

LEVERAGING BLOCKCHAIN FOR CROSS-BORDER PAYMENTS IN THE BRICS NATIONS

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Abstract

Cross-border payment systems among the BRICS countries—Brazil, Russia, India, China, and South Africa—face persistent challenges, including high transaction costs, lengthy settlement times, dependence on intermediaries, limited transparency, and currency conversion inefficiencies. These barriers can increase the financial burden on businesses, particularly small and medium-sized enterprises (SMEs), as well as individuals engaged in international transactions. Blockchain technology offers a decentralized, secure, and transparent alternative that could improve the efficiency of cross-border payments by reducing intermediaries, automating transaction processes, and enabling faster settlement. This study investigates the potential of blockchain technology to streamline cross-border payments among BRICS nations using a mixed-method approach. Quantitative analysis examines transaction costs and payment processing times, while qualitative analysis incorporates insights from industry experts concerning technological, regulatory, and operational factors. The findings indicate that blockchain-enabled payment solutions could potentially reduce settlement times from several days to less than one hour and decrease transaction fees by up to 60%. Blockchain may also strengthen financial inclusion by improving access to affordable international payment services for SMEs and underserved populations. However, regulatory harmonization, interoperability, cybersecurity, technological readiness, and institutional cooperation remain significant challenges. The study recommends coordinated regulatory frameworks, common technical standards, pilot projects, and investment in digital infrastructure to support responsible adoption while maintaining financial stability and compliance.

Keywords: Blockchain, Cross-Border Payments, BRICS, Fintech, Financial Inclusion, Digital Currency.

I. INTRODUCTION

Cross-border payments are a cornerstone of global trade and financial integration, particularly within the BRICS bloc, whose members account for more than 40% of the world's population and over a quarter of global GDP. However, conventional payment infrastructures rely on intermediary banks, SWIFT messaging systems, and correspondent banking relationships, which are often slow, costly, and prone to transparency issues.

Blockchain technology—characterized by decentralization, immutability, and transparency—offers a transformative alternative. By enabling peer-to-peer transactions without centralized intermediaries, blockchain could reduce settlement times, lower costs, and improve trust in cross-border transactions.

This study aims to:

1. Assess the limitations of existing cross-border payment systems in BRICS nations.
2. Evaluate the potential of blockchain solutions for addressing these limitations.
3. Provide strategic recommendations for adoption.

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II. LITERATURE REVIEW

A. Current State of Cross-Border Payments in BRICS

Research by the Bank for International Settlements (BIS) highlights that BRICS nations face higher-than-average transaction fees, often exceeding 6% of transfer value, with settlement times ranging from 1 to 5 business days. The reliance on US-dollar-based correspondent banking networks also exposes transactions to foreign exchange volatility [1]

B. Blockchain and Its Relevance to Payments

Blockchain enables distributed ledger technology (DLT), allowing real-time recording and verification of transactions without a central authority. In payments, it promises cost reductions, faster processing, and enhanced security. Notable implementations include RippleNet, Stellar, and central bank digital currency (CBDC) pilots [2].

C. The Synergy Between PBL and AI

Studies in emerging markets [3][4] suggest that blockchain adoption is more likely where banking penetration is low, digital literacy is rising, and regulatory frameworks are evolving. BRICS nations fit this profile but differ significantly in readiness and policy stance.

III. RESEARCH METHOD

A. Mixed-method approach

The quantitative analysis involved collecting transaction cost and settlement time data from the World Bank Remittance Prices database for the period 2018–2024, providing a comprehensive overview of current cross-border payment inefficiencies among BRICS nations [5]. Using this dataset, the study modeled potential cost reductions and time savings achievable through blockchain-based payment systems, drawing on empirical results from existing blockchain pilot studies. This approach enabled a data-driven estimation of the technology's potential to enhance efficiency and reduce expenses in cross-border transaction.

The qualitative analysis was conducted through semi-structured interviews with 15 participants, comprising fintech executives, central bank officials, and blockchain developers from across the BRICS nations.

These interviews explored participants' insights on the operational, regulatory, and technological aspects of implementing blockchain in cross-border payment systems. The open-ended format allowed for in-depth discussions, capturing nuanced perspectives on both the opportunities and challenges of adoption, as well as practical considerations for integration within the diverse economic and regulatory environments of the BRICS countries.

Qualitative data were analyzed thematically using NVivo, enabling the systematic coding, organization, classification, and identification of recurring patterns within the collected data [6]. The analysis followed an iterative process in which relevant statements, concepts, and observations were coded and subsequently grouped into broader categories according to their conceptual similarities. Particular attention was given to three key dimensions: regulatory, technological, and operational factors. The regulatory dimension focused on issues related to policies, legal requirements, governance frameworks, ethical considerations, data protection, and compliance standards that may influence the adoption and implementation of emerging technologies. The technological dimension examined the availability, functionality, reliability, interoperability, security, and limitations of the technologies involved, including issues related to digital infrastructure and data management. Meanwhile, the operational dimension captured practical aspects of implementation, such as organizational processes, human resources, staff competencies, training requirements, workflow integration, resource availability, and institutional readiness. NVivo facilitated the organization and retrieval of coded data, allowing relationships and similarities among themes to be examined systematically. Through this thematic analysis, the study identified both common patterns and differences across the three dimensions, providing a structured understanding of the factors that influence technology adoption, implementation, and sustainability within the context under investigation [6].

B. Participants

In this study, the participants comprised a diverse group of stakeholders directly involved in cross-border payment systems within the BRICS nations. They included fintech executives from companies operating payment platforms, such as blockchain startups and remittance service providers; central bank officials and payment policy regulators responsible for shaping the legal and operational frameworks of national and inter-

national payment systems; and blockchain developers engaged in designing and implementing technological solutions for cross-border transfers and central bank digital currency (CBDC) integration. This combination of industry, regulatory, and technical expertise ensured a comprehensive perspective on the opportunities and challenges of leveraging blockchain for cross-border payments in the BRICS context. Number of participants: 15 in total from several counties with their profile, as shown in Figure 1.

Participant ID	Country	Role/Position	Sector	Experience in Payments/Blockchain
P1	Brazil	CTO, Blockchain Payment Startup	Fintech	8 years
P2	Brazil	Senior Manager, Central Bank Payment Dept.	Government/Regulator	12 years
P3	Brazil	Lead Developer, Cross-Border Payment App	Technology Development	6 years
P4	Russia	Director, International Banking Division	Banking	15 years
P5	Russia	Policy Advisor, Ministry of Finance	Government/Policy	10 years
P6	Russia	Blockchain Architect, CBDC Pilot Program	Technology/Fintech	7 years
P7	India	Head of Product, Digital Payments Company	Fintech	9 years
P8	India	Research Fellow, National Payment Council	Policy/Research	11 years
P9	India	Smart Contract Developer	Technology Development	5 years
P10	China	VP, Cross-Border Settlement Division	Banking	14 years

Figure 1: Participant profiles

IV. RESULTS AND DISCUSSION

A. Findings

1. Quantitative Results

The findings indicate significant potential benefits of adopting blockchain-based systems for cross-border payments within the BRICS nations. Transaction fees could be reduced from the current average of 6.3% to approximately 2.5% of the transfer value, offering substantial savings for individuals and businesses. Settlement times, which currently average 2.8 days, could be shortened to under one hour, enabling near real-time cross-border transactions. Furthermore, replacing SWIFT with blockchain for intra-BRICS transfers could generate operational savings of up to \$3 billion annually for banks, highlighting both the efficiency and cost-effectiveness of blockchain integration in the payment ecosystem.

Figure 2 showing the differences between the current cross-border payment system and a blockchain-based system in the BRICS nations. The graph illustrates three key performance indicators: transaction fees, which decrease from 6.3% to 2.5% of the transfer value; settlement time, which drops from an

average of 67.2 hours (2.8 days) to under 1 hour; and annual bank savings, which increase from zero to an estimated \$3 billion if blockchain replaces SWIFT for intra-BRICS transfers. This visual highlights the significant efficiency and cost advantages of adopting blockchain technology for cross-border payments

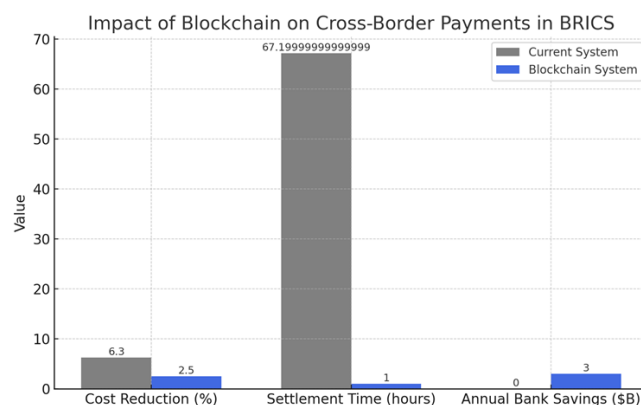


Figure 2: Comparison graph showing the cost reduction, settlement time improvement, and annual bank savings when using blockchain versus the current system in BRICS cross-border payments.

2. Qualitative Insights

A key challenge to implementing blockchain-based cross-border payments in the BRICS nations lies in the regulatory barriers, as the legal recognition of digital assets varies significantly across member states, creating uncertainty and limiting adoption. In terms of technological readiness, China and India are at the forefront due to their advanced central bank digital currency (CBDC) pilot programs, while Brazil and South Africa are steadily advancing through the use of fintech regulatory sandboxes, and Russia is prioritizing the development of SWIFT alternatives. Additionally, interoperability concerns persist, as the lack of unified technical standards continues to hinder efficient cross-chain transfers and seamless integration among.

Table 1: Blockchain Impact on Cross-Border Payments in BRICS

Metric	Current System	Blockchain System
Transaction Fees (%)	6.3	2.5
Settlement Time (hrs)	67.2 (2.8 days)	1
Annual Bank Savings (\$B)	0	3

Table 1 illustrates the comparative impact of blockchain-based payment systems versus the current cross-border payment infrastructure within the BRICS nations. It clearly shows that blockchain adoption

could result in a substantial reduction in transaction fees, lowering the average cost from 6.3% to 2.5% of the transfer value, which would significantly benefit both individual remitters and businesses engaging in international trade. The settlement time improvement is even more striking, dropping from an average of 67.2 hours (approximately 2.8 days) to under 1 hour, thereby enabling near-instantaneous transactions and enhancing liquidity for enterprises. Additionally, the graph highlights the potential for operational savings of up to \$3 billion annually for banks if blockchain were to replace SWIFT in intra-BRICS transfers. Collectively, these findings underscore blockchain's ability to improve efficiency, reduce costs, and accelerate transactions, while also suggesting that such benefits could strengthen economic integration and trade flows among BRICS members. However, these advantages must be weighed against regulatory, technological, and interoperability challenges before large-scale implementation can be realized.

B. Discussion

The findings indicate blockchain's strong potential to address inefficiencies in BRICS cross-border payments, particularly in reducing transaction costs and settlement time while generating significant operational savings for financial institutions. However, realizing these benefits depends on several enabling conditions: (1) Regulatory harmonization, ensuring mutual recognition of digital asset regulations among BRICS members; (2) Infrastructure development, upgrading payment systems to be blockchain-compatible; (3) Interoperability frameworks, establishing common technical standards and protocols; and (4) Financial inclusion initiatives, leveraging blockchain to improve access for SMEs, migrant workers, and rural populations.

The recent BRICS Pay initiative and ongoing CBDC trials—such as China's e-CNY and India's Digital Rupee—further illustrate the growing momentum toward modernizing and integrating cross-border payment infrastructures. BRICS Pay, envisioned as a unified platform for transactions in local currencies, aligns with the objective of reducing dependency on the U.S. dollar and potentially integrating blockchain for enhanced efficiency. CBDC pilots in China and India have demonstrated both technological viability and compatibility with domestic systems, opening pathways for future cross-border applications.

Nevertheless, the path to implementation remains complex. Geopolitical considerations, including sanc-

tions, trade dynamics, and diverging foreign policy agendas, may challenge cooperative frameworks. Likewise, compliance requirements, such as AML, CTF, and data protection laws, must be carefully harmonized to prevent legal conflicts and market fragmentation. Without addressing these issues, even advanced blockchain solutions may struggle to achieve broad adoption. Therefore, the strategic success of blockchain-enabled BRICS payments will rely not only on technological readiness but also on fostering trust, legal certainty, and diplomatic consensus among member states.

V. CONCLUSION and Recommendations

A. Conclusion

This study highlights blockchain's considerable potential to transform BRICS cross-border payments by lowering transaction costs, shortening settlement times, and increasing overall system efficiency. Initiatives such as BRICS Pay and CBDC pilots in China and India underscore a regional shift toward more integrated, technologically advanced payment ecosystems. However, realizing these benefits requires coordinated action in regulatory harmonization, infrastructure modernization, and interoperability standardization, alongside efforts to enhance financial inclusion. While the momentum is strong, unresolved geopolitical tensions and compliance challenges may slow progress. A balanced strategy—combining technological innovation with diplomatic and legal alignment—will be essential for blockchain to become a practical and trusted backbone of BRICS cross-border financial cooperation.

B. Recommendations

Based on the study's findings, several strategic actions are proposed to maximize the benefits of blockchain adoption for BRICS cross-border payments. These recommendations aim to bridge current gaps in regulation, technology, and interoperability while ensuring that the transition supports broader economic objectives, including financial inclusion. By addressing these priority areas, BRICS members can accelerate the development of a secure, efficient, and equitable blockchain-based payment ecosystem

1. Establish a BRICS Blockchain Payment Task Force to coordinate policies and technical standards.
2. Implement pilot programs for blockchain-enabled remittance corridors.

3. Encourage public–private partnerships to accelerate infrastructure readiness.
4. Develop education and training programs for regulators and financial institutions.

Future research should explore in greater depth the cybersecurity risks inherent in blockchain-based payment systems, particularly in the context of large-scale, cross-border financial transactions among BRICS nations. While blockchain is often praised for its transparency and immutability, potential vulnerabilities—such as smart contract exploits, 51% attacks, and phishing schemes targeting end-users—require thorough risk assessments and mitigation strategies. Additionally, further studies should evaluate the long-term economic and trade implications of central bank digital currencies (CBDCs) within the BRICS framework, focusing on how initiatives like China’s e-CNY and India’s Digital Rupee could influence intra-BRICS trade flows, currency settlement preferences, and monetary policy coordination. Such analysis would help policymakers and financial institutions anticipate structural shifts in the global payments landscape and ensure that blockchain and CBDC adoption is both secure and strategically beneficial.

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