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Reducing Friction and Failure Rates in Cross-Border Digital Payments Across ECOWAS Through Interoperable Payment Systems and Data-Driven Product Innovation

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Abstract

Cross-border digital payments within the Economic Community of West African States (ECOWAS) remain constrained by systemic friction and elevated failure rates that undermine regional trade integration and financial inclusion objectives. This paper presents a conceptual review of the literature, providing an analytical examination of the structural, regulatory, and technological barriers impeding seamless payment flows across ECOWAS member states. Through systematic analysis of interoperability gaps, regulatory fragmentation, and infrastructure deficiencies, the study identifies critical friction points spanning technical, institutional, and user-experience dimensions. The paper evaluates the Pan-African Payment and Settlement System (PAPSS) as a potential architectural solution while highlighting persistent implementation challenges rooted in regulatory heterogeneity. It further demonstrates how data-driven product innovation, encompassing transaction analytics, predictive modeling, and behavioral design, can catalyze friction reduction and enhance payment success rates. Findings reveal that achieving frictionless cross-border payments requires coordinated policy harmonization, technical standardization, and innovation ecosystems that prioritize user-centric design. The paper concludes with strategic recommendations for policymakers, financial institutions, and technology providers to accelerate payment system modernization and advance ECOWAS economic integration.

Keywords: cross-border payments, ECOWAS, payment interoperability, digital financial services, mobile money, payment system friction

1. Introduction

The Economic Community of West African States (ECOWAS) comprises fifteen member states with a combined population exceeding 400 million and significant economic heterogeneity (Kireyev, 2016). Despite decades of institution-building, cross-border trade and financial flows within the region remain constrained by fragmented payment infrastructure, regulatory divergence, and technical barriers that amplify transaction costs and failure rates (Malaguti et al., 2011). The imperative for seamless cross-border payment systems has intensified alongside the operationalization of the African Continental Free Trade Area (AfCFTA), which envisions a unified continental market predicated on efficient financial infrastructure (Ruhamya et al., 2025). Cross-border digital payments constitute the circulatory system of regional economic integration, enabling trade settlement, remittance flows, and financial inclusion for underserved populations (Mensah, 2024). ECOWAS payment systems exhibit structural friction manifested through high transaction costs, extended settlement timelines, limited interoperability between national payment schemes, and elevated failure rates that erode user confidence. These inefficiencies disproportionately affect small and medium enterprises (SMEs), informal traders, and migrant workers who depend on affordable payment channels for economic participation (Doto et al., 2025).

The proliferation of mobile money platforms across West Africa has created unprecedented opportunities for financial inclusion (Seck-Sarr, 2024). Yet this expansion has unfolded within fragmented national ecosystems characterized by limited cross-border interoperability, divergent regulatory frameworks, and technical incompatibilities that obstruct seamless payment flows (Ruhamya et al., 2025). Addressing these challenges requires a multifaceted approach combining interoperable payment architectures, regulatory harmonization, and data-driven product innovation that leverages transaction analytics to optimize payment success rates (Mensah, 2024). This paper makes three interrelated analytical contributions. First, it develops a comprehensive typology of friction and failure modes in ECOWAS cross-border digital payments. Second, it critically evaluates existing interoperability architectures and the PAPSS framework, identifying structural barriers and implementation pathways. Third, it examines how data-driven product innovation can complement architectural solutions. The paper is structured as follows: Section 2 reviews the literature; Sections 3, 4, and 5 address each analytical contribution; Section 6 synthesizes policy implications; and Section 7 concludes.

Literature Review

Regional Integration and Payment Systems in West Africa

Kireyev's (2016) comprehensive analysis of integrated economies in West Africa identifies payment system fragmentation as a critical impediment to achieving the economic convergence envisioned by

ECOWAS protocols. Historical efforts to reduce payment costs within the West African Economic and Monetary Union (UEMOA) demonstrated that technical solutions alone prove insufficient without accompanying regulatory harmonization: cross-border transaction costs within UEMOA historically exceeded 10% for remittance flows, disadvantaging low-income senders and constraining intra-regional commerce (Malaguti et al., 2011). The coexistence of the CFA franc zone alongside independent monetary authorities in countries such as Nigeria, Ghana, and Sierra Leone introduces additional complexity to payment system integration, generating structural currency conversion friction that is absent in more monetarily unified regions (Kireyev, 2016).

Mobile money has emerged as a transformative force in West African financial landscapes, extending financial services to previously unbanked populations and creating new channels for payment, savings, and credit (Seck-Sarr, 2024). The diversity of actor strategies, spanning mobile network operators, banks, fintech startups, and regulatory authorities, shapes ecosystem development trajectories (Mas, 2021). Evidence from ECOWAS member states demonstrates that mobile money adoption correlates positively with firm productivity, particularly when supported by robust innovation ecosystems (Doto et al., 2025). Konte and Tetteh (2023) confirm that firms combining mobile money with traditional financial services exhibit superior productivity outcomes, while Guermond's (2022) analysis of digital remittances in Ghana reveals complex power dynamics embedded in platform design that affect user financial agency. The IMF's (2023) exploration of multilateral platforms for cross-border payments identifies fragmented correspondent banking networks, complex compliance requirements, and inefficient foreign exchange conversion as primary friction sources globally, challenges that manifest with particular intensity in ECOWAS. Ruhamya et al.'s (2025) multi-country analysis identifies specific regulatory barriers to PAPSS implementation, including divergent foreign exchange regulations, capital control regimes, and inconsistent AML/CFT frameworks. These regulatory heterogeneities extend implementation complexity beyond technical integration into policy harmonization territory.

Data-Driven Innovation in Digital Financial Services

The application of data analytics and machine learning to financial services is reshaping product design, risk management, and customer experience across emerging markets (Ozili, 2023). Weerawarna and Miah (2023) demonstrate that real-time data-driven decision support systems for remittance management can enhance transaction success rates through predictive analytics that anticipate failure points and optimize routing. Sethupathy (2024) demonstrates that blockchain-tethered microtransaction architectures can materially reduce settlement costs and fraud exposure in emerging markets. Khaki et al. (2022) apply supervised machine learning to model fintech adoption patterns across African countries, revealing that digital literacy, infrastructure availability, and regulatory quality are the most predictive determinants of adoption. Wachira and Njuguna (2023) examine M-Pesa in Kenya, showing that productivity gains from mobile financial services are maximized when digital payment adoption is

supported by consistent regulatory environments and network reliability, a finding with direct implications for ECOWAS payment system design. Despite this growing body of evidence, critical analytical gaps persist. Most existing work examines mobile money adoption within national contexts without interrogating the specific mechanisms through which cross-border friction arises and compounds (Aker, 2023). Studies of PAPSS tend to focus on institutional architecture while underexploring regulatory implementation barriers (Ruhamya et al., 2025). The intersection of data-driven product innovation with cross-border payment friction reduction remains underdeveloped in the ECOWAS-specific literature. This paper addresses these gaps through integrated analytical treatment of friction typologies, interoperability architectures, and data-driven strategies.

Mapping Friction and Failure in ECOWAS Cross-Border Digital Payments

Technical Infrastructure Friction

Technical infrastructure deficiencies constitute the foundational layer of payment system friction in ECOWAS. Limited interoperability between national payment switches prevents efficient transaction routing across borders, forcing reliance on correspondent banking arrangements that introduce delays and costs (Malaguti et al., 2011). Many ECOWAS member states operate isolated real-time gross settlement (RTGS) systems and automated clearing houses (ACH) lacking standardized messaging protocols for cross-border connectivity (Mensah, 2024). A payment that clears domestically within seconds can require three to seven business days to settle across a land border (Malaguti et al., 2011), a gap that fundamentally undermines the case for digital payment adoption in cross-border trade and remittance contexts. Network reliability challenges compound infrastructure limitations. Inconsistent internet connectivity and mobile network coverage in rural and border regions create transaction failure points invisible to urban-facing platform designs (Doto et al., 2025). Settlement infrastructure gaps further generate friction: the lack of integrated settlement mechanisms between ECOWAS central banks necessitates prefunding arrangements that tie up liquidity and constitute barriers to entry for smaller payment service providers, while manual foreign exchange conversion processes introduce delays, pricing inefficiencies, and reconciliation errors (Malaguti et al., 2011; Ruhamya et al., 2025).

Regulatory and Institutional Friction

Regulatory heterogeneity across ECOWAS member states creates substantial institutional friction. Divergent licensing requirements mean that payment service providers authorized in one jurisdiction face complex, costly processes to establish operations in neighboring countries (Ruhamya et al., 2025). Capital controls, transaction limits, and documentation requirements impede cross-border payment flows in several member states, while AML/CFT framework divergence introduces compliance complexity through varying customer due diligence requirements and transaction monitoring thresholds (Ruhamya et al., 2025). Taxation policies, including transaction taxes on mobile money, further distort

payment system economics and erode the cost advantages digital channels offer over informal alternatives (Foerster, 2022).

Operational, User Experience, and Behavioral Friction

Liquidity management constitutes an acute operational challenge. Payment service providers must maintain float balances across multiple currency corridors, and the absence of efficient liquidity rebalancing mechanisms produces corridor-level imbalances that manifest directly as transaction rejections when users initiate cross-border payments in constrained corridors (Weerawarna & Miah, 2023). Foreign exchange conversion processes simultaneously introduce cost and timing friction, with limited market competition producing wide bid-ask spreads and opaque pricing that generates post-transaction trust deficits (IMF, 2023). User experience friction manifests through complex transaction processes, limited real-time status visibility, and inadequate multilingual customer support in ECOWAS's linguistically diverse environment. Payment interfaces designed primarily in English or French exclude users more comfortable in indigenous languages, while digital literacy gaps create barriers for users with limited experience of formal financial systems (Aker, 2023; Aker & Carroll, 2022). Trust deficits stemming from prior encounters with payment failures generate behavioral friction that suppresses adoption, as negative incidents create reputational damage extending beyond individual providers to undermine confidence in digital payment systems broadly (Seck-Sarr, 2024).

Comprehensive Friction Typology

Table 1 synthesizes the multidimensional friction landscape in ECOWAS cross-border digital payments. The typology reveals how friction operates across technical, institutional, operational, and experiential layers, generating compound effects that elevate failure rates, inflate transaction costs, and constrain adoption.

Table 1. Typology of Friction and Failure Points in ECOWAS Cross-Border Digital Payments

Friction Category	Primary Manifestation	Affected System Layer	Principal Consequence
Technical Infrastructure	Isolated national switches; incompatible messaging protocols; network unreliability in border zones	Switching, routing, and settlement infrastructure	Settlement delays (3–7 days); routing failures; intermittent system downtime
Regulatory Heterogeneity	Divergent licensing regimes; inconsistent AML/CFT standards; fragmented consumer protection rules	Institutional and compliance layer	Market fragmentation; compliance cost inflation; constrained competition; regulatory arbitrage

Foreign Exchange	Manual conversion workflows; opaque pricing; capital controls; limited competition for minor currency pairs	Settlement and pricing layer	Wide bid-ask spreads; price opacity; conversion delays; unpredictable total transaction cost
Liquidity Management	Insufficient agent networks in border regions; corridor-level float imbalances; no automated rebalancing	Operational and agent-network layer	Transaction failures from liquidity shortfall; capital inefficiency; service gaps in peripheral areas
User Experience	Multi-step transaction flows; no real-time status updates; inadequate multilingual support	Interface and service-delivery layer	Low adoption; user abandonment at completion stage; preference for informal payment channels
Digital Identity	Absence of harmonized cross-border identity frameworks; repeated KYC requirements per jurisdiction	Customer onboarding and verification layer	Onboarding friction; binding transaction limits; exclusion of informally documented populations

Note. AML/CFT = Anti-Money Laundering and Combating the Financing of Terrorism; KYC = Know Your Customer. Table synthesizes findings from Malaguti et al. (2011), Ruhamya et al. (2025), Mensah (2024), Doto et al. (2025), and Weerawarna & Miah (2023).

The typology demonstrates that addressing cross-border payment challenges requires coordinated interventions across multiple dimensions simultaneously. Technical investments prove insufficient without accompanying regulatory harmonization; regulatory reform without operational capability development still leaves liquidity-driven failure rates unchanged; and both prove inadequate without attention to user experience. The compound nature of friction means that weaknesses in any single layer can cascade through the system to undermine overall payment performance.

Interoperable Payment Systems: Architecture, Gaps, and the PAPSS Framework

Interoperability Models and Architectural Choices

Payment system interoperability can be realized through multiple architectural models, each with distinct implications for scalability, governance, and implementation complexity. Bilateral arrangements between payment service providers enable direct connectivity for specific corridors but

scale poorly: achieving full interoperability among n providers requires n(n−1)/2 separate connections, creating exponential complexity (IMF, 2023). Multilateral switching platforms provide superior scalability through centralized infrastructure to which all participating providers connect via a single interface, enabling standardized messaging and centralized rule enforcement, though they require multi-stakeholder governance frameworks ensuring neutral operation (Mensah, 2024; Ruhamya et al., 2025). Hub-and-spoke architectures represent a hybrid model preserving national payment infrastructure investments while enabling cross-border connectivity through standardized interfaces, the architecture adopted by PAPSS. Distributed ledger technology offers an alternative paradigm through peer-to-peer settlement that eliminates correspondent banking intermediaries, though it faces scalability, regulatory acceptance, and legacy integration challenges in the ECOWAS context (Sethupathy, 2024).

Existing Interoperability Initiatives in ECOWAS

Several interoperability initiatives operate within ECOWAS subregions, but their geographic scope and functional capabilities remain limited. UEMOA has pursued domestic mobile money interoperability within individual member states, though cross-border interoperability within UEMOA itself remains restricted, with most transactions still processed through correspondent banking arrangements (Malaguti et al., 2011). Ghana's mobile money interoperability platform demonstrates the feasibility of multilateral switching infrastructure and has generated measurable reductions in transaction costs and improvements in SME payment efficiency (Guermond, 2022). However, the Ghana initiative remains domestically scoped, with no cross-border connectivity to neighboring ECOWAS members. Nigeria's payment system interoperability through NIBSS has achieved substantial domestic connectivity while remaining largely isolated from regional neighbors (Kireyev, 2016). Given that Nigeria represents approximately 60% of ECOWAS GDP (Kireyev, 2016), its limited cross-border payment integration constitutes a major structural bottleneck for regional payment flows.

PAPSS: Architecture, Potential, and Implementation Challenges

PAPSS, launched by the African Export-Import Bank (Afreximbank) in collaboration with the African Union and AfCFTA Secretariat, represents the most architecturally comprehensive attempt at continental payment interoperability (Ruhamya et al., 2025). The system employs a hub-and-spoke model connecting national payment switches, central banks, and commercial banks through a central hub, using ISO 20022 messaging standards to ensure interoperability with modern payment infrastructure while providing translation capabilities for legacy systems. Transactions settle in near real time, with net positions between central banks settled periodically through PAPSS Settlement Accounts, theoretically eliminating correspondent banking relationships, reducing settlement times from days to seconds, and enabling transparent foreign exchange conversion. Despite its sophistication, PAPSS faces substantial implementation barriers. Ruhamya et al.'s (2025) multi-country analysis identifies divergent foreign exchange regulations as a primary constraint, with capital controls in some

countries structurally incompatible with PAPSS's seamless settlement model. Licensing fragmentation means providers must obtain approvals from multiple regulatory authorities, constraining participation particularly for smaller fintech companies and mobile money operators (Ruhamya et al., 2025). AML/CFT divergence introduces compliance complexity, while central bank coordination requirements, establishing settlement accounts, agreeing on net settlement procedures, and coordinating liquidity management across divergent monetary policy frameworks, represent institutional coordination challenges that have no purely technical solution.

Comparative Analysis of Interoperability Mechanisms

Table 2 provides a comparative overview of payment interoperability mechanisms operating or proposed within ECOWAS, evaluating scope, interoperability level, and key limitations.

Table 2. Comparative Overview of Payment Interoperability Mechanisms in ECOWAS

Mechanism / Initiative	Geographic Scope	Interoperability Level	Key Limitation
Bilateral Provider Agreements	Specific corridors between paired providers	Provider-to-provider connectivity for select transaction types	Poor scalability; inconsistent user experience; exponential complexity as corridors multiply
Ghana Mobile Money Interoperability	Domestic (Ghana only)	Full domestic interoperability across mobile money providers	No cross-border functionality; excludes bank-to-mobile integration; geographically isolated
UEMOA Domestic Interoperability	Selected UEMOA member states	Domestic mobile money interoperability in some CFA zone countries	Incomplete within UEMOA; excludes anglophone ECOWAS members; limited cross-border settlement
Nigeria NIBSS Platform	Domestic (Nigeria only)	Comprehensive bank–fintech domestic interoperability	Isolated from regional ecosystem; regulatory barriers impede external linkage
PAPSS (Pan-African Payment and Settlement System)	Continental (all African countries)	Comprehensive multi-currency, multi-channel cross-border interoperability	Regulatory heterogeneity barriers; incomplete country participation; central bank coordination complexity
Correspondent Banking	Global but operationally inefficient for intra-ECOWAS corridors	Limited, intermediary-dependent interoperability	High costs; multi-day settlement; opacity; inaccessible to non-bank payment service providers

Note. Table synthesizes findings from Malaguti et al. (2011), IMF (2023), Ruhamya et al. (2025), and Mensah (2024). NIBSS = Nigeria Inter-Bank Settlement System; PAPSS = Pan-African Payment and Settlement System; UEMOA = West African Economic and Monetary Union.

The comparison demonstrates that existing interoperability mechanisms remain fragmented, with successful domestic initiatives failing to extend across borders. PAPSS offers the most architecturally comprehensive solution, yet faces implementation barriers that extend beyond technical integration into policy harmonization and institutional coordination. The continued dominance of correspondent banking as the default mechanism for many cross-border ECOWAS transactions reflects the slow pace of infrastructure modernization and the persistence of legacy institutional arrangements (Malaguti et al., 2011; IMF, 2023).

Data-Driven Product Innovation as a Catalyst for Reducing Payment Friction

Transaction Analytics for Failure Prediction and Prevention

Digital payment systems generate granular transaction data encompassing sender and recipient characteristics, transaction amounts, routing paths, success/failure outcomes, and error codes. Systematic analysis enables identification of failure patterns and prediction of success probabilities before transactions are initiated (Weerawarna & Miah, 2023). Machine learning models trained on historical transaction data can predict which transactions face elevated failure risk based on corridor, amount, time of day, and user profile, enabling real-time routing optimization and proactive liquidity rebalancing that reduces the incidence of failure attributable to constraint imbalances. Weerawarna and Miah (2023) demonstrate that real-time decision support systems for remittance management can substantially enhance cross-border payment success rates. By analyzing historical patterns, current system performance metrics, and external factors such as foreign exchange volatility, these systems optimize routing decisions, predict transaction timing, and provide users with transparent success probability estimates. Such capabilities transform payment systems from reactive failure-handling mechanisms into proactive success-optimization platforms, a qualitative shift in the user value proposition that is achievable within existing regulatory and infrastructure constraints, making data-driven approaches particularly valuable during the period before structural interoperability reforms are fully implemented.

User Behavior Analytics and Personalized Product Design

Understanding user behavior patterns, preferences, and pain points enables design of payment products tailored to specific segments (Ozili, 2023). Transaction data analysis reveals distinct user archetypes, frequent small-value remitters, occasional large-value traders, cross-border merchants, each exhibiting unique needs and friction sensitivities. Seck-Sarr (2024) shows that mobile money providers achieving superior adoption outcomes are those that successfully tailor products to local contexts, a finding that

extends naturally to cross-border payment product differentiation: low-cost instant remittances for migrant workers; trade settlement solutions with integrated foreign exchange hedging for SME merchants; and savings-linked transfer products for diaspora investment. Analytics on user abandonment patterns, identifying where users initiate but fail to complete transactions, reveal specific friction sources such as complex verification requirements, unclear fee structures, or inadequate real-time status communication. Addressing these friction points through iterative design improvements can substantially increase completion rates at marginal cost. Konte and Tetteh's (2023) finding that mobile money's productivity impact is maximized when services are matched to specific enterprise financial management needs reinforces the value of segmentation-driven product design.

Dynamic Pricing, Liquidity Optimization, and Fraud Prevention

Data analytics enables dynamic pricing strategies that balance user affordability with provider sustainability (Malaguti et al., 2011). Machine learning models predicting corridor-level transaction flows enable proactive liquidity rebalancing, reducing liquidity-driven failure rates while simultaneously lowering the capital tied up in prefunding arrangements (Weerawarna & Miah, 2023). Algorithmic foreign exchange risk management reduces costs that would otherwise be passed to users through wider spreads, while transparent, competitive pricing builds user trust and differentiates providers in competitive markets (IMF, 2023). Cross-border payments face elevated fraud risks attributable to multi-jurisdictional transaction complexity and cross-border identity verification challenges (Ruhamya et al., 2025). Machine learning-based fraud detection systems identify transaction anomalies in real time, enabling intervention while minimizing false positives that create friction for legitimate users. Sethupathy (2024) demonstrates that blockchain-tethered payment architectures provide cryptographic security and transaction transparency that builds user trust without prohibitive processing overhead, a design principle relevant to ECOWAS contexts where trust deficits remain a documented adoption barrier (Aker & Carroll, 2022).

Ecosystem Data Sharing and Collaborative Innovation

Realizing the full potential of data-driven innovation requires ecosystem-level data sharing among payment service providers, regulators, and technology partners (Mensah, 2024). Aggregated, anonymized transaction data can inform infrastructure investment decisions, regulatory policy development, and identification of systemic friction points that individual providers cannot address in isolation. Khaki et al. (2022) demonstrate that fintech adoption in African countries is significantly influenced by regulatory quality and digital infrastructure, underscoring the importance of proactive public-sector engagement in shaping enabling environments for data-driven innovation. Public-sector-led instant payment systems can serve as neutral data aggregators generating system-wide insights regarding transaction patterns and failure modes, simultaneously informing public policy and private sector innovation while maintaining appropriate privacy governance (Mensah, 2024).

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Policy Implications and Strategic Recommendations

The analytical findings of the preceding sections converge on a set of policy implications demanding coordinated action across regulatory harmonization, infrastructure investment, innovation enablement, and institutional capacity building.

Regulatory Harmonization. ECOWAS member states should adopt a harmonized regulatory framework establishing common licensing standards, capital requirements, and operational regulations for payment service providers, enabling regional licensing through mutual recognition processes (Ruhamya et al., 2025). Simultaneously, AML/CFT frameworks should be harmonized using risk-based proportionality, with divergent customer due diligence requirements replaced by mutual recognition arrangements that reduce onboarding friction without compromising financial integrity (Foerster, 2022). Graduated liberalization of foreign exchange regimes for payment transactions, beginning with elevated thresholds for documentation-free transfers, should be pursued as a coordinated policy objective (Malaguti et al., 2011).

Infrastructure Investment and Technical Standardization. ECOWAS member states should prioritize PAPSS connectivity through a phased rollout beginning with early adopters, with technical integration accompanied by regulatory reforms addressing identified barriers (Ruhamya et al., 2025). National payment systems require investments in redundancy, disaster recovery, and network reliability, with priority given to border regions where cross-border payment demand is highest (Mensah, 2024). Adoption of ISO 20022 messaging standards should be mandated regionally to ensure interoperability and reduce integration costs for new entrants.

Innovation Enablement. Coordinated regulatory sandbox frameworks should enable controlled testing of innovative payment solutions across multiple jurisdictions simultaneously, reducing barriers for data-driven fintech solutions (Ozili, 2023). Frameworks for ecosystem-level data sharing should be established, enabling aggregated, anonymized transaction insights to inform infrastructure investment and regulatory policy while protecting user privacy (Mensah, 2024). Regulatory frameworks should explicitly encourage collaboration among banks, mobile network operators, and fintech companies to leverage complementary capabilities (Mas, 2021).

Digital Identity and Capacity Building. A regional digital identity framework enabling mutual recognition of identity credentials across member states, with inclusive design for populations lacking formal documentation, would directly address one of the most persistent structural exclusion mechanisms in current payment systems (Aker, 2023). Central banks and payment system regulators require enhanced technical capacity encompassing cybersecurity, data analytics, and emerging

technology literacy; regional training programs and knowledge-sharing platforms can build collective capacity efficiently (Ruhamya et al., 2025).

Monitoring and Adaptive Management. Regional payment system monitoring infrastructure tracking transaction volumes, success rates, costs, and user satisfaction should be established with publicly reported indicators, enabling evidence-based policy adjustment and transparent accountability for integration commitments (Mensah, 2024). Regulatory frameworks should incorporate adaptive review mechanisms enabling timely adjustment to emerging technological developments without requiring full legislative cycles.

Conclusion

Cross-border digital payment friction in ECOWAS is a multidimensional structural problem whose resolution requires simultaneous interventions across technical, regulatory, operational, and behavioral dimensions. This paper has developed an analytical typology of friction and failure modes, critically evaluated interoperability architectures, and examined how data-driven product innovation can complement architectural solutions to reduce payment failures and costs. The typology reveals that technical infrastructure limitations, regulatory fragmentation, liquidity management challenges, and user experience deficiencies compound in ways that elevate failure rates and suppress adoption across all user segments. No single intervention, whether technical or regulatory, is sufficient to address the full friction landscape, underscoring the need for coordinated, multi-domain reform strategies. The analysis of interoperability mechanisms reveals a fragmented landscape in which successful domestic initiatives have not extended across borders, while PAPSS, the most architecturally comprehensive solution, confronts significant regulatory and institutional implementation barriers (Ruhamya et al., 2025). The critical insight is that the path to PAPSS operationalization runs through regulatory reform as much as technical integration.

Data-driven product innovation offers a complementary pathway, enabling failure prediction, liquidity optimization, personalized product design, and trust-building within existing constraints (Weerawarna & Miah, 2023; Sethupathy, 2024). The proliferation of digital payment platforms generates data assets that, when analyzed systematically, yield friction-reduction opportunities that can be pursued by individual providers without waiting for ecosystem-level structural reforms. However, realizing the full potential of data-driven approaches ultimately requires ecosystem data sharing frameworks, analytical capabilities, and governance structures that only coordinated public-private action can establish (Mensah, 2024). The broader context of AfCFTA implementation lends urgency to payment system integration: the vision of a unified continental market depends fundamentally on efficient financial infrastructure, and ECOWAS is uniquely positioned to demonstrate that regional integration in Africa can deliver measurable gains for citizens and enterprises. Efficient payment systems enable small traders to access regional markets, facilitate remittance flows that support household welfare, and

reduce transaction costs that disproportionately burden low-income populations (Doto et al., 2025; Konte & Tetteh, 2023). Achieving this vision requires sustained political commitment, institutional capacity, stakeholder collaboration, and adaptive management responsive to evolving technologies and user needs.

Limitations include reliance on published literature rather than proprietary transaction data, which constrains the granularity of empirical claims regarding specific failure rates; no reliable regional data on cross-border payment failure rates is publicly available for ECOWAS. Future research should employ mixed methods combining quantitative transaction data analysis with qualitative investigation of user experiences and institutional dynamics, and track PAPSS implementation outcomes empirically as the system scales. Investigation of how emerging technologies, central bank digital currencies, artificial intelligence-driven routing, and decentralized finance protocols, interact with ECOWAS's specific regulatory and infrastructure context represents a productive frontier for subsequent scholarship.

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