenges of DeFi is the lack of transparent regulatory frameworks. In response, decentralized ecosystems have moved towards the creation of self-regulatory frameworks. These frameworks include internal network rules for reporting, code inspection, and error management that are developed and enforced by the members themselves. This approach has introduced a new concept of "crowd surveillance." Interviewees emphasized that self-regulation strengthens intra-system trust and reduces the burden of external surveillance. Of course, the success of these frameworks depends on transparency, participation, and effective incentive mechanisms.

3. Creating decentralized insurance funds

One of the key innovations in DeFi is the formation of insurance funds that operate on the basis of collective participation and smart contracts. In this model, users deposit their assets in an insurance pool and receive compensation in the event of a technological incident or contract default. This approach has transformed insurance from a centralized service to an automated and networked mechanism. Data analysis showed that these funds have increased user confidence and reduced concerns about technological risks. In fact, decentralized insurance acts as a vital complement to the sustainability of the entire DeFi system.

Consequences

1. Increased stability and resilience of the financial system

The result of the interplay between smart technologies, data transparency, and self-regulating risk mechanisms is the financial stability realized within decentralized contexts. Financing through networked technologies running on a blockchain eliminates or reduces the dependence on the traditional cycle relying on intermediaries, which increases the resiliency to systemic shocks in value creation. In the new structure, flows of information are real-time, traceable, and tamper-proof; thus, the speed of making discretionary capital decisions is not only faster but also more reliable. This characteristic enables momentary response options to changes in the market, preventing financial crises that result from the time delays in information or data mismanagement. The flexibility, in a decentralized financial system, results from designing mechanisms such as reconfigurable smart contracts and dynamically adaptable risk adjustment protocols to new rule sets in volatile market scenarios.

2. Reducing costs and systemic risks

One of the most obvious achievements of using the decentralized model in financing is reducing transaction and management costs. In traditional structures, a large part of the resources are spent on coordination between financial institutions, repeated credit assessments, and multi-stage controls. In contrast, in a decentralized system, the role of intermediaries is replaced by smart contracts and many

processes are executed automatically. This not only increases the speed of capital circulation but also significantly reduces transaction costs. Blockchain transparency prevents accounting errors and data manipulation; as a result, monitoring and auditing costs are reduced and the risk of fraud or non-compliance is controlled. On the other hand, reducing systemic risks means preventing the transmission of a crisis from one financial sector to another. In centralized systems, institutions are so interdependent that the bankruptcy of a large institution can domino the entire market. However, in a decentralized system, the distribution of data and assets in a network of nodes reduces the concentration of risk.

3. Improving the level of trust and participation in capital markets

Trust serves as the foundation of any financial system, and in traditional systems, trust is often created through traditionally trusted institutions such as banks or central supervisors. However, in a decentralized model, trust is created in a technological and transparent way. Due to the transparency of the blockchain, when using a blockchain protocol, all transactions are visible to every all the users within the protocol, which changes trust from being based upon an individual-centered relationship, to being a widely system feature. Within this framework, credibility is based on actual performance and data recorded on the chain, rather than the history of a specific institution or official. This aspect can enhance the participation of new players in the financing process, especially small investors and start-ups within the decentralized model. More generally improving trust enhances democratizing access to the capital. In other words, institutional or privileged investors are no longer the only individuals participating in the financing cycle, but any individual with enough financial literacy, and access to digital files can also participate in this network. Such widespread participation increases liquidity in the market, and promotes the distribution of financial innovations.

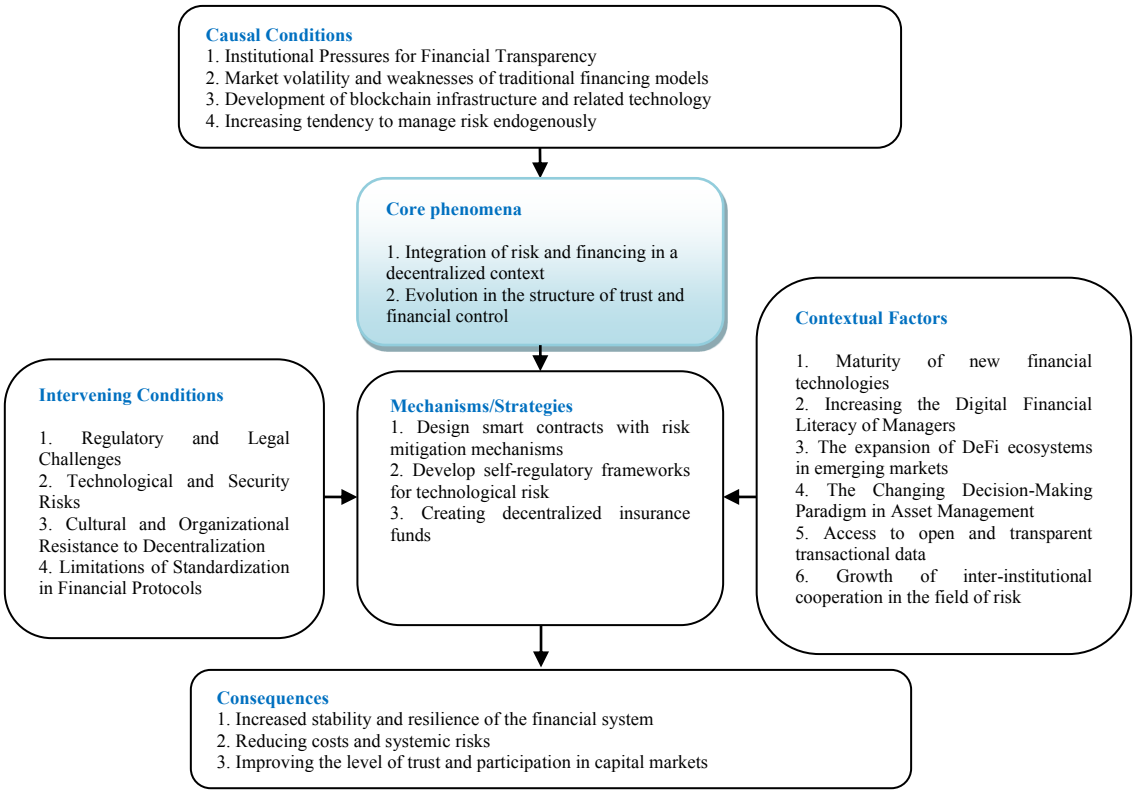

Figure 1: Final research model based on grounded theory

5. Discussion and Conclusion

The findings of the present study showed that the central phenomenon in Iran's decentralized finance system is the integration of risk and financing. This integration is actually a response to the need of emerging markets to replace traditional instruments with transparent and reliable mechanisms based on blockchain technology. A review of international literature shows that the limitations of traditional models, such as bureaucratic complexities and limited access to financial services, have accelerated the adoption of decentralized mechanisms (Kumar et al., 2024). The findings of our study are also in line with these studies, as they show that in Iran, the structural weaknesses of the traditional system, such as high transaction costs and slow banking processes, have caused young users to tend to DeFi tools.

However, the present study has an important difference from global studies; In Iran, DeFi adoption is limited to users with high internet access and digital awareness, and the majority of the population still does not benefit from this system. This limitation indicates that the integration of risk and financing is operationalized only in the context of limited adoption, and without a local management framework, the capacity for public uptake is reduced. The causal condition analysis of the present study showed that technological maturity, digital financial literacy, and institutional transparency are the main drivers of DeFi adoption and operation. In comparison with the international literature, Kumar et al. (2024) have emphasized that the transparency of transaction recording on the blockchain increases user trust and accelerates adoption by two times. Our findings show that in Iran, this factor is also important, but due to the lack of legal infrastructure and internet restrictions, technological maturity is limited and adoption is informal. The examination of the background conditions showed that the economic environment, monetary policies, and information technology infrastructure play a decisive role in the formation of the model. The findings of our study show that in Iran, high inflation rates and currency fluctuations have made decentralized instruments with the possibility of using stablecoins attractive

Intervening conditions, including sanctions, internal regulations, and organizational culture, have created serious constraints on the adoption of DeFi. The research findings show that sanctions and legal restrictions have forced users to use VPNs to access decentralized tools, and many activities are carried out in an informal space.

The present study shows that actors are trying to reduce operational risks and increase liquidity by using smart contracts, stablecoins, and decentralized tools. However, in Iran, legal and technological constraints have pushed actors' strategies towards informal and less transparent measures. Comparison with international findings shows that in other countries, similar mechanisms with appropriate legal support and infrastructure are more effective. This analysis shows that successful strategies require coordination between technology, regulations, and user education. The analysis of macro implications shows that the successful implementation of the risk and financing integration model can bring positive economic, technological, and institutional effects. From an economic perspective, increasing access to liquidity and reducing transaction costs will empower small and medium-sized businesses and reduce the effects of inflation.

In terms of institutions, the model discussed further facilitates coordination among policymakers, financial institutions, and market participants, as well as the necessity for dynamic regulatory frameworks. These findings align with Oranburg's (2025) findings, establishing the need for nimble monetary regulatory frameworks in decentralized settings. The final research model is framed in the context of Iran to support risk management and enhance the performance of decentralized financial systems, in an environment variable and structured institutional constraints. The model relies on field findings and market data analysis, to the extent it illustrates the interaction among causal, context, intervening, strategic, and consequential factors in an integrated model. The causal layer of the model includes the main drivers of the adoption and operation of decentralized systems. In Iran, inefficiencies in traditional systems, limited access to banking services, high inflation, and currency fluctuations are among the most important causal factors that drive user behavior towards the use of decentralized protocols. Local data shows that a large portion of active decentralized users are young people who have turned to decentralized systems to bypass banking restrictions and preserve the value of their assets. The model shows that these causal factors are directly related to the level of system adoption and

the volume of decentralized transactions, and play a decisive role in the formation of new financial models. The underlying layer of the model covers the economic, social, and technological conditions that determine the capacity of decentralized systems to function. In Iran, infrastructure constraints such as mediocre internet speeds and inadequate access in rural areas, the digital divide, and limited financial literacy have a direct impact on users' ability to actively participate. The model shows that without these conditions, many risk management mechanisms will not be implemented and the efficiency of the protocols will decrease. For example, even with the availability of decentralized lending tools, the lack of a stable digital infrastructure and the inability to use blockchain technology to record and track transactions will limit user exploitation.

The intervention layer of the model deals with the impact of institutional and cultural constraints and barriers. Research indicates that the effects of international sanctions, restricting domestic rules and regulations, a lack of legal recognition of smart contracts, and cultural inertia of organizations negatively impact the adoption and function of decentralized systems. By providing a framework that models the barriers in a causal and consequential way, the final model presents that, only if adaptive mechanisms are designed, and the detriments of these constraints addressed, will the true productivity of decentralized systems ever be achieved. For example, the use of local tools for transaction insurance and operational compliance with domestic laws can reduce the risks arising from legal and regulatory constraints. The strategic layer of the model includes the behavior and decision-making of actors who play a key role in managing risk and directing cash flows. The model shows that users and developers can increase the stability of the system by choosing reliable protocols, using stablecoins to preserve asset value, and adopting local risk management strategies. For example, utilizing local insurance approaches as mechanisms and fabricating smart contracts according to the specificities of Iranian local conditions can mitigate operational and currency risks. This layer also indicates that user behavior will not only impact adoption of the system but also the transparency and efficacy of transactions, in addition to actively strengthening the stability and resilience of the system. The consequence layer of the model examines the economic, institutional, and technological consequences of decentralized systems. The model indicates that, if all other elements work together, decentralized systems will increase access to financial services, mitigate operational risks, and improve the transparency of transactions. These systems can also provide financial inclusion for the unbanked population and small businesses by creating local infrastructure and adapting to Iran's economic and currency conditions. The model shows that the positive outcome of the systems depends on the optimal interaction between causal, contextual, interventionist, and strategic components, and the lack of coordination in each of these components reduces the efficiency of the entire system. One of the theoretical innovations of the model is the multi-layered integration of different components into a single framework that interpretively and analytically shows the interaction and mutual influence of causal, contextual, interventionist, strategic, and consequential factors. Unlike many previous models that have only addressed a limited dimension, the present model, with a comprehensive view of the Iranian conditions, has been able to directly include local risk management mechanisms and adaptive strategies in the framework. This framework shows that sustainable adoption and resilience of the system is not possible without considering internal constraints and local strategies.

The theoretical implications of the study are based on situating decentralized finance in a constrained institutional and regulatory context. In contrast to the majority of studies conducted internationally that investigate DeFi in relatively liberal financial and technological contexts, this case model show how localized constraints - for example sanctions, limited access to the internet, and a low level of institutional transparency- reshapes the integration of risk and financing. It is this recognition of contextual adaptation that adds an additional layer of understanding of the evolution of decentralized systems in emerging economies. By way of doing so, the study advances grounded theory approaches to financial research, by evidence that DeFi adoption in state constrained contexts is not simply a technological and economic phenomenon, but an institutional adaptation and informal innovation. Another significant insight that comes from this research is that decentralized finance in Iran is adaptive governance mechanism rather than a full replacement for

centralized finance. Users, devleopers, and informal communities are constructing hybrid governance designs that compensate for the lack of an official regulatory framework. The governing structures being created—based on peer verification, customized smart contracts, and trust networks—serve as informal but effective governance of finance. Collectively, this finding suggests that DeFi ecosystems are unique environments in which self-regulatory capacities—facilitating stability and resilience through low or absence of institutional support—can develop in restrictive environments.

While risk is generally a financial concept, this study shows that in the context of decentralized finance in Iran, risk is a socio-technical concept is also shaped by factors surrounding trust, legality, and access. The findings in this study indicates that actors understand risk not just in terms of market volatility or operation uncertainty, but also in terms of exposure to regulatory risks or interruptions in the underlying infrastructure. This shift in the definition of risk more broadly reestablishes preparations for risk in decentralized financial contexts by placing social and institutional uncertainty within the scope of the financial model. As such, the combination of risk and financing throughout this research represents a hybridized instance of risk rationalization situated within constrained digital contexts.

The results imply that DeFi can be a vehicle for promoting financially sustainable inclusion, provided that it is able to contextually fit with local regulatory and technological circumstances, in policy terms, of course. The model and analytical narrative suggest that formalizing decentralized tools through contextually feasible adaptations of regulation—effective sandboxing, legal recognition of smart contracts, and state-supported blockchain infrastructure—could provide legitimacy to the reliability and accessibility of the system. Policymakers can help establish bridges from informal adoption into spaces of institutional legitimacy, and could transform DeFi from a confined risk-hedging mechanism into an onramp for scalable economic empowerment and inflation mitigation. DeFi aligned with these principles is consistent with a global trend to inclusive innovation in fintech, specific to Iran's unique economic and regulatory context.

These results suggest theoretical and empirical implications for future research on decentralized finance in developing countries. Future research should examine cross-countries comparative studies to investigate how different levels of institutional maturity and regulatory openness effect DeFi adoption and performance. In addition, longitudinal studies should investigate how adaptive strategies for local actors evolve as technological and legal infrastructures mature. Practically, design features derived from adaptive strategies can inform our understanding of resilient DeFi ecosystems when properly constructed to promote adaptive strategies in a context of institutional uncertainty for financial stability and innovation.

6. Implementation and Policy Recommendations

This list of recommendations is directed towards financial institutions, supervisory authorities, the central bank, fintech companies, and other start-ups, and is intended to advance pragmatic and policy frameworks for the sustainable development of decentralized finance in Iran.

Designing an adaptive regulatory framework for DeFi

Because of Iran's legal and regulatory limitations, there is a strong need for the establishment of a flexible regime that encourages the adoption of DeFi. This regime should allow decentralized protocols to run without infringing on domestic laws but, at the same time, alleviate onerous financial and legal risks for users.

Developing indigenous cybersecurity standards

Given technological limitations and the weakness of digital infrastructure, it is essential to define national security standards for decentralized protocols. These standards could include auditing smart contracts, examining network vulnerabilities, and creating multiple layers of protection to reduce operational risks.

Creating a digital trust platform

One of the obstacles to the adoption of DeFi in Iran is the lack of trust in digital systems. Creating local validation systems and transaction transparency tools will allow users to see and track transactions and increase the level of trust in decentralized systems.

User education and empowerment

Risk management in DeFi requires users to be familiar with the tools and protocols. Designing training programs focused on digital financial literacy,

cybersecurity training, and familiarity with smart contracts can ensure active participation and reduce losses from uninformed behavior.

Facilitating the integration of decentralized systems with banking infrastructure

To increase efficiency and financial inclusion, banking infrastructure needs to adapt to decentralized protocols. This could include creating secure interfaces for exchanging information and liquidity between banks and DeFi platforms.

Establishing local transaction insurance mechanisms

Given currency fluctuations and legal risks, developing local insurance products to cover losses resulting from transaction failures or cyberattacks will increase user trust and reduce resistance to adopting decentralized systems.

Supporting the development of the startup ecosystem

Encouraging fintech companies and startups to design native protocols and provide decentralized financial services in accordance with Iranian conditions will reduce dependence on foreign systems and enhance domestic capabilities.

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