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Original Research Article

Systematic Identification and Analysis of Factors Affecting the Adoption, Development and Implementation of Digital Rial in Iran Based on Optimal Governanceauthors

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Central Bank Digital Currencies (CBDCs), as emerging instruments within international monetary systems, hold substantial potential for enhancing financial transparency, reducing transaction costs, and strengthening monetary security. Given the economic and policy imperatives, the implementation of a digital rial in Iran requires a comprehensive examination of its technical, economic, and institutional dimensions. This study aims to systematically identify and analyze the key factors influencing the acceptance, development, and implementation of the digital rial in Iran. The research employs a mixed-methods design. In the qualitative phase, data were collected through semi-structured interviews with experts in finance, technology, and policy, and analyzed using thematic analysis; the final model was subsequently developed using Interpretive Structural Modeling (ISM). In the quantitative phase, data were gathered through standardized questionnaires using stratified sampling and analyzed through Structural Equation Modeling (SEM). The findings include 120 open codes, 24 basic themes, and 6 organizing themes. The results indicate that factors such as trust in good governance, advanced technological infrastructure, perceived security, system efficiency, and social acceptance constitute core determinants of the successful adoption and development of the digital rial. Enhancing regulatory transparency, establishing effective legal frameworks, and ensuring coherent macro-level policymaking are essential prerequisites for the successful implementation of this project.

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1 Introduction

In the digital era, rapid advances in information and communication technologies have profoundly influenced monetary and financial systems (Erkut, 2020). Among the most significant of these developments is the emergence of digital currencies, particularly central bank digital currencies (CBDCs) as national digital money (Alfalah, 2021). As the official digital currency of Iran, the digital rial has the potential to enhance the efficiency of the financial system, reduce transaction costs, and increase economic transparency (Eslami, 2012). Nevertheless, the acceptance, development, and implementation of such a currency require careful consideration of various economic, social, political, and technological factors. The adoption of the digital rial in Iran faces multiple challenges (Tavllaei, 2014): on the one hand, users and financial institutions must develop sufficient trust in this currency, and on the other hand, technological and legal infrastructures must be designed in ways that facilitate its deployment (Ghiyasi et al., 2021). Thus, systematically identifying and analyzing the factors that influence the acceptance, development, and implementation of the digital rial particularly within the framework of good governance is essential (Karanjam et al., 2022).

To examine this issue, several theoretical frameworks may be employed. One such framework is the Technology Acceptance Model (TAM), which investigates determinants such as perceived usefulness and perceived ease of use as key drivers of new-technology adoption (DeLone et al., 2018). TAM provides a widely used structure for identifying and explaining the factors influencing individuals' intention to adopt products and services based on new technological innovations. Additionally, the theory of good governance offers an analytical lens through which the influence of governance components on the development and implementation of the digital rial can be examined.

A number of factors affecting digital-rial adoption have been identified in previous studies. Economic variables such as inflation rates and macroeconomic stability are among these determinants: in unstable economic conditions, public trust in a new currency tends to diminish (Eslami, 2012). Transaction costs also play an important role, as reducing the costs associated with financial operations can motivate individuals and institutions to adopt the digital rial (Talebdoost & Amirpour, 2021). Good governance defined as the efficient, transparent, and accountable management of resources and policies can significantly contribute to the acceptance of the digital rial (Jafari, 2021). Understanding barriers and facilitators of adoption can guide policymakers in

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designing more effective regulatory and economic strategies. Moreover, the digital rial may serve as a tool for promoting e-commerce and attracting foreign investment (Ghiyasi et al., 2021).

Social factors also have a substantial impact on the acceptance of the digital rial. Public awareness and education regarding digital currencies can help reduce concerns and strengthen public trust. Furthermore, confidence in financial institutions can influence individuals' willingness to adopt the digital rial (Beikzad & Jalilinejad, 2021). From a technological standpoint, adequate infrastructure for digital transactions and strong cybersecurity systems are among the most critical prerequisites for adoption (Afrasiabi & Shiri-Mohammadabad, 2014). Concerns regarding data security and transaction safety may hinder public acceptance. Likewise, political and legal factors such as the presence of clear and supportive legal frameworks and governmental endorsement can facilitate the adoption of the digital rial (Jafari, 2021).

Despite these potential benefits, several challenges and barriers may complicate the adoption and implementation of the digital rial. A lack of public awareness and education remains one of the most significant obstacles; many individuals are still unfamiliar with the concept of digital currencies, highlighting the need for extensive public education (Eslami, 2012). Infrastructural limitations may also impede the implementation process, as Iran's information and communication technology infrastructure may not yet be sufficiently advanced to support widespread digital-rial adoption (Talebdoost & Amirpour, 2021). Security concerns, including the risks of cyberattacks and misuse, may further undermine trust in the digital currency. Additionally, the absence of transparent legal frameworks and the ambiguity of financial regulations may hinder acceptance and adoption (Karanjam et al., 2022).

Accordingly, systematically identifying and analyzing the factors affecting the acceptance, development, and implementation of the digital rial within the framework of good governance can contribute to improving Iran's financial and economic processes. This research can assist policymakers and financial institutions in recognizing both the barriers and the enablers of adoption, thereby enabling the formulation of more effective strategies for implementing and expanding the digital rial. Ultimately, such analysis can help shape a transparent and sustainable financial system that meets the needs of Iranian society and the national economy. Therefore, exploring this topic from economic, social, political, and technological perspectives is of vital importance. To address these challenges, several key questions arise: What factors influence the acceptance of the digital rial in Iran? How can good

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governance contribute to its development and implementation? And what barriers and challenges lie ahead in the process of implementing the digital rial?

The remainder of this paper is structured as follows. Section 2 develops the theoretical framework and reviews the relevant literature, drawing explicitly on the Technology Acceptance Model (TAM) and the theory of good governance to explain the adoption and governance dimensions of the digital rial. Section 3 presents the research methodology, detailing the construction of the conceptual model, the identification of dimensions and components, data collection procedures, and the application of MICMAC analysis to assess the driving power and dependence of the variables. Section 4 reports the empirical results of the structural analysis, including T-values and significance coefficients, and provides a rigorous discussion of the findings. Finally, Section 5 concludes the study by synthesizing the main results and offering policy implications and directions for future research regarding the design and implementation of the digital rial.

2 Theoretical Foundations and Literature Review

2.1 The Nature of the Digital Rial

Money, in its earliest conception, served as an intermediary that facilitated the exchange of goods and services (An et al., 2023). In contemporary economies, money continues to play this role; however, it is generally understood to fulfill three distinct functions: a medium of exchange, a unit of account, and a store of value (Aggarwal & Kumar, 2021). Traditional physical currencies perform these functions with the support of sovereign political systems. Governments guarantee that the currency they issue can be exchanged for other assets of value such as gold or widely accepted foreign currencies (Cheng, 2020). Consequently, individuals recognize the validity of issued currency based on the credibility of the governing political system and the country's gross domestic product (Margetts & Dunleavy, 2013). Any currency whose functionality is guaranteed by a centralized political authority is referred to as centralized or traditional money (Guerrero et al., 2016). By contrast, another category of money exists in which the performance of monetary functions is not guaranteed by a central authority, and its issuance and transactions are not controlled by a centralized institution.

The simultaneous rise of electronic data-processing technologies and the expansion of the internet fostered innovations in banking systems (Dhaoui, 2019). Subsequently, the emergence of Bitcoin in 2009 designed as a decentralized currency marked a transformative milestone, popularizing the use of distributed ledger technology, blockchain systems, and decentralized financial instruments developed by private entities (Fountain, 2016). In response to these developments and their far-reaching implications, central banks worldwide began exploring the concept and technological foundation of decentralized digital money (Guerrero et al., 2016).

Contrary to common initial assumptions, the general concept of central bank digital currency (CBDC) is not entirely new. For decades, various forms of digital central bank money have existed, most notably in the form of reserve accounts held by commercial banks at central banks (Beikzad & Jalilinejad, 2021). According to established classifications of monetary forms, any currency issued by a central bank whose creation, storage, and transfer processes occur entirely via electronic means falls under the broad definition of a CBDC (Lee-Geiller & Lee, 2019). This form of digital central bank money may be used exclusively by banks and public institutions as a tool for interbank settlement and liquidity management, or it may be issued in a manner that allows broader public access (Afrasiabi & Shiri-Mohammadabad, 2014). The issuance of CBDC in the form of digital tokens constitutes another model, enabling objectives such as reducing reliance on centralized financial-transaction management and enabling peer-to-peer (P2P) value exchange (Fountain, 2016).

In its most general form, a CBDC can be defined as an electronic liability of the central bank that can be used for settlement purposes or as a store of value (Dhaoui, 2019). This definition encompasses a wide range of design parameters, each of which can be adjusted to derive a more specific typology of CBDC. Some of the key parameters include the level of access, interest-bearing capability, convertibility into other central bank liabilities, token-based versus account-based structure, cryptographic mechanisms, anonymity and authentication requirements, and infrastructural resilience (Westerman et al., 2014). Accordingly, CBDC may also be considered a restricted form of digital money that can be categorized within the broader domain of central bank reserves (Beikzad & Jalilinejad, 2021).

The optimal configuration of each design dimension of the digital rial depends on the central bank's objectives for developing a CBDC (Guerrero et al., 2016). For instance, a CBDC designed primarily to provide a secure retail payment instrument may differ substantially from one designed to enhance the transmission and implementation of monetary policy (Gabalán et al., 2019). At a conceptual level, CBDC implementation can follow either an account-based model where users access digital money through accounts held with an

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intermediary or a token-based model. In the account-based system, owners access their funds through accounts maintained with a trusted central authority (typically banks). Conversely, in the token-based model, holders of digital tokens can access and transact with their CBDC units directly, without the need for an intermediary, thereby enabling peer-to-peer transactions (Afrasiabi & Shiri-Mohammadabad, 2014).

In a direct architecture, the CBDC is issued, managed, and distributed solely by the central bank without the involvement of commercial banks. The central bank serves as the exclusive issuer and directly provides digital currency to end users (Lee-Geiller & Lee, 2019). For example, individuals may open digital-currency accounts directly with the central bank or load value onto central bank–managed payment instruments. In this architecture, customer identification may be conducted by the private sector, the central bank, or other public institutions authorized by the central bank (Eslami, 2012). However, the central bank remains the sole provider of payment services (Dhaoui, 2019).

Although the direct model appears attractive due to its structural simplicity and the elimination of intermediaries, its implementation requires rigorous evaluation of system reliability, speed, and overall payment-system efficiency (Jafari, 2021). Additionally, global experience suggests that payment-system infrastructures frequently rely on the participation of private-sector entities outside the central bank. Because this model substantially expands the operational responsibilities of the central bank, its adoption could result in a significant increase in the institution’s routine workload (Ghiyasi et al., 2021). Even if the central bank possesses the technical capacity to develop such an infrastructure, the resulting CBDC may still lack the consumer appeal of existing retail payment systems (Talebdoost & Amirpour, 2021).

3 Digital Governance

The revolutionary expansion of information and communication technologies (ICT) in citizens’ daily lives and the rising penetration of these technologies among households over recent decades has resulted in the production of large volumes of data concerning individuals, groups, and societies. In this context, a government’s key strategic advantage for improving its governance indicators lies in its ability to access, process, and utilize these data in managing societal affairs (Afrasiabi & Shiri-Mohammadabad, 2014). Governments, seeking to respond to the evolving needs and expectations of citizens, are compelled to adopt ICT-driven reforms in the public sector,

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thereby enabling a fundamental transformation in the provision of public services (Karanjam et al., 2022).

Digital governance, with its far-reaching capabilities, plays a critical role in reducing bureaucratic paperwork, reengineering administrative processes, restructuring government institutions, lowering public-sector costs, increasing organizational flexibility and adaptability, reducing fraud and administrative corruption, enhancing citizen participation, improving transparency within government, promoting decentralization, strengthening democratic foundations, reforming administrative bureaucracy, improving governmental accountability, and increasing efficiency, productivity, information quality, and data accessibility ultimately saving time and improving effectiveness (Lee-Geiller & Lee, 2019).

In its simplest form, digital governance refers to the organizational structures through which resources for digital transformation are developed and allocated (Dhaoui, 2019). The purpose of these mechanisms is to enhance the effectiveness of an organization's digital initiatives. Over the past decade, emerging digital technologies have fundamentally reshaped the role of ICT within organizations. The advent of technologies such as blockchain, cloud computing, and big data has profoundly altered the nature of ICT applications in organizational performance (Gabalán et al., 2019). ICT has evolved from a cost-saving tool into a primary generator of value and profit, thereby increasing the importance of monitoring and guiding an organization's digital activities (Möhlmann et al., 2019).

A major and persistent challenge confronting governments is the need to respond to the changing demands and expectations of citizens whose consent forms the basis of governmental legitimacy (Afrasiabi & Shiri-Mohammadabad, 2014). Accordingly, governments must continually search for innovative methods that enable sustained improvements in public-service delivery (An et al., 2023). The use of ICT to provide governmental services marks a new initiative aimed at facilitating citizens' access to public services via electronic channels and redefining the relationship between government and citizens (DeLone et al., 2018). Governance in the digital era thus inaugurates a new phase in the evolution of state–citizen relations and has established a prominent position within public-sector management reforms and administrative-system modernization efforts (Alfalah, 2021).

Industrial Revolution 4.0 is currently underway, and the conditions created by the COVID-19 pandemic have highlighted the indispensable role of cyberspace in modern society (Ghiyasi et al., 2021). Tasks that previously required physical presence must now be carried out online, making the

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expansion of national e-government infrastructure a key public demand (Erkut, 2020). Organizations are therefore moving toward unified governance structures. Currently, most firms operate under two distinct governance systems: (1) corporate governance and (2) IT governance (Beikzad & Jalilinejad, 2021). Although many IT-governance frameworks emphasize business–technology alignment, these two domains remain largely separate in practice (Guerrero et al., 2016). To achieve genuine integration, organizations must move toward merging these systems into a single governance mechanism. Digital governance represents a concept that goes beyond both corporate and IT governance and constitutes the final step in preparing corporate governance systems for the demands of the digital age (Díaz et al., 2018).

4 Methodology

This study is exploratory in nature, aiming to construct concepts, patterns, and frameworks. It is applied in purpose, interpretive in philosophical orientation, and employs methodological pluralism through the simultaneous use of two strategies. The research adopts a mixed-method approach, integrating thematic analysis with interpretive structural modeling (ISM). In the first phase, thematic analysis is applied to identify the core themes related to the concept of the digital rial. In the second phase, the extracted themes are structured hierarchically following the ISM procedure, and the relationships among the major themes are modeled accordingly.

Research data may be collected through library-based methods such as reviewing existing literature or through field methods including interviews and questionnaires. In this study, expert interviews were used for the thematic-analysis phase, and a researcher-developed questionnaire was used for the ISM phase.

Given the objectives of the study, the questionnaire was administered to experts and specialists in the fields of banking, monetary policy, and finance, who collectively constitute the study’s target population.

The qualitative phase was conducted using Maxqda 2020 and MicMac software, while quantitative analyses were performed using SPSS and SmartPLS.

4.1 Sampling Method

In the thematic-analysis stage, expert interviews were conducted using the snowball sampling method until theoretical saturation was achieved, resulting in a total of 17 interviews. The point of theoretical saturation is reached when

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no new insights are provided by interviewees and additional data become repetitive.

For the ISM methodology, a questionnaire was distributed among experts, and 15 completed questionnaires were returned and served as the basis of the ISM model.

In the quantitative phase, the statistical population consisted of technology managers and specialists in the banking sector. Based on Cochran's formula, the sample size was determined to be 384 respondents. The questionnaire used in this phase was derived from the qualitative stage; the open codes and basic themes identified during the thematic analysis formed the foundation of the quantitative instrument.

4.2 Validity and Reliability

To enhance the credibility of qualitative research, scholars recommend employing at least two validation strategies (Agheli et al., 2023). In this study, the following techniques were used:

Member checking: Feedback from two faculty members and two doctoral students in economics and financial management was obtained regarding the research process and data, leading to revisions in several conceptual labels.

Prolonged engagement: Due to the importance and novelty of the topic, the researcher engaged extensively with the literature, ensuring a deep and comprehensive examination of relevant concepts.

Data triangulation: To enhance diversity in the reviewed materials, various forms of textual data including books, academic papers, policy reports, and analytical documents from multiple databases were included.

In line with contemporary qualitative research practices, the reliability and trustworthiness of the qualitative findings were ensured through systematic and detailed note-taking throughout the analysis process. In addition, the coding procedure was independently conducted by a researcher who was not involved in the data collection stage, thereby reducing potential researcher bias and enhancing analytical rigor (Braun & Clarke, 2023).

(a) detailed and systematic note-taking, and (b) anonymous coding by an independent coder not involved in the research team.

4.3 Thematic Analysis

Thematic analysis is based on a systematic coding process. A theme represents a conceptual pattern within the data that relates directly to the research questions. This method analyzes qualitative textual data typically obtained

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from interviews and transforms dispersed, heterogeneous observations into rich, structured findings (Agheli et al., 2023).

The thematic network is developed following a structured process involving four stages: (1) familiarization with the text, (2) generating insights and interpretations, (3) coding and qualitative analysis, and (4) systematic examination of individuals, interactions, groups, organizational contexts, or cultural patterns.

Themes are categorized into the following levels:

- **Basic themes:** initial codes and key ideas derived from interviews
- **Organizing themes:** clusters formed through synthesizing basic themes
- **Global themes:** overarching themes capturing the fundamental principles of the text as a whole

These themes are then illustrated using web-like thematic maps that visually represent the key themes at each level and the relationships among them. The thematic network is not merely a preliminary or final report; rather, it serves as an analytical tool for deconstructing the text and identifying meaningful patterns within it.

4.4 Interpretive Structural Modeling (ISM)

Interpretive Structural Modeling (ISM) is an interactive learning process through which a set of diverse yet interrelated elements is organized into a comprehensive and systematic model. As a hybrid methodology, ISM lies at the intersection of mathematical sciences, graph theory, social sciences, group decision-making, and computer science. ISM helps establish order within complex relationships among system components and facilitates the identification of internal linkages among variables. It is therefore a powerful technique for analyzing the influence of one variable on others.

ISM is interpretive because the structure of relationships among variables is derived from expert judgments and group consensus. It is structural because, based on the identified relationships, it extracts an overarching hierarchical structure from a complex set of elements. Ultimately, the relationships and the resulting structure are presented in a graphical model.

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Table 1
Descriptive Statistics of Interview Participants

Row	Gender	Position	Education	Work Experience (years)
1	Male	Deputy of Finance	M.A.	27
2	Male	Provincial Director	Ph.D.	29
3	Male	Deputy of Planning	M.A.	28
4	Male	District Director	Ph.D.	30
5	Male	Deputy of Technology	M.A.	27
6	Male	Deputy of Credit	M.A.	32
7	Male	CEO of a Technology-Based Knowledge Enterprise	Ph.D.	27
8	Male	Chief Executive Officer	Ph.D.	33
9	Male	Resident Inspector	M.A.	25
10	Male	Bank Customer (Directly Engaged with Digital Payment and Financial Systems)	M.A.	29
11	Male	Deputy of IT Banking	Ph.D.	26
12	Male	Faculty Member	Ph.D.	18
13	Male	Faculty Member	Ph.D.	25
14	Female	Entrepreneur and Business Owner	Ph.D.	22
15	Female	Faculty Member (FinTech and Blockchain Specialist)	Ph.D.	27
16	Male	Member of Parliament (Economic and Financial Policy-Maker)	M.A.	23
17	Female	Faculty Member	Ph.D.	21

Source: Research Findings

5 Research Findings

5.1 Qualitative Findings

5.1.1 Identification of Dimensions and Elements

In the first step, all interview transcripts concerning the digital rial were carefully reviewed to ensure familiarity with the data. Following several rounds of review, 120 open codes were extracted. In the next step, basic themes were identified through the analysis and synthesis of annotated statements.

Subsequently, 24 basic themes were formed, leading to the development of six organizing themes. In the fifth step, thematic patterns were identified either inductively (bottom-up) or theoretically–deductively (top-down). In an inductive approach, themes emerge from the data itself; in a deductive approach, themes originate from the researcher's theoretical interests or prior literature.

Given the novelty of the topic and the absence of established theoretical foundations on the digital rial, the inductive approach was deemed most

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appropriate for identifying basic, organizing, and global themes. As a result, 24 basic themes, 6 organizing themes, and 1 global theme were derived from 120 open codes related to the systematic identification and analysis of factors influencing the acceptance, development, and implementation of the digital rial in Iran based on principles of good governance. These results are presented in Table 2.

Tabel 2

Results of Thematic Analysis and Code Frequencies

Overarching Theme	Organizing Theme	Basic Theme	Open Code (English Translation)	Frequency
Adoption, Development, and Implementation of the Digital Rial in Iran Based on Good Governance	Sustainable Performance of the Digital Rial	Physical Infrastructure	Resilient infrastructure against external pressures	11
			Scalable infrastructure	9
			Enhancement of technical knowledge	7
			Edge computing	5
		Network Infrastructure	Development of high-quality telecommunications networks	15
			Development of decentralized financial networks	8
			Use of quantum technologies	6
			Deployment of cloud-based technologies	9
			Utilization of blockchain technology	14
			Peer-to-peer technology-based platforms	13
		Cybersecurity	Execution of cyber-attack simulation drills	10
			Continuous infrastructure testing	16
			High-standard multilayered security compliance	18
			Designing security systems based on “security-in-depth”	14
			Network resilience against DDOS attacks	21
			Need for a robust and resilient network	15
			Conducting cyber drills to identify vulnerabilities	9
		Vulnerability Reduction	Focus on active prevention models	13
			Development of modular platforms	8
			Flexible infrastructure design	12
			Use of security tokens for user authentication	14
			Regular security testing	18
		Multi-Layer Defense Systems	Continuous and automatic security updates	16
			Fine-grained access management	12
			Suspicious behavior analysis via AI	10
			Multi-factor authentication	14
			Advanced cryptography	16

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		Operational Speed	Rapid threat response	12
			Threat identification	9
			Access control	14
		Performance Quality	Use of AI for suspicious behavior analytics	12
			Implementation of intrusion detection systems	8
			Use of advanced encryption algorithms	15
	Monetary & Fiscal Policies of the Digital Rial	Self-Regulating Algorithms	Precise liquidity management	7
			Accurate interest-rate management	9
			Automatic adjustment of circulating Digital Rial based on market conditions	16
		Smart Contract Systems	Use of intelligent credit-scoring mechanisms	8
			Preventing inflationary shocks through value adjustments	7
			Managing large-scale financial transactions based on economic conditions	11
			Enabling more precise monetary policy	8
			Interest-rate control	9
			Reducing time and cost of interbank transfers	6
			Reducing transaction costs	14
		Smart Digital Monetary Policy	Corruption reduction	7
			Alignment with rapid market changes	12
			Managing the volume of Digital Rial in circulation	10
			Real-time economic analytics	8
			Big-data utilization	6
			Enhanced monitoring of money supply and demand	14
			Increasing money velocity	17
			Data-driven monetary policy adjustment	8
			Flexibility in monetary policy	13
		Economic Stability	Strengthening macroeconomic stability	7
			Facilitating liquidity management	9
			Increasing financial efficiency	6
			Interest-rate adjustment to attract or reduce liquidity	11
			Mechanisms to restrict money supply during crises	9
			Enhanced central bank control over money circulation	15
			Precise digital-money management	10
			Real-time liquidity supervision	18
			Liquidity control	13
		Inflation Control	Rapid monetary-policy adjustment based on digital data	10
			Use of intelligent systems to analyze economic impacts	7
			Contractionary monetary policies	5
			Interest-rate changes	8

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			Transaction-limit enforcement	11
			Limiting Digital Rial supply	8
	Legal & Regulatory Framework	Zero-Knowledge Technologies	Ensuring user privacy	9
			Enhancing international trust in Iran's financial systems	12
			Protecting users' privacy rights	9
			Smart regulation	14
			Partitioned/Selective privacy	10
			Autonomous governance systems	9
			Enabling user complaints and legal recourse	15
		Regulatory Strengthening	Use of ZKP cryptographic technologies	10
			Strict policies on personal-data usage	12
			Compliance with ISO 27001 security standards	8
			Alignment of Digital Rial regulations with domestic law	11
		International Standards	Addressing terrorism financing risks	5
			Addressing anti-money-laundering (AML) requirements	9
			Compliance with international regulatory standards	13
	Social Acceptance of the Digital Rial	Public Trust	Use of virtual-reality technologies	16
			Use of augmented-reality technologies	8
			Establishment of public oversight panels	11
			Development of inclusive financial systems	15
			Enabling participation of low-income and underserved groups	9
			System transparency	5
			Regular system-performance reporting	13
			Accountability	8
			Legal protection of user transactions	9
			Processing users' personal data only as necessary	16
			Transparency in digital-money management processes	12
		Cultural Orientation	Development of innovative products based on user needs	12
			Creation of digital local communities for user interaction	7
			Secure and simple digital wallets	14
			Easy access to financial services	10
			Public access to system performance	9
			Alignment with diverse societal needs	7
			User-friendly platforms for technology adoption	11
		Public Awareness	Financial incentives	15
			AR-based educational applications	14

			Demonstrating practical benefits of the Digital Rial	12
			Transparency about personal-data management	17
			Public education campaigns on Digital Rial benefits	16
			Increasing public awareness	12
	Traditional–Digital Banking Integration	Reducing Negative Impacts	Personalized digital financial services	8
			Digital loan provision	14
			Digital financial consulting	14
			Innovative banking services	13
			Bank adaptation to digital transformation	10
		Digital Transformation	Investment in decentralized finance	9
			Investment in open banking	8
		System Integration	Collaboration with fintech companies	9
			Development of open API infrastructures	14
	Good Governance of the Digital Rial	Transparency	Establishing independent supervisory boards	11
			Use of transparency-enhancing technologies	6
		Accountability	Use of digital voting platforms	9
			Continuous oversight by independent institutions	14

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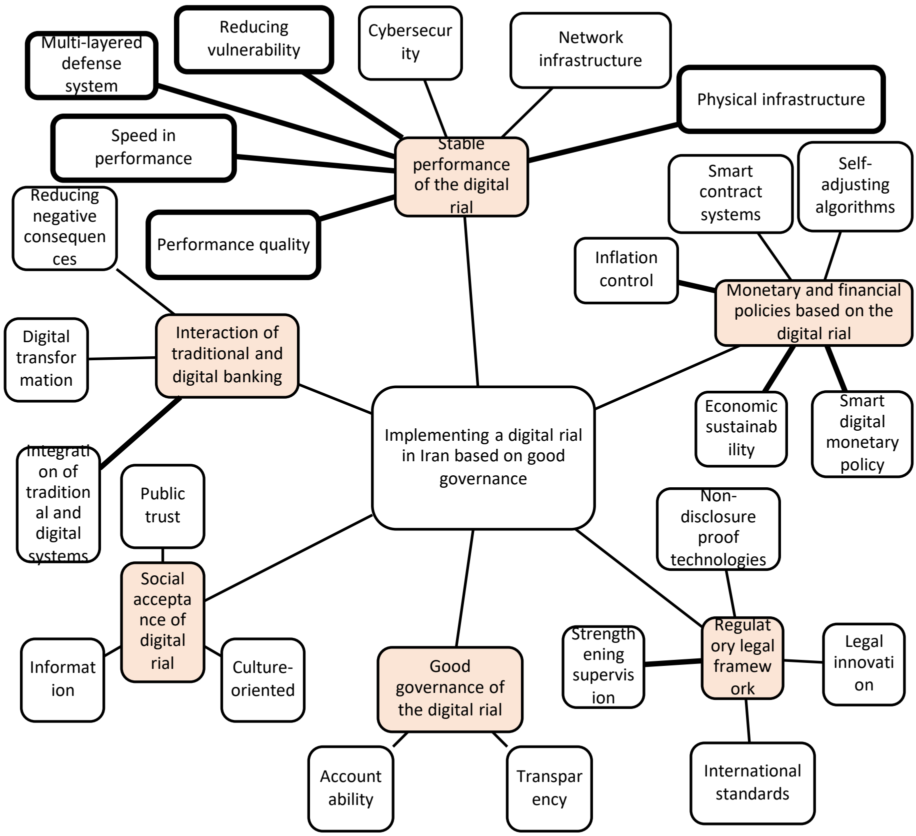

Figure 1. Initial research model
Source: Research Findings

5.1.2 Formation of the Structural Self-Interaction Matrix (SSIM)

The Structural Self-Interaction Matrix (SSIM) is the first matrix in Interpretive Structural Modeling (ISM). This matrix is employed to identify the internal relationships among indicators based on expert judgment. The resulting matrix at this stage reveals which variables influence others and which variables are influenced in return. Conventionally, to identify the pattern of relationships among elements, symbolic notations such as those presented in Table 3 are used.

Table 3

States and Symbols Used to Represent Variable Relationships

Symbol	**Relationship Description**
V	Variable *i* influences variable *j*
A	Variable *j* influences variable *i*
X	Mutual relationship between *i* and *j*
O	No relationship exists

Source: Research Findings

The SSIM is constructed from the dimensions and indicators of the study, comparing them through the four conceptual relationship states. The information obtained is synthesized according to the ISM methodology, and the final SSIM is formed (Agheli et al., 2023). Based on the symbols presented in Table 3, the SSIM is shown in Table 4.

Table 4

Structural Self-Interaction Matrix (SSIM)

SSIM	**C01**	**C02**	**C03**	**C04**	**C05**	**C06**
C01		V	V	X	V	O
C02			V	O	V	A
C03				A	O	O
C04					X	V
C05						O
C06						

Source: Research Findings

5.1.3 Formation of the Reachability Matrix

The Reachability Matrix is derived by converting the SSIM into a binary (0–1) matrix. In this matrix, the diagonal elements are set equal to one. Furthermore, transitivity of relationships must be verified; that is, if variable A leads to variable B, and variable B leads to variable C, then variable A must also lead to variable C. In practice, if this transitive relationship is not reflected, the matrix must be corrected to incorporate such secondary effects. Accordingly, the Reachability Matrix of the variables is presented in Table 5.

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Table 5
Initial Reachability Matrix of Variables

SSIM	C01	C02	C03	C04	C05	C06
C01	0	1	1	1	1	0
C02	0	0	1	0	1	0
C03	0	0	0	1	0	0
C04	1	0	0	0	1	1
C05	0	0	0	1	0	0
C06	0	1	0	0	0	0

Source: Research Findings

5.1.4 Formation of the Final Reachability Matrix

Once the initial reachability matrix has been obtained, transitivity is introduced into the relationships among variables to derive the Final Reachability Matrix. This matrix is square, and each of its entries is equal to one if an element can reach another element through any path length; otherwise, the entry is zero.

The method of obtaining the reachability matrix is based on Euler's theorem, in which the adjacency matrix is added to the identity matrix. Subsequently, the resulting matrix is raised to the power of *n* until no further changes occur in its entries. The procedure is expressed as follows:

Equation (1): Determination of the Final Reachability Matrix

$$A + I$$
$$M = (A + I)^n$$

Where:

- A = Initial reachability matrix
- I = Identity matrix
- M = Final reachability matrix

The exponentiation of the matrix is performed according to Boolean algebra rules:

Equation (2): Boolean Operations

$$1 \times 1 = 1; \; 1 + 1 = 1$$

Therefore, secondary relationships must be verified. Specifically, if variable A leads to B, and B leads to C, then A must also lead to C. If such

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transitive effects are not reflected in practice, the matrix must be corrected to incorporate them.

Accordingly, the Final Reachability Matrix of the variables related to the implementation of the digital rial is presented in Table 6.

Table 6

Final Reachability Matrix of Variables

SSIM	C01	C02	C03	C04	C05	C06
C01	1	1	1	1	1	1
C02	1	1	1	0	1	1
C03	0	0	1	1	0	0
C04	1	0	1	1	1	1
C05	0	0	1	1	1	1
C06	0	1	0	0	0	1

Source: Research Findings

5.1.5 Determining Relationships and Leveling of Dimensions and Indicators

To determine the relationships and hierarchical levels of the criteria, the reachability set and the antecedent set must be extracted for each criterion from the reachability matrix:

- **Reachability set (row elements, outputs or influences):** Variables that can be reached through a given variable.
- **Antecedent set (column elements, inputs or dependencies):** Variables through which a given variable can be reached.

The intersection of these two sets is then calculated. The first variable for which the intersection equals the reachability set is assigned to Level 1. Thus, Level 1 elements represent those with the highest degree of dependency in the model. After determining the level of a variable, it is removed from all sets, and the process is repeated to identify the next level (Agheli et al., 2023).

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Table 7
Input and Output Sets for Level Determination

Variable	Code	Input Set (Dependencies)	Output Set (Influences)	Intersection	Level
Regulatory and Legal Framework	C01	C01, C02, C04	C01, C02, C03, C04, C05, C06	C01, C02, C04	3
Good Governance of the Digital Rial	C02	C01, C02, C06	C01, C02, C03, C05, C06	C01, C02, C06	3
Monetary and Fiscal Policies of the Digital Rial	C03	C01, C02, C03, C04, C05	C03, C04	C03, C04	1
Sustainable Performance of the Digital Rial	C04	C01, C03, C04, C05	C01, C03, C04, C05, C06	C01, C03, C04, C05	4
Social Acceptance of the Digital Rial	C05	C01, C02, C04, C05	C03, C04, C05, C06	C04, C05	2
Interaction of Traditional and Digital Banking	C06	C01, C02, C04, C05, C06	C02, C06	C02, C06	1

Source: Research Findings. Note: In cases where the output set and the intersection are identical, the variable is assigned to Level 1.

The reachability set includes the criterion itself and the criteria influenced by it. The antecedent set includes the criterion itself and the criteria that influence it. Once both sets are determined, their intersection is calculated, and the hierarchical levels are assigned accordingly.

The final hierarchical structure of the identified variables is illustrated in Figure 3, where only meaningful relationships between elements of each level and those of the level below, as well as significant internal relationships within each level, are considered.

5.1.6 Graphical Representation of the Model

After determining the hierarchical levels of the factors, the identified relationships can be represented in the form of a conceptual model. This graphical representation (Figure 2) provides a clearer understanding of the interconnections among the variables.

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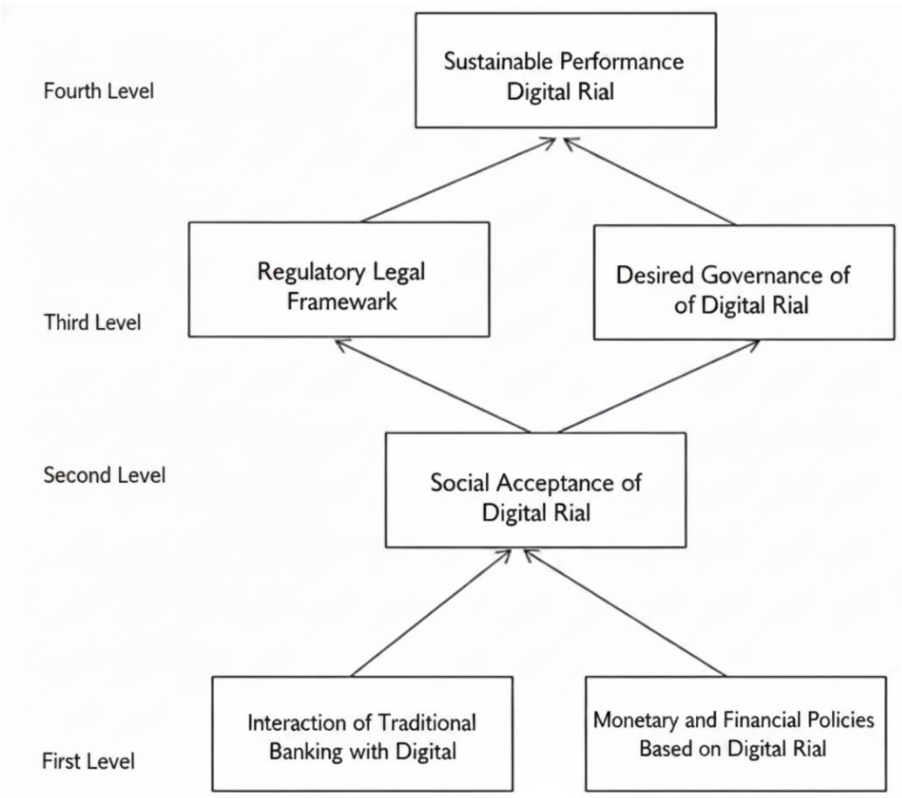

Figure 2. Model Design Based on Dimensions and Components
Source: Research Findings

5.1.7. MICMAC Analysis

In the Interpretive Structural Modeling (ISM) framework, the reciprocal relationships and influences among criteria, as well as the connections between criteria across different hierarchical levels, are clearly demonstrated. This facilitates a deeper understanding of the decision-making environment for managers.

To identify the key criteria, the driving power and dependence of each criterion are derived from the final reachability matrix. The driving dependence chart for the variables under study is presented in Table 8.

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Table 8
Driving Power and Dependence of Variables

Factors	C01	C02	C03	C04	C05	C06
Driving Power	6	5	5	5	4	6
Dependence	3	5	2	2	6	1

Source: Research Findings

To determine the key criteria, the driving power and dependence values are mapped into the final reachability matrix. Figure 3 illustrates the driving dependence diagram for the variables under study, categorized into four quadrants: Autonomous (I), Dependent (II), Linkage (III), and Independent (IV).

- **Autonomous variables (Quadrant I):** These variables exhibit low dependence and low driving power. They are generally disconnected from the system, as they have weak linkages. Changes in these variables do not significantly affect the system.
- **Dependent variables (Quadrant II):** These variables have high dependence but low driving power. They are highly influenced by other variables but exert little influence on the system themselves.
- **Independent variables (Quadrant IV):** These variables demonstrate high driving power but low dependence. In other words, they exert strong influence on the system while being minimally affected by other variables.
- **Linkage variables (Quadrant III):** These variables possess both high dependence and high driving power. They are highly influential and highly influenced, meaning that even small changes in these variables can lead to fundamental shifts in the system.

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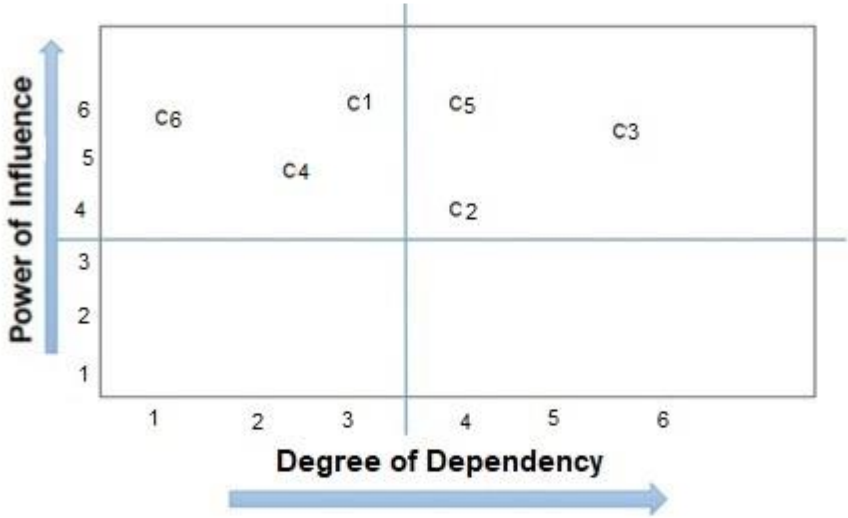

Figure 3. Power of Influence and Degree of Dependency (MICMAC Output)
Source: Research Findings

MICMAC Analysis Results

Based on the driving–dependence diagram, it can be concluded that the variables Regulatory and Legal Framework (C01), Sustainable Performance of the Digital Rial (C04), and Interaction between Traditional and Digital Banking (C06) exhibit low dependence and high driving power. In other words, these variables exert strong influence on the system while being minimally affected by other variables. Accordingly, they are positioned in the independent quadrant.

Conversely, the variables Social Acceptance of the Digital Rial (C05), Good Governance of the Digital Rial (C02), and Monetary and Fiscal Policies of the Digital Rial (C03) demonstrate high dependence and high driving power. These linkage variables are both highly influential and highly influenced, meaning that even minor changes in them can lead to fundamental transformations in the system. Thus, they are located in the Linkage quadrant.

It is noteworthy that no variable falls within the Autonomous quadrant (Quadrant I), which typically represents criteria with weak connections to the system.

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5.2 Quantitative Findings

5.2.1 Measurement Model Evaluation

In the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, the evaluation of measurement models is conducted using three criteria: reliability, convergent validity, and discriminant validity.

According to recent methodological guidelines, reliability in partial least squares structural equation modeling (PLS-SEM) is evaluated by examining indicator loadings and internal consistency reliability measures, with particular emphasis on composite reliability as a robust criterion for construct reliability assessment (Sarstedt et al., 2024).

- Factor loadings represent the numerical values indicating the strength of the relationship between a latent variable and its corresponding observed indicator within the path analysis process. The higher the loading of an indicator on a construct, the greater its contribution to explaining that construct.
- A negative loading indicates an inverse relationship, meaning that the corresponding item was designed in reverse form.
- In exploratory research settings, factor loadings of 0.40 or higher are generally considered acceptable for retaining indicators within the measurement model (Hair & Alamer, 2022).

In the present study, as shown in Table 10, all factor loadings exceed the threshold of 0.4 and are statistically significant at the 99% confidence level. This confirms that the indicators (manifest variables) adequately explain their respective latent constructs.

Furthermore, the results demonstrate that the values of Cronbach’s alpha and **Composite Reliability (CR in Table 10, all factor loadings exceed the threshold of 0.4 and are statistically significant at the 99% confidence level. This confirms that the indicators (manifest variables) adequately explain their respective latent constructs.

Furthermore, the results demonstrate that the values of Cronbach’s alpha and Composite Reliability (CR) for all constructs are above the minimum are above the minimum acceptable level acceptable level of 0.7. Therefore, the constructs in this study exhibit of 0.7. Therefore, the constructs in this study exhibit satisfactory reliability satisfactory reliability.

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Table 9
Composite Reliability, Cronbach's Alpha, Convergent Validity, and Shared Values (R^2)

Organizing Theme	Basic Dimension	Factor Loading	Composite Reliability (CR > 0.7)	Cronbach's Alpha	AVE	Communality	R^2
Sustainable Performance of the Digital Rial	Physical Infrastructure	0.924	0.978	0.964	0.824	0.964	0.851
	Network Infrastructure	0.914					
	Cybersecurity	0.921					
	Vulnerability Reduction	0.919					
	Multi-layer Defense System	0.881					
	Operational Speed	0.904					
	Performance Quality	0.888					
Monetary and Fiscal Policies of the Digital Rial	Self-regulating Algorithms	0.896	0.952	0.925	0.771	0.931	–
	Smart Contract System	0.835					
	Digital Monetary Policy	0.912					
	Economic Stability	0.839					
	Inflation Control	0.904					
Regulatory and Legal Framework	Zero-Knowledge Proof Technologies	0.895	0.903	0.865	0.767	0.894	0.807
	Legal Innovation	0.865					
	Strengthening Supervision	0.884					
	International Standards	0.858					
Social Acceptance of the Digital Rial	Public Trust	0.879	0.915	0.898	0.831	0.902	0.838
	Cultural Orientation	0.936					
	Public Awareness	0.918					
Interaction between Traditional and Digital Banking	Mitigation of Negative Consequences	0.924	0.935	0.924	0.867	0.926	–
	Digital Transformation	0.932					
	Integration of Traditional and Digital Systems	0.938					
Good Governance of the Digital Rial	Transparency	1.000	0.864	0.895	0.703	0.785	0.710
	Accountability	0.779					

Source: Research Findings

As shown in Table 9, the evaluation of the Average Variance Extracted (AVE) criterion indicates that all constructs have values greater than the minimum acceptable threshold of 0.50. Therefore, the constructs in this study exhibit satisfactory convergent validity. Since all indicators demonstrate AVE values above 0.50, convergent validity is confirmed across all measurement items.

To assess the goodness-of-fit of the structural model, several criteria are employed. The most fundamental criterion is the significance coefficients, also referred to as T-values. Structural model fit is evaluated using T-values, which must exceed 1.96 to confirm statistical significance at the 95% confidence level.

5.2.2 Structural Model Fit

After evaluating the measurement models, the next step is to assess the fit of the structural model. Unlike the measurement model, the structural model does not deal with observed variables (indicators) directly; instead, it focuses exclusively on latent variables and the relationships among them.

5.2.2.1 Significance Coefficients (Z-statistics / T-values)

The first criterion in evaluating the structural model is the significance coefficients (Z-statistics or T-values). As noted, T-values must be greater than 1.96 to confirm significance at the 95% confidence level.

Figure 4 illustrates that all paths between the variables in the model are statistically significant and thus confirmed. This finding validates the hypothesized relationships among the latent constructs in the study.

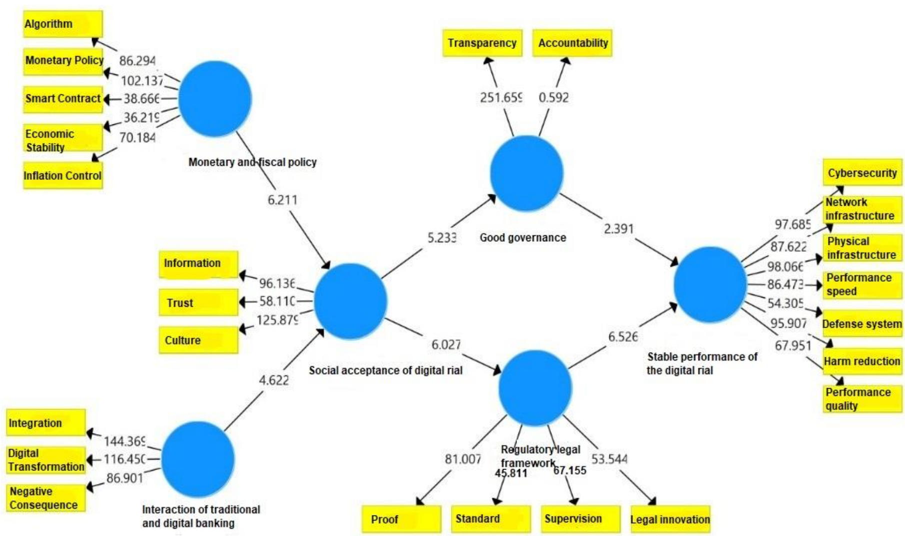

Figure 4. T-Values
Source: Research Findings

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5.2.2.2 Path Coefficient Criterion

The second criterion for evaluating the structural model fit in this study is the R^2 coefficients of the endogenous (dependent) latent variables. The R^2 statistic reflects the extent to which exogenous (independent) variables explain the variance of an endogenous construct.

In recent PLS-SEM literature, the coefficient of determination (R^2) is commonly interpreted using three threshold levels—weak, moderate, and substantial—depending on the research context and model complexity, reflecting the model's explanatory power (Sarstedt et al., 2024).

– 0.19 → Weak explanatory power
– 0.33 → Moderate explanatory power
– 0.67 → Strong explanatory power

If an endogenous construct is influenced by only one or two exogenous constructs, an R^2 value greater than 0.33 indicates a sufficiently strong relationship between the constructs.

In the structural model of this study, the R^2 values are represented within circles in the model diagram. As illustrated in Figure 5, four constructs exhibit R^2 values greater than 0.67, which corresponds to the threshold for strong explanatory power. Therefore, from the perspective of this criterion, the structural model demonstrates a satisfactory level of fit.

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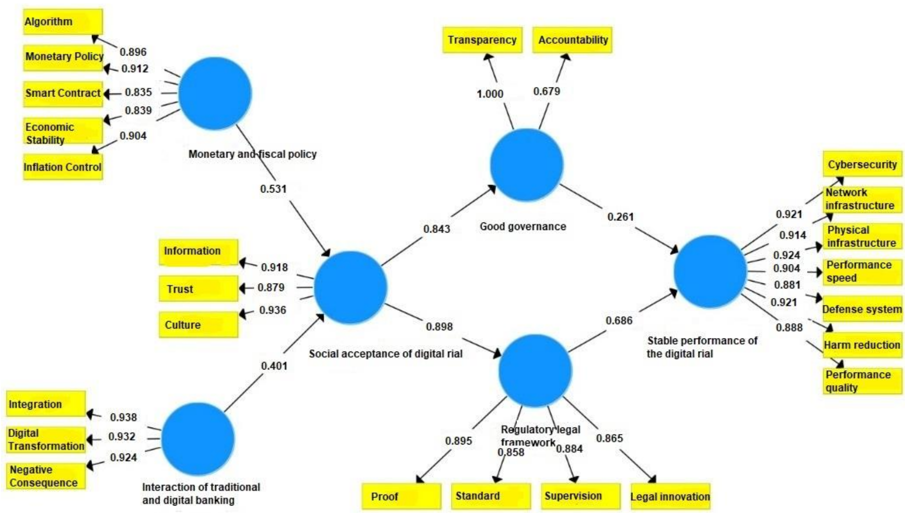

Figure 5. Significance Coefficients
Source: Research Findings

5.2.3 Overall Model Fit

The overall model encompasses both the measurement and structural components. By confirming the fit of each, the adequacy of the complete model can be assessed. To evaluate the overall model fit, a single criterion known as the Goodness-of-Fit (GOF) index is applied:

$$GOF = \sqrt{\overline{Communalities} \times \overline{R^2}}$$

The value of $\overline{Communalities}$ is obtained from the average communality values reported in Table 9, which equals 0.900. Since several first-order endogenous latent variables exist in this model, the average $\overline{R^2}$ is calculated as 0.801.

Thus, the GOF value is:

$$GOF = \sqrt{0.900 \times 0.801} = 0.849$$

According to the thresholds of 0.01 (weak), 0.25 (moderate), and 0.36 (strong) introduced for GOF, the obtained value of 0.849 indicates that the overall model demonstrates a strong goodness-of-fit.

5.2.4 Path Analysis

The T-statistic determines the significance of the effects among variables:

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– If T > 1.96, the effect is positive and significant at the 95% confidence level.
– If -1.96 < T < +1.96, the effect is not significant.
– If T < -1.96, the effect is negative but significant.

In addition, the path coefficients indicate the strength of relationships:

– Above 0.60 → Strong relationship
– Between 0.30 and 0.60 → Moderate relationship
– Below 0.30 → Weak relationship

The empirical data obtained from the field study were analyzed using SmartPLS software, and the results confirmed that all hypothesized paths in the model are statistically significant and consistent with the theoretical framework.

Table 10
Regression Coefficients and T-Statistics

No.	Hypothesis	Path Coefficient	T-Value	Test Result
1	Monetary and Fiscal Policies → Social Acceptance of the Digital Rial	0.531	6.211	Hypothesis Confirmed
2	Interaction of Traditional and Digital Banking → Social Acceptance of the Digital Rial	0.401	4.622	Hypothesis Confirmed
3	Social Acceptance of the Digital Rial → Good Governance	0.843	5.233	Hypothesis Confirmed
4	Social Acceptance of the Digital Rial → Regulatory and Legal Framework	0.898	6.027	Hypothesis Confirmed
5	Good Governance → Sustainable Performance of the Digital Rial	0.261	2.391	Hypothesis Confirmed
6	Regulatory and Legal Framework → Sustainable Performance of the Digital Rial	0.686	6.526	Hypothesis Confirmed

Source: Research Findings

6 Discussion and Conclusion

The findings of this study indicate that the success of implementing the Digital Rial is significantly dependent on its sustainable performance, which encompasses physical infrastructure, network infrastructure, cybersecurity, vulnerability reduction, multi-layer defense systems, and optimization of speed and quality of operations. Given the critical role of security in digital financial systems, the use of advanced cryptographic protocols such as Elliptic Curve Cryptography (ECC) and blockchain technologies is considered essential. These technologies not only safeguard the integrity of financial transactions but also enhance public trust and transparency in the digital financial system. Moreover, the deployment of advanced systems to prevent

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cyberattacks and the development of multi-layered security architectures are necessary measures to ensure resilience and sustainability in digital payment infrastructures.

The study also highlights the role of Artificial Intelligence (AI) in optimizing the performance of the Digital Rial. Machine learning algorithms can detect anomalies in transactions and identify financial fraud, thereby significantly increasing user trust and security. Additionally, AI can improve the efficiency of real-time payment systems by optimizing financial data processing algorithms, thereby enhancing both speed and accuracy. In the domain of economic management, AI can support predictive analysis of economic behaviors and intelligent management of supply and demand, enabling more effective economic decision-making.

In the field of monetary policy, the findings suggest that self-regulating algorithms can contribute to economic stability and inflation control. Designed on the basis of dynamic economic models, these algorithms enable automatic adjustment of the monetary base in response to macroeconomic changes, preventing severe fluctuations in money supply. The use of smart contracts in financial systems further facilitates the automatic and precise implementation of monetary policies, enhancing transparency and reducing administrative costs.

From a legal and regulatory perspective, the study emphasizes the need to establish comprehensive legal frameworks and new regulatory mechanisms for the Digital Rial. These frameworks must protect user privacy while simultaneously strengthening transparency and oversight of transactions. Technologies such as zero-knowledge proofs can empower regulators to monitor transactions effectively without disclosing sensitive details, thereby ensuring both personal data protection and financial transparency.

The findings also underscore the importance of good governance in the implementation of the Digital Rial. Good governance in this context entails establishing structures that guarantee transparency, accountability, and stakeholder participation. This can be achieved through improved reporting of system performance, enhanced management of transactions and data, and greater accountability of responsible institutions. Active participation of both public and private entities in decision-making and oversight processes contributes to the formulation of more comprehensive policies and continuous improvement of system performance.

Social acceptance emerges as a key determinant of success. Building public trust and fostering awareness of the benefits and usage of the Digital Rial are crucial. Comprehensive educational programs and widespread

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information campaigns can reduce psychological and cultural barriers, facilitating broader adoption. Thus, awareness campaigns and training initiatives for users and economic actors are essential.

One of the major challenges is the integration of traditional banking with digital systems. The findings suggest that this integration must be achieved through common protocols and the development of unified digital infrastructures to ensure seamless and efficient transitions. Digital transformation in banking also requires careful organizational change management and strategic planning to mitigate potential negative impacts and enhance system productivity.

The study stresses the necessity of employing advanced economic and analytical models to evaluate the impact of the Digital Rial on macroeconomic variables such as inflation, unemployment, and economic growth. These models enable simulation of interrelationships among macroeconomic variables, providing policymakers with tools for more effective economic decisions and targeted monetary policies.

From an international standards perspective, the findings highlight the importance of global development and standardization of the Digital Rial to increase international acceptance and facilitate cross-border financial interactions. In the context of globalized financial markets, establishing international legal and regulatory frameworks for digital currencies is critical. Such standards can reduce risks associated with exchange rate volatility and lack of transparency in international transactions, while ensuring fair competition among stakeholders.

The study further emphasizes the importance of continuous monitoring and dynamic feedback on the performance of the Digital Rial. This process involves collecting and analyzing operational data, identifying strengths and weaknesses, and continuously optimizing the system. Given the rapid pace of technological and economic changes, ongoing updates and adaptation to emerging challenges are essential to maintain effectiveness.

Investment in research and development (R&D) in innovative financial technologies (FinTech) is also deemed crucial. Allocating resources to scientific research and development projects not only supports the successful implementation of the Digital Rial but also stimulates job creation and innovation in financial markets.

Moreover, collaboration between the public and private sectors is identified as a vital element in developing the Digital Rial infrastructure. Such cooperation can accelerate technological development, facilitate regulatory

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processes, and address implementation challenges through shared resources and expertise.

Finally, the study underscores the importance of continuous workforce training and specialized skill development in financial technologies. Given the rapid growth of this sector, up-to-date and specialized training programs can significantly enhance technical capabilities and human resource management in the financial industry.

The ultimate conclusion of this research is that the success of the Digital Rial depends on the collaboration and consensus of all economic, social, and governmental stakeholders. Establishing an interactive platform and fostering inter-institutional cooperation can lead to the integration and sustainability of the Digital Rial system, leveraging all available capacities to improve its efficiency.

7 Practical Recommendations

Practical recommendations for good governance and the implementation of the Digital Rial are presented below. To achieve successful deployment, the government and the central bank must adopt a multifaceted and scientific approach encompassing legal, technological, economic, and social dimensions. The following set of recommendations is proposed in line with the findings of this study:

1) Establish Adaptive Legal and Regulatory Frameworks
    - Smart and dynamic legislation: The government and central bank should design a flexible and adaptive legal system for managing the Digital Rial. Laws must be based on comparative legal approaches and incorporate algorithmic regulation to address rapid changes in digital technologies and cryptocurrencies. A comprehensive framework should include precise legal definitions of digital currency, transparency in data ownership laws, and clear regulations to prevent misuse and fraud.
    - **Technology-driven regulatory oversight:** Supervision of Digital Rial operations should leverage RegTech solutions. The use of big data analytics, artificial intelligence (AI), and distributed ledger technologies (DLT) can enable intelligent, real-time monitoring of transactions and reduce potential risks. Zero-knowledge proofs should also be employed to safeguard user privacy while ensuring transparency in transactions.
2) Strengthen Cybersecurity and Financial Technology Infrastructure

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- **Advanced cryptography and multi-layered security:** The development of the Digital Rial must be grounded in advanced cryptographic protocols such as Elliptic Curve Cryptography (ECC) and multi-layered security architectures. Quantum-resistant algorithms and intrusion-resilient technologies are essential to counter cyber threats and protect financial data.
- **AI-based fraud detection and prevention systems:** Machine learning algorithms should be deployed to identify anomalies in digital transactions and detect financial fraud. AI-driven adaptive fraud prevention systems can significantly reduce security risks and enhance public trust.

3) Develop Technical and International Interoperability Infrastructure
   - **Global standardization for acceptance:** The central bank should collaborate with international institutions to establish global standards for the Digital Rial. These standards must align with ISO and other international organizations, while ensuring compatibility with global financial protocols such as SWIFT and DLT-based systems.
   - **Integration with international payment systems:** To facilitate cross-border financial interactions and reduce transaction costs, the Digital Rial must be interoperable with global payment infrastructures. Blockchain-based payment systems and digital financial data transfer protocols can reduce friction in international transactions and enhance global acceptance.
4) Implement Algorithmic Monetary Policies
   - **Self-regulating algorithms:** Smart, self-adjusting algorithms should be employed to automatically regulate the monetary base in response to macroeconomic conditions. Designed on dynamic economic models and time-series analysis, these algorithms can help control inflation and maintain financial stability.
   - **Smart contracts for monetary execution:** The use of smart contracts in the Digital Rial system enables precise and automated implementation of monetary and fiscal policies. This technology enhances transparency, reduces administrative costs, and allows real-time monitoring of economic performance.
5) Invest in Research & Development (R&D) and Financial Technology Innovation
   - **Advanced FinTech research:** The government and central bank must invest in FinTech projects, including advanced cryptography, real-time payment systems, and blockchain applications. Allocating

resources to predictive economic modeling and big data analytics can improve the efficiency of monetary and economic policies.

- **Collaboration with academic institutions:** Close cooperation with universities, research centers, and scientific institutions is essential for developing indigenous knowledge and innovative economic models, thereby supporting the successful implementation of the Digital Rial.

6) Enhance Public Awareness and Social Acceptance
   - **Comprehensive education and awareness campaigns:** The government should launch educational programs and public campaigns to explain the benefits of the Digital Rial to citizens and businesses. Digital learning platforms and targeted micro-training can improve financial literacy and facilitate public adoption.
   - **Building public trust through transparency and accountability:** Establishing mechanisms for transparent reporting on Digital Rial performance and policies can significantly strengthen public confidence. Regular publication of updated statistics on adoption rates, transaction volumes, and economic impacts is essential.
7) Manage Organizational Change and Digital Transformation in Banking
   - **Digital transformation strategies:** The central bank should design a comprehensive strategy for managing digital transformation in the banking sector. This includes workforce skill development, organizational restructuring, and adoption of innovative financial technologies to ensure integration between traditional and digital banking.
   - **Organizational risk management frameworks:** Risk management frameworks must be developed based on critical scenario analysis. These should cover cybersecurity risks, economic fluctuations, and changes in consumer behavior to ensure the resilience and sustainability of the financial system.
8) Employ Advanced Analytical Models for Macroeconomic Impact Assessment
   - **Macroeconomic modeling:** The central bank should utilize advanced economic models such as Dynamic Stochastic General Equilibrium (DSGE) models, multivariate correlation analysis, and Artificial Neural Networks (ANNs) to simulate the impact of the Digital Rial on macroeconomic variables such as inflation, unemployment, and economic growth.
   - **Short- and long-term impact analysis:** Advanced statistical tools and predictive models should be applied to assess both short-term and

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long-term effects of the Digital Rial on the national economy, enabling more sustainable and intelligent policy-making.

9) Foster Inter-Institutional and Private Sector Collaboration

- **Public–private partnerships (PPP):** Collaboration between government and private sectors is essential to accelerate infrastructure development and adoption of the Digital Rial. PPP contracts can leverage private financial and technological resources to support implementation.
- **Encouraging innovation through FinTech ecosystems:** The government should support innovation ecosystems and FinTech startups to develop new solutions and products based on the Digital Rial. Establishing accelerators and regulatory sandboxes can expedite testing and deployment of emerging technologies.

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