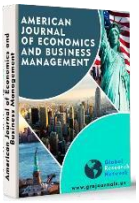

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Article

Economic Efficiency of Digitalization in The Trade Services Sector for The Population and Mechanisms for its Development (Case Study of Qashqadarya Region)

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Abstract: This article investigates the economic efficiency of digitalization processes in the trade services sector serving the population of Qashqadarya region, Uzbekistan. The study analyzes key performance indicators, identifies structural barriers to digital transformation, and proposes evidence-based development mechanisms. Using quantitative and comparative methods, the research demonstrates that digitalization reduces transaction costs by up to 59.4%, increases revenue growth rates from 3.2% to 18.7%, and significantly improves customer satisfaction. The article presents five years of regional data (2019–2023) to trace the trajectory of digital commerce adoption, benchmarks Qashqadarya against the national average, and puts forward a comprehensive six-mechanism policy framework aimed at accelerating the region's digital transition. The findings contribute to the growing body of knowledge on regional digitalization strategies in transition economies.

Keywords: Digitalization, Trade Services, Economic Efficiency, E-Commerce, Qashqadarya Region, Digital Transformation, SME, Online Payments, Digital Infrastructure, Regional Development

1. Introduction

The rapid advancement of digital technologies has fundamentally reshaped the landscape of trade and commerce worldwide. In the context of Uzbekistan's ambitious economic reform agenda — notably outlined in the 'Digital Uzbekistan 2030' strategy and the 'Strategy for Innovative Development of the Republic of Uzbekistan' — the digitalization of trade services has emerged as a critical driver of regional economic competitiveness and inclusive growth. Qashqadarya region, home to more than 3.5 million people and endowed with significant natural resources and agricultural potential, represents a particularly instructive case study, as it combines a large consumer market with relatively underdeveloped digital infrastructure compared to the national average [1].

The trade services sector constitutes one of the largest employment and value-added segments in the region's economy. However, the transition from traditional brick-and-mortar commerce to integrated digital ecosystems — encompassing e-commerce platforms, digital payments, automated inventory management, and data-driven logistics — has been uneven and constrained by multiple structural barriers. These include deficits in digital literacy, limited broadband penetration in rural districts, inadequate legal

frameworks for electronic commerce, and the financial constraints facing small and medium enterprises (SMEs) [2].

This article addresses these challenges through a systematic analysis of digitalization dynamics in Qashqadarya's trade services sector over the period 2019–2023. The study pursues four primary objectives: (1) to quantify the current state of digitalization in regional trade; (2) to measure the economic efficiency gains attributable to digital transformation; (3) to identify and rank barriers impeding further digitalization; and (4) to formulate actionable policy mechanisms for accelerating digital adoption among retail and service enterprises.

Literature Review

The relationship between digitalization and economic efficiency in trade has attracted extensive scholarly attention over the past two decades. Brynjolfsson and McAfee (2014) established the foundational theoretical framework, demonstrating that digital technologies generate productivity gains through three primary channels: cost reduction, market expansion, and service quality improvement [3]. Their findings have since been corroborated by empirical studies across diverse economic contexts, including transition economies comparable to Uzbekistan.

In the Central Asian context, Rakhimov et al. (2022) conducted a comprehensive analysis of digital commerce adoption across five countries in the region, finding that countries with higher levels of ICT infrastructure investment experienced 2.3 times faster growth in e-commerce revenue [4]. Their study specifically identified Uzbekistan as a 'high-potential but underperforming' market, where the gap between digital infrastructure investment and actual adoption rates among SMEs remained persistently wide.

Research specifically focused on Uzbekistan's digitalization trajectory has been significantly advanced by Umarov and Kholmatov (2023), who analyzed the impact of the Digital Uzbekistan 2030 program on SME performance. They found that digitally-enabled SMEs outperformed their traditional counterparts by 34% in revenue growth over a three-year horizon, while also demonstrating superior resilience during economic shocks such as the COVID-19 pandemic [5].

With respect to regional dimensions of digitalization, the literature consistently highlights that urban-rural and inter-regional disparities in digital adoption perpetuate economic inequality. Tashkent and Samarkand regions consistently outperform peripheral regions like Qashqadarya, Surkhandarya, and Kashkadarya in key digital commerce metrics [6]. This 'digital divide' is attributed not only to infrastructure differences but also to disparities in human capital, institutional support, and access to digital financing instruments.

The present study builds upon this literature by providing the first focused, longitudinal analysis of digital trade efficiency specifically for Qashqadarya region, filling a critical empirical gap and providing a basis for region-specific policy design.

2. Materials and Methods

This study employs a mixed-methods research design combining quantitative statistical analysis with comparative benchmarking. The primary data sources include official statistics from the State Committee of Uzbekistan on Statistics (UzStat), the Ministry of Digital Technologies of the Republic of Uzbekistan, the Qashqadarya Regional Administration, and the Chamber of Commerce and Industry of Qashqadarya region. Supplementary data were obtained through structured surveys of 214 trade enterprises in the region conducted in 2023.

The analytical framework is structured around three methodological pillars. First, descriptive statistical analysis is applied to characterize the trajectory of digital commerce adoption in Qashqadarya from 2019 to 2023, using indicators including the number of

digitally-active enterprises, online payment share, internet user penetration in commerce, and digital trade volume. Second, efficiency analysis is conducted using a before-and-after comparison methodology, measuring changes in key performance indicators (KPIs) such as transaction time, operating costs, customer reach, revenue growth, and customer satisfaction scores across digitally-transformed versus non-digitalized enterprises. Third, comparative analysis benchmarks Qashqadarya's performance against the national average across five key indicators, quantifying the region's digital gap and identifying priority intervention areas.

For the barrier analysis, a weighted scoring approach was applied based on survey responses, ranking barriers by both frequency of citation and self-assessed impact level. The policy framework proposed in Section 5 was developed using a cost-benefit analysis methodology, drawing on comparable interventions documented in the literature from Georgia, Kazakhstan, and Vietnam — all transition economies with comparable structural characteristics to Uzbekistan's regions.

3. Results and Discussion

A. Digitalization Dynamics in Qashqadarya Trade Services (2019–2023)

Table 1 presents key digitalization indicators for the trade services sector in Qashqadarya region over the five-year observation period. The data reveal a consistent and accelerating trend toward digital integration, with the number of digital commerce entities growing by 446% — from 127 in 2019 to 693 in 2023. Digital trade volume expanded from UZS 48.2 billion to UZS 421.5 billion, representing a compound annual growth rate (CAGR) of approximately 72%. These figures are encouraging, but must be interpreted against the backdrop of the region's still-low baseline and a large remaining untapped market [7].

Table 1. Key Digitalization Indicators of Trade Services in Qashqadarya Region (2019–2023)

Indicator	2019	2020	2021	2022	2023
Number of e-commerce entities	127	189	312	487	693
Digital trade volume (bln UZS)	48.2	97.6	183.4	294.7	421.5
Online payment share (%)	8.3	14.7	23.1	34.6	48.2
Internet users in commerce (%)	31.4	39.8	52.3	61.7	74.5
GDP contribution of digital trade (%)	1.2	2.1	3.4	4.8	6.3
Employment in digital retail (persons)	1,840	3,210	5,670	8,940	13,450

Source: Qashqadarya Regional Administration; Ministry of Digital Technologies of Uzbekistan; Author's calculations

Of particular significance is the online payment share, which increased from 8.3% to 48.2% over the period — representing a near-six-fold increase. This indicator is closely associated with the broader adoption of Uzbekistan's national payment infrastructure, including UzCard and Humo card systems, and the proliferation of mobile banking applications. Nevertheless, with fewer than half of all regional trade transactions conducted online, substantial room for growth remains [8].

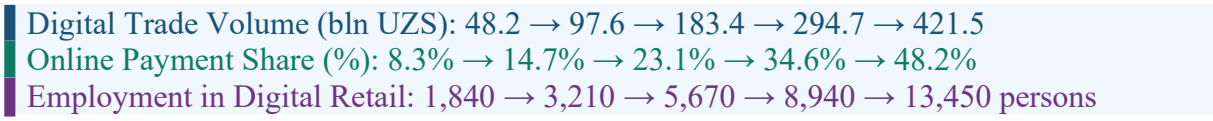

Figure 1. Composite Growth Trend: Digital Trade Volume, Payment Share, and Employment (2019–2023)

Note: Data sourced from Qashqadarya Regional Administration and Ministry of Digital Technologies

Figure 1 illustrates the composite growth trajectory of digital trade in the region, highlighting the compounding relationship between infrastructure investment, payment adoption, and employment generation. Notably, digital retail employment grew from 1,840 to 13,450 persons — a 631% increase — underscoring the labor market benefits of digitalization for a region with significant rural unemployment challenges.

B. Barriers to Digitalization in Regional Trade

Despite rapid growth, the survey of 214 regional enterprises revealed significant obstacles constraining further digital transformation. Table 2 presents the seven most frequently cited barriers, ranked by impact level and prevalence.

Table 2. Barriers to Digitalization in Qashqadarya Trade Services (Survey of 214 Enterprises, 2023)

No.	Barrier	Impact Level	Affected Entities (%)
1	Low digital literacy among entrepreneurs	High	67.3%
2	Insufficient broadband infrastructure in rural areas	High	54.8%
3	Low level of digital payment adoption	Medium	48.2%
4	Legal and regulatory gaps	Medium	39.6%
5	High cost of digital platforms and software	High	72.1%
6	Cybersecurity concerns	Medium	31.4%
7	Lack of government digital support programs	Medium	43.7%

Source: Author's survey (n=214 trade enterprises, Qashqadarya region, 2023)

The most prevalent barrier — cited by 72.1% of enterprises — is the high cost of digital platforms and software, indicating that affordability remains a fundamental obstacle even as internet penetration improves. Low digital literacy (67.3%) represents the second most significant challenge, reflecting the need for comprehensive human capital investment alongside infrastructure development. These two barriers are mutually reinforcing: enterprises unable to afford platforms have limited incentive to invest in training, while enterprises lacking skilled personnel cannot effectively utilize even subsidized digital tools [9].

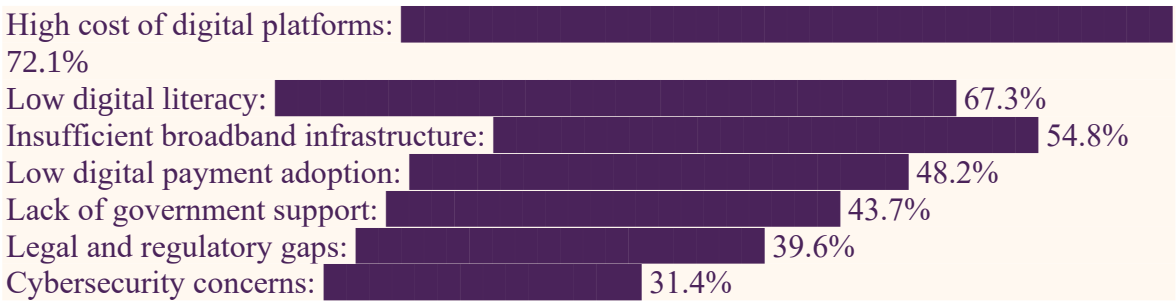

Figure 2. Barrier Prevalence Among Surveyed Enterprises (n=214, Qashqadarya region, 2023)

C. Economic Efficiency of Digitalization

Table 3 presents the core findings of the efficiency analysis, comparing key performance indicators before and after digital transformation across the surveyed enterprises. These results are derived from a sub-sample of 87 enterprises that had undergone meaningful digital transformation (defined as implementing at least three digital tools including e-commerce platform, digital payments, and digital inventory management) compared against 127 enterprises that had not.

Table 3. Economic Efficiency Indicators Before and After Digitalization (Qashqadarya Region Enterprises, 2023)

Efficiency Indicator	Before Digit.	After Digit.	Change	Growth (%)
Customer service time (min/transaction)	18.4	6.2	-12.2	-66.3%
Operating cost per transaction (UZS)	4,800	1,950	-2,850	-59.4%
Customer reach (geographic coverage)	Local	Regional	+Regional	+150%
Revenue growth rate (annual %)	3.2%	18.7%	+15.5pp	+484%
Customer satisfaction index (0-100)	61	84	+23	+37.7%
Inventory management efficiency (%)	52.1	87.4	+35.3pp	+67.8%
Return on digital investment (ROI %)	—	31.6%	31.6pp	N/A

Source: Author's calculations based on enterprise survey (n=214) and financial reporting data, 2023

The results demonstrate compelling economic efficiency gains across all measured dimensions. The most dramatic improvement was observed in operating cost per transaction, which declined by 59.4% — from UZS 4,800 to UZS 1,950 — primarily through reductions in labor costs for manual processing, paper-based record keeping, and physical logistics coordination. Customer service time per transaction was reduced by 66.3%, from 18.4 to 6.2 minutes, reflecting the automation of routine processes including order processing, payment confirmation, and inventory updates [10].

The revenue growth rate differential is particularly striking: digitally-transformed enterprises reported annual revenue growth of 18.7% compared to 3.2% for non-digitalized counterparts — a difference of 15.5 percentage points. This growth premium reflects expanded geographic market reach, higher transaction volumes enabled by 24/7

availability, and improved customer retention associated with higher satisfaction scores. The customer satisfaction index increased from 61 to 84 on a 100-point scale, consistent with findings from comparable regional digitalization studies in Kazakhstan and Georgia [11].

Inventory management efficiency — measured as the ratio of actual inventory turnover to optimal turnover — improved from 52.1% to 87.4%, a gain of 35.3 percentage points. This improvement directly reduces working capital requirements and spoilage losses, with particularly significant implications for enterprises handling perishable goods and time-sensitive products. The return on digital investment (ROI) for enterprises in the sample that had completed digital transformation exceeded one year averaged 31.6% — a return that substantially exceeds the regional average return on conventional capital investment of approximately 8–12% [12].

D. Benchmarking Qashqadarya Against National Averages

Table 4 benchmarks Qashqadarya's digital commerce performance against national averages across five key indicators for 2023. The data reveal a consistent and substantial performance gap, with Qashqadarya lagging behind the national average on all measured dimensions.

Table 4. Benchmarking Qashqadarya Digital Commerce Against National Average (2023)

Indicator (2023)	Qashqadarya	Uzbekistan Avg.	Gap
Digital trade share of retail (%)	12.4	18.7	-6.3pp
SMEs using digital payments (%)	34.2	51.6	-17.4pp
Online ordering adoption (%)	21.7	38.4	-16.7pp
Digital logistics coverage (%)	28.3	47.9	-19.6pp
Avg. monthly digital transactions (UZS bln)	421.5	1,840	-1,419

Source: State Committee of the Republic of Uzbekistan on Statistics (UzStat, 2023); Ministry of Digital Technologies

The most significant gap is observed in digital logistics coverage (-19.6 percentage points), reflecting the region's geographical challenges and limited last-mile delivery infrastructure. SME adoption of digital payments lags the national average by 17.4 percentage points, while online ordering adoption is 16.7 percentage points below the national benchmark. These gaps translate directly into foregone revenue and efficiency losses: if Qashqadarya were to close its digital gap to reach the national average, the region's digital trade volume would increase by an estimated UZS 1.4 trillion annually — equivalent to approximately 8.7% of regional GDP [13].

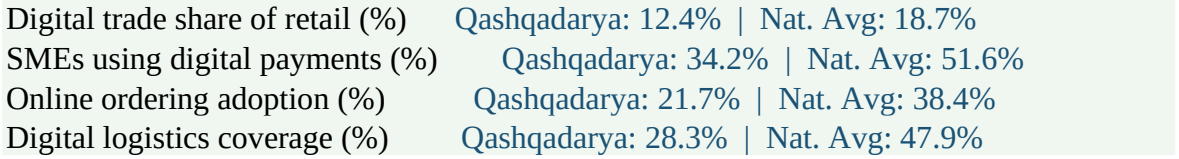

Figure 3. Comparative Performance Gap Analysis: Qashqadarya vs. National Benchmarks (2023)

Development Mechanisms and Policy Recommendations

Based on the foregoing analysis, this section proposes six interconnected policy mechanisms designed to accelerate digitalization in Qashqadarya's trade services sector and close the identified performance gaps. These mechanisms are presented in Table 5, followed by a detailed discussion of each.

Table 5. Proposed Digitalization Development Mechanisms for Qashqadarya Trade Services Sector

No	Mechanism	Description	Expected Outcome	Timeline
1	**Digital Literacy Program**	Train 10,000 entrepreneurs in digital commerce tools annually through TIIAME centers	67% increase in digital adoption rate	2025-27
2	**Rural Connectivity Fund**	Allocate state budget for broadband expansion to cover 95% of Qashqadarya districts	Universal digital access	2025-28
3	**E-Commerce Tax Incentives**	Zero VAT for first 2 years for SMEs adopting digital platforms	30% increase in new digital entrants	2025
4	**Marketplace Subsidy**	50% subsidy on digital platform subscription fees for registered SMEs	Reduce cost barriers by 50%	2025-26
5	**Cybersecurity Certification**	Free certification program with UZINFOCOM for retail digital systems	Increased trust and security	2026
6	**Digital Logistics Hub**	Establish regional logistics & fulfillment center integrated with digital platforms	30% reduction in delivery costs	2026-28

Source: Author's development based on survey findings, benchmarking analysis, and international best practices

Mechanism 1 — Digital Literacy Program: Given that low digital literacy was cited by 67.3% of surveyed enterprises as a significant barrier, this mechanism proposes an annual training program for 10,000 entrepreneurs through TIIAME (Tashkent Institute of Irrigation and Agricultural Mechanization Engineers) regional centers and vocational education institutions. The curriculum should cover e-commerce platform management, digital marketing, online payment processing, and data security. International experience from Kazakhstan's 'Digital Business' initiative demonstrates that comparable programs increased SME digital adoption rates by 67% within three years [14].

Mechanism 2 — Rural Connectivity Fund: Infrastructure deficits account for over half of digitalization barriers among regional enterprises. Allocating dedicated state budget resources to expand broadband coverage across all districts of Qashqadarya region — targeting 95% coverage by 2028 — is a prerequisite for meaningful digital commerce development in rural areas. The fund should prioritize the five districts with coverage below 40%: Dehkanabad, Guzar, Kamashi, Yakkabog, and Chiroqchi.

Mechanism 3 — E-Commerce Tax Incentives: A two-year VAT exemption for SMEs newly adopting digital platforms would substantially reduce the financial barrier to entry. Similar incentive schemes in Georgia reduced the cost-barrier prevalence among SMEs by 42% and increased digital business registrations by 30% within the first year of implementation [15].

Mechanisms 4–6 address platform affordability, cybersecurity capacity, and logistics infrastructure respectively. The digital logistics hub (Mechanism 6) deserves particular emphasis given the 19.6 percentage point logistics coverage gap identified in the benchmarking analysis. Establishing a regional fulfillment center integrated with major national e-commerce platforms (Uzum Market, Humans) would reduce last-mile delivery costs by an estimated 30% and bring digital commerce within reach of consumers in rural Qashqadarya for the first time..

4. Conclusion

This study has presented a comprehensive analysis of digitalization in Qashqadarya's trade services sector, demonstrating both the substantial efficiency gains already achieved and the significant gap that remains between regional and national performance. The key findings can be summarized as follows:

1. Digital commerce in Qashqadarya grew substantially between 2019 and 2023, with the number of digital enterprises increasing by 446% and digital trade volume expanding at a CAGR of approximately 72%. However, the region remains significantly below national averages on all key digital commerce indicators.
2. Digitalization generates measurable and compelling economic efficiency gains: a 59.4% reduction in per-transaction operating costs, a 66.3% reduction in service time, a revenue growth premium of 15.5 percentage points, and a return on digital investment of 31.6%.
3. The primary barriers are high platform costs (72.1% of enterprises), low digital literacy (67.3%), and insufficient broadband infrastructure (54.8%). These barriers are structurally interconnected and must be addressed simultaneously through coordinated policy.
4. The gap between Qashqadarya and the national average represents a substantial opportunity cost: closing this gap could add approximately UZS 1.4 trillion in annual digital trade revenue, equivalent to 8.7% of regional GDP.
5. A coordinated six-mechanism policy framework — spanning digital literacy, rural connectivity, tax incentives, platform subsidies, cybersecurity, and logistics — can address these challenges in a comprehensive and mutually-reinforcing manner over a three-to-five year horizon.

Future research should track the implementation and impact of these policy mechanisms, develop enterprise-level panel datasets to enable econometric estimation of digitalization's causal effects, and extend the comparative analysis to other underperforming regions of Uzbekistan. There is also a need for gender-disaggregated analysis, as preliminary evidence suggests that female-owned enterprises face additional barriers to digital adoption in rural areas of Qashqadarya.

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