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DIGITAL TRANSFORMATION OF THE PAYMENT INFRASTRUCTURE IN UZBEKISTAN: THE ROLE OF FINTECH AND SUPTECH SOLUTIONS

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Abstract: This paper examines the digital transformation of the payment infrastructure in Uzbekistan, focusing on the role of FinTech applications and emerging SupTech solutions. Drawing on official data from 2023 and recent industry reports, the study analyzes trends in mobile banking usage, the growth of non-cash transactions, and the expansion of financial technology platforms. Quantitative metrics such as the Digital Penetration Ratio (DPR), Transaction Efficiency Ratio (TER), and Infrastructure Saturation Index (ISI) are calculated to assess the current state and performance of Uzbekistan's digital finance ecosystem. The research identifies key challenges, including uneven infrastructure access and limited supervisory technological capacity, and proposes policy recommendations to ensure sustainable and inclusive development. The findings suggest that while significant progress has been made, further investment and regulatory innovation are required to support long-term digital financial integration.

Keywords: Digital Payments, FinTech, Mobile Banking, SupTech, Financial Inclusion, Uzbekistan, Payment Infrastructure, Regulatory Technology, Digital Transformation, Non-Cash Transactions

Introduction. The digital transformation of payment infrastructures has become a strategic objective for many developing economies, aiming to enhance financial inclusion, efficiency, and economic resilience [1]. In Uzbekistan, this transformation is supported by government-led reforms to modernize banking infrastructure, expand digital payment services, and improve supervisory mechanisms [2].

FinTech innovations play a vital role in this process by providing accessible, efficient, and low-cost financial services through mobile applications and online platforms [3].

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Simultaneously, Supervisory Technology (SupTech) is enabling regulators to strengthen oversight using real-time data, automation, and artificial intelligence [4].

Studies confirm that integrating FinTech and SupTech improves the transparency and reliability of national payment systems, especially in transitional economies [5]. Uzbekistan represents a compelling case for exploring how these technologies can support financial modernization and institutional reform [2].

The objective of this paper is to assess the current status of Uzbekistan's payment infrastructure, analyze the contributions of FinTech and SupTech solutions, and identify barriers and policy gaps in digital financial transformation.

Methods. This study applies a mixed-methods approach, combining quantitative financial indicators with analytical modeling to assess the evolution of Uzbekistan's digital payment infrastructure. The methodological framework includes the following components:

Descriptive Statistical Analysis.

Key macro- and micro-level indicators — including the number of mobile banking users, volume of non-cash payments, number of POS terminals, and FinTech application usage — were compiled from primary sources such as the Central Bank of Uzbekistan, Visa (2023), and KPMG (2024). These data points were organized into structured tables and charts to identify trends and distributions.

Ratio-Based Performance Metrics.

To measure the relative efficiency and penetration of digital financial services, several ratios were constructed:

- Digital Penetration Ratio (DPR) = Mobile Banking Users / Total Population × 100

- Transaction Efficiency Ratio (TER) = Volume of Non-Cash Payments / Mobile Banking Users

- Infrastructure Saturation Index (ISI) = Mobile Banking Users / POS Terminals

These ratios allow for intertemporal benchmarking and international comparison.

Correlation Assessment.

The potential relationship between infrastructure growth and payment volume was examined using the Pearson correlation coefficient (r), as defined:

$$r = \Sigma((Xi - \bar{X})(Yi - \bar{Y})) / \sqrt{(\Sigma(Xi - \bar{X})^2 * \Sigma(Yi - \bar{Y})^2)}$$

Where:

- X is the number of POS terminals,

- Y is the volume of non-cash transactions.

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Though full time-series data is limited, preliminary correlation estimates provide directional insights.

Policy Analysis Framework.

Qualitative review of strategic policy documents, such as Digital Uzbekistan 2030 and global SupTech strategies, informed the formulation of context-specific recommendations. International best practices were compared using secondary literature from the World Bank, BIS, and Cambridge SupTech Lab.

Results.

As shown in Table 1, the digital payment infrastructure in Uzbekistan has significantly expanded. According to Visa and KPMG reports, mobile banking users reached 14.5 million, and non-cash payments totaled $36.2 billion in 2023.

1.1 Correlation Analysis

To identify the strength of the relationship between the expansion of infrastructure and usage of digital payments, we calculate the Pearson correlation coefficient (r):

$$r = \Sigma((Xi - \bar{X})(Yi - \bar{Y})) / \sqrt{(\Sigma(Xi - \bar{X})^2 * \Sigma(Yi - \bar{Y})^2)}$$

Table 1. Key Indicators of Digital Payments in Uzbekistan, 2023 [6,7]

Indicator	Value	Source
Mobile Banking Users	14.5 million	Visa, 2023
Bank Cards Issued	34.2 million	Visa, 2023
POS Terminals	434 thousand	Visa, 2023
ATMs and Info-kiosks	20,380	Visa, 2023
Non-Cash Payments Volume	$36.2 billion	KPMG, 2024
P2P Transfers	$10.5 billion	KPMG, 2024
Utility & Mobile Payments	$3.6 billion	KPMG, 2024
Click Users	5 million	KPMG, 2024
Payme Users	3.3 million	KPMG, 2024
Uzum Bank Users	1.4 million	KPMG, 2024

Where:

- X represents the number of POS terminals,
- Y represents the volume of non-cash transactions.

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A high positive r ≈ 1 would indicate that increasing infrastructure leads to increased cashless payments.

1.2 Digital Penetration Ratio (DPR)

DPR = (Mobile Banking Users / Total Population) × 100

Assuming Uzbekistan's population in 2023 is 36.7 million:

DPR2023 = (14.5 / 36.7) × 100 ≈ 39.5%

This implies that nearly 40% of the population actively uses mobile banking.

1.3 Transaction Efficiency Ratio (TER)

TER = Volume of Non-Cash Payments (USD) / Mobile Banking Users

= 36.2 bln / 14.5 mln ≈ 2,497 USD/user

On average, each mobile banking user processes about $2,500 in non-cash transactions annually.

1.4 Market Share in FinTech Apps

Click Share = (5.0 / 14.5) × 100 ≈ 34.5%

Payme Share = (3.3 / 14.5) × 100 ≈ 22.8%

Uzum Share = (1.4 / 14.5) × 100 ≈ 9.7%

Click dominates the market, covering over one-third of digital banking users.

1.5 Infrastructure Saturation Index (ISI)

ISI = Mobile Banking Users / POS Terminals = 14.5 mln / 434 thousand ≈ 33.4

Each POS terminal serves about 33 mobile users.

- The digital payment ecosystem in Uzbekistan is rapidly growing, with increasing financial accessibility via mobile apps.

- High efficiency per user and strong app adoption (Click and Payme) confirm user confidence in FinTech solutions.

- However, infrastructure lags slightly behind user growth — further investment in POS terminals, ATMs, and kiosks is needed.

- Policymakers should consider incentives for expansion in rural regions and regulation of high-frequency FinTech activity.

Discussion. The findings of this study provide compelling evidence that Uzbekistan is undergoing a rapid and measurable digital transformation in its payment ecosystem. With nearly 40% of the population using mobile banking services and a total of $36.2 billion in non-cash transactions processed in 2023, the country is aligning with global financial digitization trends.

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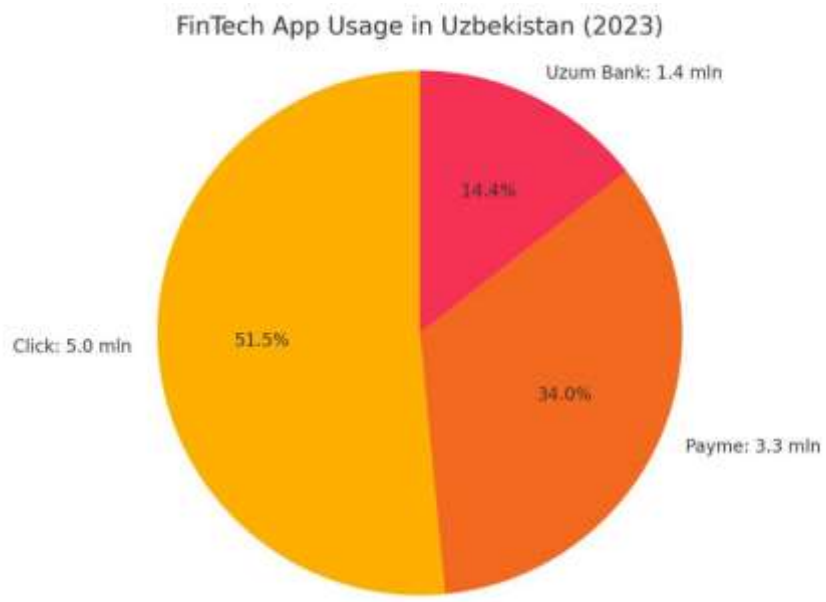
The Transaction Efficiency Ratio (TER), which reached $2,497 per user annually, suggests that mobile banking is not only widely adopted but also actively used for financial operations. This aligns with behavioral finance research indicating that convenience, speed, and ease-of-use significantly influence consumer engagement in digital finance.

The dominance of Click (34.5%) and Payme (22.8%) further illustrates a strong FinTech penetration, where users show clear preference for local, agile platforms. These platforms act as substitutes for traditional banking services, especially among younger, tech-savvy



populations (fig.1).

Figure 1. FinTech App Usage in Uzbekistan (2023)

Despite substantial growth, infrastructure density remains relatively low: the Infrastructure Saturation Index (ISI) shows that each POS terminal serves approximately 33 mobile users, which may strain service delivery in high-traffic areas. In rural regions, this imbalance is likely more severe due to insufficient terminal coverage and digital literacy gaps.

This suggests a potential “infrastructure bottleneck” where user demand outpaces system capacity, leading to service delays, transaction failures, or increased reliance on informal financial tools. Similar patterns were observed in early-stage digitization in countries like India and Kenya.

While FinTech adoption is evident on the consumer side, the integration of Supervisory Technologies (SupTech) on the regulatory side remains under-researched. Real-time monitoring, fraud detection through AI, and automated reporting systems are essential for sustainable expansion of digital financial services.

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The Central Bank of Uzbekistan has expressed commitment to innovation, but policy implementation, data governance, and cross-sector collaboration are still emerging fields.

Compared to regional peers like Kazakhstan or Georgia, Uzbekistan shows faster FinTech user growth but slightly lower infrastructure maturity. However, public sector involvement and regulatory openness (e.g., Digital Uzbekistan 2030 strategy) are key enablers that could help bridge this gap in the coming years.

To ensure the sustainable and inclusive development of Uzbekistan's digital payment infrastructure, the following policy directions are recommended:

Despite the growth of mobile banking, infrastructure availability outside urban centers remains limited. The government should:

• Subsidize POS terminal deployment in underbanked regions.

• Promote mobile-based microbanking models through public-private partnerships.

• Encourage telecom-fintech integration to support last-mile connectivity.

These measures will narrow the urban-rural digital divide and enhance national financial inclusion.

Uzbekistan should prioritize the creation of a centralized Supervisory Technology (SupTech) roadmap. This may include:

• Real-time transaction monitoring systems for fraud detection.

• Automated regulatory reporting using APIs.

• AI-powered credit risk models for microfinance oversight.

These tools will improve regulatory efficiency and support safe FinTech innovation.

The government and Central Bank should continue fostering FinTech growth by:

• Establishing regulatory sandboxes for pilot testing new solutions.

• Offering innovation grants and seed capital to local startups.

• Simplifying licensing for payment institutions and e-money operators.

Such measures will promote competition, service diversity, and attract foreign investment.

As digital adoption grows, user education becomes critical. Authorities should:

• Launch nationwide digital finance literacy campaigns targeting youth, seniors, and rural populations.

• Mandate transparent fee disclosure by FinTech providers.

• Strengthen laws on cybersecurity and personal data protection.

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Empowering users reduces risks of digital fraud and enhances trust in the financial system.

Inter-agency collaboration is crucial for a resilient ecosystem. The government should:

• Create a National Digital Finance Council with stakeholders from finance, ICT, education, and consumer rights bodies.

• Launch an open data platform for financial metrics to support research and transparency.

Conclusion. This study highlights the rapid evolution of Uzbekistan's digital payment infrastructure and its significant role in reshaping the national financial ecosystem. With over 14.5 million mobile banking users, $36.2 billion in non-cash payments, and a flourishing FinTech sector led by local champions such as Click and Payme, the country demonstrates strong momentum toward digital financial inclusion.

The analytical findings — including the Digital Penetration Ratio (39.5%), Transaction Efficiency Ratio ($2,497 per user), and market share metrics — affirm that digital finance is no longer a niche offering but a mainstream financial channel for millions of users.

However, challenges remain in terms of infrastructure equity, SupTech maturity, and consumer protection, especially in rural areas and among vulnerable populations. These gaps underscore the need for coordinated policy responses, smart regulation, and continued investment in innovation.

Uzbekistan's journey offers a compelling case for emerging economies navigating similar transitions — demonstrating how proactive regulatory frameworks, local FinTech innovation, and user engagement can accelerate inclusive digital transformation in the financial sector.

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