



# Interoperable Payment Platforms as a Tool for Enhancing the Resilience of the Digital Economy

Vladimir Ulyanov

Bachelor's degree, Azerbaijan state oil and industry university, Baku, Azerbaijan

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## ABSTRACT

The article examines the role of interoperable payment platforms in strengthening the resilience of the digital economy. It analyzes architectural, regulatory, and operational compatibility as the foundation for integrating fiat and cryptocurrency-based payment mechanisms. It is emphasized that technical interoperability is complemented by UX/UI design, which enables adaptation to various asset types and levels of digital literacy. Particular attention is paid to institutional and macroeconomic effects such as financial risk diversification, reduced dependency on centralized providers, and the expansion of financial inclusion. The study highlights that the future development of digital payment infrastructure is associated with the adoption of open, flexible, and compatible solutions capable of maintaining settlement stability amid global digitalization and technological fragmentation.

**Key words :** Interoperability, payment platforms, digital economy, cryptocurrencies, UX design, digital inclusion.

## 1. INTRODUCTION

The modern digital economy is characterized by a high degree of dependence on payment infrastructure, which ensures the continuity of financial flows amid globalization, the expansion of e-commerce, and the proliferation of decentralized financial technologies. However, existing payment systems often rely on centralized operators and exhibit limited capacity for scalable adaptation to emerging forms of digital assets, including cryptocurrencies. This creates risks of fragmentation within the settlement environment, reduces the level of financial inclusion, and constrains the ability of countries and companies to implement effective digital strategies. In this context, the development of interoperable payment platforms capable of enabling end-to-end compatibility between traditional and decentralized payment mechanisms becomes particularly important, as it contributes to the resilience of the financial ecosystem.

The aim of this study is to analyze the architectural, user-centric, and institutional parameters of interoperable payment platforms, as well as their potential to enhance the sustainability of the digital economy.

## 2. TRENDS AND BARRIERS IN THE TRANSFORMATION OF PAYMENT INFRASTRUCTURE

Modern payment infrastructure is a complex, multi-layered system that contains both established traditional settlement systems and rapidly evolving digital technologies. The past two decades have seen a continued user and business preference shift toward electronic payment solutions [1]. Standardized bank transfers, card networks, and instant payment systems have become an integral part of global financial circulation. At the same time, the role of mobile and online platforms – offering real-time transfers and transaction automation – continues to expand. According to research by McKinsey, approximately 9 out of 10 consumers in the USA and Europe now use some form of electronic payment. The most common method is online purchasing via a brand's official website (figure 1).

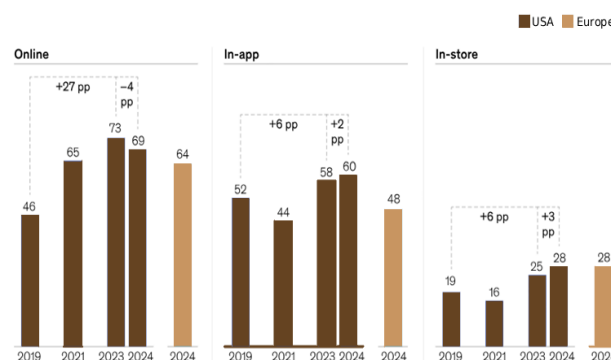
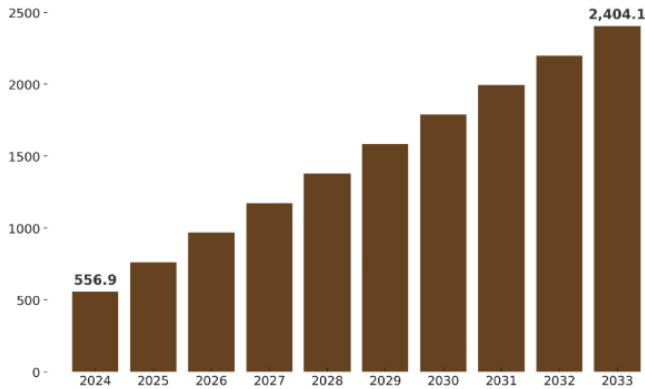


Figure 1: Digital payments by category, pp of respondents [2]

In parallel with the digitalization of fiat-based payments, a new paradigm of decentralized payment technologies is coming to the forefront. Increasing adoption of cryptocurrencies, the rise of stablecoins, and the implementation of central bank digital currency (CBDC) initiatives are setting the stage for the inclusion of alternative value into one payment infrastructure. eMarketer predicts that by 2026, 20 % of cryptocurrency

owners will make payments using it, up from 14.2 % in 2024, suggesting a move toward the real-world use case. Meanwhile, data from Grand View Research estimates the global market for cryptocurrency payment applications at \$556.9 million in 2024 (figure 2).



**Figure 2:** Growth of the global market for cryptocurrency payment applications, million dollars [3]

However, despite the high level of technological maturity demonstrated by certain solutions, their large-scale implementation faces a range of institutional and technological barriers [4]. On the one hand, the absence of unified interaction standards among payment systems limits interoperability. Use of conflicting data transmission protocols, format differences in messages (incompatibility between ISO 20022 and SWIFT MT), and failure of close coordination among supervising authorities hinder the development of an integrated settlement landscape. Legal limitations associated with cryptocurrency regulation and cross-border activities, however, exacerbate regulatory fragmentation, making it difficult to develop global payment solutions.

At the user experience level, these issues are translated into having to work with multiple tools and platforms for different types of payments, which end up slowing down the settlements process. Also, without secure interfaces and trust that is built, numerous users, particularly in developing countries, still have issues once they transition to digital payment. Thus, the payment infrastructure of today remains technically fragmented functionally and needs strategic efforts towards technical and institutional integration.

### 3. DIMENSIONS OF PAYMENT SYSTEM INTEROPERABILITY

As a transnational digital environment becomes a daily fact for businesses, institutions, and users alike, the ability of various payment systems to interact with each other to create a single smooth system acquires systemic significance. Interoperability, in this context, encompasses not only payment message delivery at a technical level but also regulation concordance and operational synchronization among and between institutions and jurisdictional domains.

Technical interoperability involves the use of compatible data exchange protocols, shared message structures, and architectural solutions that provide for the seamless integration of different payment systems (table 1).

**Table 1:** Components of technical interoperability in payment systems [5, 6]

Interoperability component	Examples / standards	Purpose
Data exchange protocols	ISO 20022, HTTP(S), WebSockets.	Transmission of payment information between systems.
Payment message formats	SWIFT MT, ISO 20022 XML.	Standardization of data structure in payments.
Architectural solutions	Service-oriented architecture (SOA), microservices.	Flexible scalability and modular integration
Interaction interfaces (APIs)	Open APIs, Open Banking, PSD2.	Integration with financial institutions and fintech platforms.
Security mechanisms	TLS/SSL, PKI, two-factor authentication.	Data protection and transaction authentication.

Thus, technical interoperability forms the foundation for seamless data exchange between payment systems. Although, its effective realization is out of the question without the concomitant adaptation of regulatory conditions ensuring the validity and legal safeguarding of cross-border operations.

Regulatory compatibility encompasses the harmonization of requirements related to anti-money laundering (AML), customer identification (KYC), personal data protection, taxation, and cross-border fund transfers. Misalignment in any of the foregoing can often result in delay or incapacity to complete settlement among members from various countries. One of the strategic directions for overcoming these barriers is the development of international cooperation at the level of central banks and payment regulators, as exemplified by the BIS Project Nexus. This initiative, led by the Bank for International Settlements, aims to standardize the method of connecting instant payment systems (IPS) to one another. Instead of establishing separate integrations for every new country, a payment system operator can create a single connection to the Nexus platform [7]. Up to 2025, the third stage of the project – such as issuance of a detailed technical specification – has been completed, the operating company Nexus Global Payments has been established, and a pilot launch is scheduled for 2026.

In a broader sense, interoperability requires not only technical protocol alignment but also of the operational parameters that underpin interactions among systems. Operational interoperability includes aligning workflow synchronization, settlement timelines, clearing, and resolution of commitments. This becomes particularly important in the context of payment

system interactions across different time zones, liquidity regimes, and collateral requirements for settlement (table 2).

**Table 2:** Components of operational interoperability in payment systems [8, 9]

Component	Description	Purpose
<b>Workflow synchronization</b>	Alignment of transaction processing stages between systems.	Reduction of delays; prevention of discrepancies in payment statuses.
<b>Settlement time windows</b>	Accounting for differences in settlement schedules (cut-off times) across jurisdictions.	Ensuring timely clearing and settlement.
<b>Clearing procedures</b>	Standardization of mechanisms for calculating mutual obligations.	Reducing operational risks and simplifying the processing of high-volume payment flows.
<b>Obligation settlement</b>	Use of harmonized settlement methods (gross/net settlement); ensuring liquidity.	Securing finality of settlements and managing default risks.
<b>Time zone and liquidity regime coordination</b>	Coordination of settlement processes between systems in different time zones and regulatory frameworks.	Enhancing reliability in managing liquidity and synchronizing settlement activities across systems.

An example of operational interoperability implementation is the Visa+ initiative, aimed at enabling compatibility between various P2P services within the United States without the need for traditional banking credentials. Through this solution, users can make instant transfers between applications such as Venmo and PayPal using only a phone number or unique identifier. Visa+ architecture integrates a shared payment router, an identity verification system, and a settlement mechanism within a multi-platform ecosystem. The Visa mobile application is at the center of user engagement with an adaptive User Experience design that features a minimalistic interface, personalized notifications, and embedded repeat payment flows that reduce steps in frequent transactions. The company reported Visa Direct platform enabling such transfers cleared approximately 10 billion transactions during 2024 with endpoints of over 11 billion. The cross-border P2P payments segment grew over 80 % year-over-year. Payment infrastructure interoperability is hence a multi-faceted issue that can be resolved by architectural standardization, regulatory harmonization, and operational alignment concurrently. End-to-end equivalence across heterogeneous payment systems not only makes transactions more effective and faster but also less dependent on intimidating settlement channels, thereby strengthening the digital economy as a whole.

#### 4. UX/UI DESIGN IN HYBRID PAYMENT INTERFACES

Interoperable platforms that support multiple types of assets and settlement logics require UX/UI design that simultaneously ensures intuitive navigation, security, and adaptability to varying levels of digital literacy among users. Designing such interfaces goes beyond traditional banking – it now encompasses multi-asset applications that combine the functionality of a wallet, a crypto platform, and a P2P service within a unified environment.

User behavior in hybrid payment systems is shaped by trust, visual predictability, and a sense of control over the transaction. The novelty of digital forms of money, especially decentralized ones, demands that interfaces actively reduce uncertainty: visual security indicators (e.g., lock icons, 2FA, biometric authentication), action confirmations, and contextual assistance become critical elements in establishing perceived reliability. Successful interfaces do not persuade the user through explanation, but rather foster confidence through coherent structure, transparent transactional logic, and the absence of cognitive overload.

In response to the challenges of multi-currency environments and decentralization, a set of solutions has emerged that aims to enhance the adaptability and inclusiveness of payment interfaces (table 3).

**Table 3:** Technological and interface solutions supporting adaptability and inclusion in payment platforms [10, 11]

Interface solution	Purpose	Functional advantages
Responsive layout design	Standardizes user experience across device types.	Enables cross-platform accessibility: mobile, desktop, terminal environments.
Interface and data localization	Automatic adaptation to language, currency, and cultural norms.	Enhances global accessibility and reduces cognitive friction.
Context-sensitive tooltips and user guidance	Supports users with low digital proficiency.	Minimizes operational errors and lowers entry barriers.
Security parameter visualization	Explicit representation of transaction protection mechanisms.	Strengthens user trust in digital payment environments.
Integration of biometric authentication and MFA	Streamlines access while ensuring strong identity verification.	Balances usability with enhanced security protocols.
Color-coded differentiation of currencies/types	Provides visual hierarchy and categorization of operations.	Facilitates quick identification of asset class and transaction scenario.

These solutions reflect the systematization of interface design principles in a multi-currency environment, among which the following can be highlighted:

- unification of interaction scenarios regardless of asset type;
- visual differentiation of currencies and operations;
- contextual validation of transactional parameters;
- adaptive accessibility across devices and regions;
- minimization of cognitive load through predictable architecture and intelligent prompts.

Thus, UX/UI design in hybrid payment systems serves as a mediator between complex technical architecture and the user's everyday financial practice. In the context of settlement fragmentation, it functions not merely as an interface but as a space of trust, inclusion, and transformation of digital financial behavior.

## 5. MACROECONOMIC AND INSTITUTIONAL EFFECTS OF INTEGRATING CRYPTOCURRENCIES INTO PAYMENT SYSTEMS

Inclusion of cryptocurrency instruments in national and international payment systems has a multi-aspect impact on the financial infrastructure, extending beyond technological innovation to shape important macroeconomic indicators – such as stability of financial flows, risk structure, access to payment infrastructure, and degree of dependence on foreign settlement intermediaries.

The most significant effect may be the higher robustness of financial flows with the development of new channels of settlement. Cryptocurrencies, due to their strong level of independence and insusceptibility to external interruptions, can maintain continuity in transactions even under sanctions or financial exclusion. The decentralized architecture of blockchain systems further reduces the likelihood of systemic failure that typically follows centralized nodes of settlement. This holds especially for countries that have limited access to foreign financial markets, where conduits based on cryptocurrencies serve as a failsafe for sustaining external economic activity.

Another implication is risk diversification, achieved through restricting the vital dependence on individual payment providers, correspondent banks, or currencies. With multiple settlement channels that are accessible – both fiat and crypto-asset channels – participants in payment ecosystems can redistribute financial flows as a response to regulatory, logistical, and currency risks. This will increase the demand for institutional flexibility and for payment infrastructure that can absorb higher levels of volatility and legal risk. Hybrid payment platforms that support digital and traditional assets become instruments of strategic resilience not only for individual market actors but for the financial system as a whole.

Great importance is laid on financial inclusion, especially in developing economies where millions remain beyond the formal banking framework. Decentralized payment solutions –

requiring no bank accounts and operable via mobile devices – open access to basic financial services for broad segments of the population. Examples include crypto wallets with low transaction costs, instant transfer systems embedded in messaging applications, and smart contract-based P2P payment mechanisms. In unstable currency nations, cryptocurrencies also have the ability to function as a store of value, mitigating in part the institutional weaknesses of local monetary systems.

Hence, the macroeconomic impact of cryptocurrency usage is not merely in the technology enhancement of the payment system, but also in building a more diversified, equitable, and resilient finance system that can adapt to the scenarios of world turmoil. This requires a rethinking of institutional strategies for regulation of payment systems, the development of cross-border coordination, and promotion of architectural approaches based on openness, interoperability, and technological neutrality principles. At the same time, the growing presence of cryptocurrencies in important financial infrastructure necessitates a coherent assessment of risks attached to it – e.g., regulatory arbitrage, cyber risks, illicit finance flows, and possible fragmentation on the systemic side – before mass adoption.

## 6. CONCLUSION

The analysis demonstrates that interoperable payment platforms are becoming central facilitators of constructing a secure digital economy. Their ability to harmonize fiat and cryptocurrency-based settlement systems into an architecturally consistent framework provides for continuity of financial flows, decentralizes dependence on centralized settlement providers, and ensures ease of adaptation to regulatory fragmentation. The creation of these platforms involves considering a broad variety of factors – from technical compatibility and regulation coordination to interface design, which affects user habits and accessibility of access. In the context of transforming payment logic, multi-currency UX design becomes particularly important, as it aims to reduce cognitive load, build trust in transactions, and ensure the universality of user experience.

From a macroeconomic perspective, the integration of digital assets and hybrid settlement channels contributes to the diversification of financial risks, the expansion of payment infrastructure, and the reduction of entry barriers into the digital economy – especially in developing countries. At the same time, the sustainable development of these platforms requires coordination among public institutions, fintech developers, and international organizations. It can be assumed that the future of payment systems lies in open, adaptive, and interoperable platforms, where the user interface serves as the point of synthesis between complex financial architecture and everyday user needs.

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