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DIGITAL SILK ROAD AND UZBEKISTAN: INFRASTRUCTURE UPGRADING, INCLUSION, AND DIGITAL SERVICES GROWTH

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Abstract. This article explores how the Digital Silk Road agenda aligns with Uzbekistan’s national digital transformation efforts. It focuses on telecom infrastructure upgrades, territorial inclusion, and expanding digital service markets. The study aims to clarify how infrastructure investments connect to service sector growth and inclusive access, while offering practical policy suggestions for ongoing innovation. The methodology includes document and policy analysis, a descriptive-comparative review of official statistics and open data, and a framework mapping the pathway from infrastructure to services, human capital, and institutional trust. Results indicate that improvements in connectivity have boosted online service adoption, increased telecom output, and expanded digital access beyond major cities. However, these advances also pose governance challenges related to competition, cybersecurity, and data management. The article recommends targeted last-mile investments, pro-competition access policies, enhanced cyber and data governance, and digital logistics solutions to promote trade and reduce regional digital disparities.

Keywords: Digital Silk Road; digital infrastructure; fiber optic networks; internet penetration; regional inclusion; digital services; data governance; digital logistics.

RAQAMLI IPAK YO'LI VA O'ZBEKISTON: INFRATUZILMANI MODERNIZATSIYALASHTIRISH, INKLYUZIYA VA RAQAMLI XIZMATLARNING O'SISHI

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Annotatsiya. Mazkur maqola Raqamli Ipak yo'li tashabbusining O'zbekistonning milliy raqamli transformatsiya strategiyasi bilan o'zaro uyg'unligini tahlil qiladi. Tadqiqotning dolzarbligi shundaki, raqamli infratuzilmaga yo'naltirilgan investitsiyalar nafaqat telekommunikatsiya tarmoqlarini modernizatsiya qiladi, balki hududiy

tengsizliklarni kamaytirish, raqamli xizmatlar bozorini kengaytirish va iqtisodiy inkluzivlikni kuchaytirishda ham muhim omil bo'lib xizmat qiladi. Shu nuqtai nazardan, maqolaning maqsadi infratuzilma yangilanishi, xizmatlar sektori o'sishi va aholi uchun inkluziv raqamli kirish o'rtasidagi bog'liqlikni aniqlash hamda ushbu yo'nalishdagi siyosiy ustuvorliklarni belgilashdan iborat.

Tadqiqot metodologiyasi hujjatlar va normativ-huquqiy asoslarni tahlil qilish, rasmiy statistika hamda ochiq ma'lumotlarni tavsifiy-qiyosiy ko'rib chiqish, shuningdek, infratuzilmadan raqamli xizmatlar, inson kapitali va institutsional ishonchgacha bo'lgan uzviy zanjirni konseptual xaritalash usullariga asoslanadi. Bunday yondashuv raqamli rivojlanish jarayonini faqat texnik o'zgarish sifatida emas, balki ko'p bosqichli institutsional-iqtisodiy transformatsiya sifatida baholash imkonini beradi.

Tahlil natijalari shuni ko'rsatadiki, telekommunikatsiya infratuzilmasining kengayishi va sifat jihatidan yaxshilanishi internet qamrovini oshirgan, onlayn xizmatlardan foydalanish ko'lamini kengaytirgan hamda telekommunikatsiya va raqamli xizmatlar sektorida iqtisodiy faollikni kuchaytirgan. Ayniqsa, raqamli kirish imkoniyatlarining yirik shaharlardan tashqari hududlarda ham ortib borayotgani hududiy inkluziyaning muhim belgisi sifatida namoyon bo'ladi. Shu bilan birga, mazkur ijobiy siljishlar raqobat muhiti, ma'lumotlarni boshqarish sifati, kiberxavfsizlik, platformaviy bog'liqlik va institutsional muvofiqlashtirish bilan bog'liq yangi xatarlarni ham yuzaga chiqarmoqda.

Kalit so'zlar: Raqamli Ipak yo'li; raqamli infratuzilma; optik tolali tarmoqlar; internet qamrovi; hududiy inkluziya; raqamli xizmatlar; ma'lumotlar boshqaruvi; raqamli logistika.

ЦИФРОВОЙ ШЁЛКОВЫЙ ПУТЬ И УЗБЕКИСТАН: МОДЕРНИЗАЦИЯ ИНФРАСТРУКТУРЫ, ИНКЛЮЗИЯ И РОСТ ЦИФРОВЫХ УСЛУГ

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Аннотация. В статье анализируется, каким образом инициатива Цифрового Шёлкового пути соотносится с национальной стратегией цифровой трансформации Узбекистана. Актуальность исследования обусловлена тем, что инвестиции в цифровую инфраструктуру не только способствуют модернизации телекоммуникационных сетей, но и выступают важным фактором сокращения территориальных диспропорций, расширения рынков цифровых услуг и укрепления экономической инклюзивности. В этой связи цель статьи состоит в выявлении взаимосвязи между обновлением инфраструктуры, ростом сектора услуг и обеспечением инклюзивного цифрового доступа, а также в определении ключевых направлений государственной политики в данной сфере.

Методология исследования основана на анализе документов и нормативно-правовой базы, описательно-сравнительном обзоре официальной статистики и открытых данных, а также на концептуальном картировании цепочки взаимосвязей от инфраструктуры к цифровым услугам, человеческому капиталу и институциональному доверию. Такой подход позволяет рассматривать цифровое развитие не только как технологическое обновление, но и как многоуровневую институционально-экономическую трансформацию.

Результаты анализа показывают, что расширение и качественное улучшение телекоммуникационной инфраструктуры способствовали росту охвата интернетом, увеличению использования онлайн-услуг и усилению экономической активности в телекоммуникационном и цифровом сервисном секторах. Особенно важно, что расширение цифрового доступа происходит не только в крупных городах, но и за их пределами, что свидетельствует о нарастании территориальной инклюзии. Вместе с тем выявленные положительные сдвиги сопровождаются новыми вызовами, связанными с конкурентной средой, качеством управления данными, кибербезопасностью, платформенной зависимостью и институциональной координацией.

Ключевые слова: Цифровой Шёлковый путь; цифровая инфраструктура; волоконно-оптические сети; интернет-проникновение; региональная инклюзия; цифровые услуги; управление данными; цифровая логистика.

Introduction

Digital technologies have become a crucial driver of productivity, market transformation, and government capacity in both developed and emerging economies. From the perspective of general-purpose technologies (GPTs), connectivity infrastructure such as fiber-optic networks, international bandwidth, mobile broadband coverage, and data center capacity act as essential capital stock that lowers transaction costs, broadens market access, and speeds up the spread of innovation. However, infrastructure alone rarely ensures inclusive and sustainable progress. The digital dividend's impact relies on complementary factors: human capital (digital and STEM skills), regulatory quality (competition and open access), data governance (privacy and cross-border flows), and cybersecurity readiness (Schiller, 2008; McKinsey & Company, 2020). When these complements are weak, digitalization can exacerbate spatial and social inequalities rather than reduce them.

In Uzbekistan, the national digital strategy has progressed through the Digital Uzbekistan-2030 agenda and associated reforms. Meanwhile, the Digital Silk Road, expanding within the wider Belt and Road Initiative, adds a transnational dimension involving connectivity, standards, digital trade, and logistics. For Central Asian countries, the Digital Silk Road presents both opportunities and risks: it can attract investments, facilitate technology transfer, strengthen regional corridors, and boost service exports, but it may also increase dependence on certain standards or suppliers and heighten cyber and data security risks (Ghiasy & Krishnamurthy, 2021). In this context, Uzbekistan's recent improvements in connectivity serve as a valuable case for examining how infrastructure investments can enhance service-sector growth and promote inclusion within institutional limits.

This paper addresses three research questions:

(1) How have Uzbekistan's connectivity and adoption indicators evolved in the most recent period covered by official and internationally comparable sources?

(2) Through which mechanisms do these changes affect regional inclusion and innovation-oriented entrepreneurship?

(3) What policy instruments can enhance benefits while mitigating market power, governance, and cybersecurity risks?

Research methodology and Data

The study uses a mixed-method approach. First, it conducts a structured review of strategic and regulatory documents that shape Uzbekistan’s digital agenda, including telecom development programs and Uzbekistan-2030 strategic targets for fiber expansion and fixed broadband coverage (Lex.uz, 2024). Second, it applies descriptive-comparative analysis to updated quantitative indicators from: (a) official government communications on end-2022 telecom infrastructure (international bandwidth, fiber length, broadband ports, settlement coverage); (b) internationally comparable adoption indicators for early 2025 from DataReportal; and (c) official statistics on telecom service output in the first half of 2024 and 2025 (Stat.uz). Third, it employs a conceptual modeling approach to connect these indicators through an ‘infrastructure → services → inclusion and innovation’ pathway.

Theoretically, the mechanism is outlined as follows. Infrastructure upgrades improve connectivity quality (speed, reliability, latency) and lower access costs, which encourages the adoption of online services (e-commerce, fintech, GovTech, distance learning, and telemedicine). Growing service adoption expands the digital services market and motivates firms to invest in digital business models and platform-based activities. The final outcomes—productivity gains, new jobs, and regional inclusion depend on additional factors: competition policy and open access to infrastructure, skills development, and trust institutions such as data governance and cybersecurity.

Limitations should be acknowledged. Some indicators are published as snapshots rather than annual time series, and subnational microdata are not consistently available from open sources. Additionally, service output in nominal currency terms may reflect both real growth and price effects. Therefore, the paper emphasizes a coherent interpretation of trends and policy implications and proposes econometric extensions for future research using regional panels.

Results

Results are shown in three sections: (i) infrastructure upgrades, (ii) adoption and user base growth, and (iii) telecom services market output. Table 1 summarizes the main indicators, and Figures 1-3 offer a concise visual overview.

Table 1

Key Indicators for Infrastructure and Market Activity in Uzbekistan

Indicator	Date	Value	Notes (source)
International bandwidth (capacity)	2023	3200 Gbps	https://digital.gov.uz/oz
Total fiber-optic network length	2023	170 000 km	https://digital.gov.uz/oz
Broadband access ports	2023	4.6 million	https://digital.gov.uz/oz
Settlements covered by high-speed communications	2023	80%	https://digital.gov.uz/oz
Mobile coverage	2023	99%	https://digital.gov.uz/oz
Mobile subscribers	2023	31.3 million	https://digital.gov.uz/oz
Mobile broadband coverage	2023	98%	https://digital.gov.uz/oz
Base stations	2023	54 200	https://digital.gov.uz/oz
Internet users	2025	32.7 million	DataReportal (Digital 2025)
Internet penetration	2025	89.0%	DataReportal (Digital 2025)
Mobile connections	2025	33.9 million	DataReportal (Digital 2025)
Social media identities	2025	11.7 million	DataReportal (Digital 2025)
Telecom services output	2024	9.8 trillion UZS	https://stat.uz/uz/
Telecom services output	2025	11.9 trillion UZS	https://stat.uz/uz/
Strategic target: fibre-optic network length	2024	260 000 km	Uzbekistan-2030 strategy https://lex.uz/uz/
Strategic target: fixed broadband coverage	2024	90%	Uzbekistan-2030 strategy https://lex.uz/uz/

Infrastructure upgrades in 2023 show significant progress in international bandwidth, expanding fiber networks, and increasing broadband access ports. These improvements are economically vital: greater international capacity lessens congestion and latency for cross-border traffic, while fiber expansion offers faster, more reliable last-mile connections. Enhanced mobile coverage and base-station deployment also boost digital service availability in areas where fixed broadband expansion is costly. Overall, these upgrades reflect an infrastructure-first strategy aimed at reducing connectivity barriers for households, businesses, and public services.

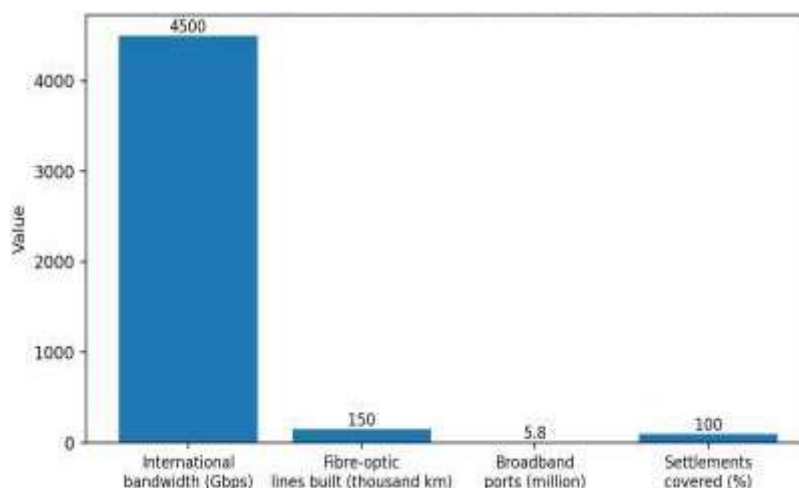


Figure 1. Key telecom infrastructure indicators/targets (2023)

Expansion of adoption and user base continues. 2025 metrics show high internet penetration and a large number of mobile connections. From a platform-economy standpoint, this enhances network effects: a larger connected user base increases potential demand for e-commerce, digital payments, and online services, reinforcing the business case for private investment in digital platforms. However, adoption metrics do not automatically imply inclusion; effective use depends on affordability, digital skills, and trust (including cybersecurity and privacy safeguards).

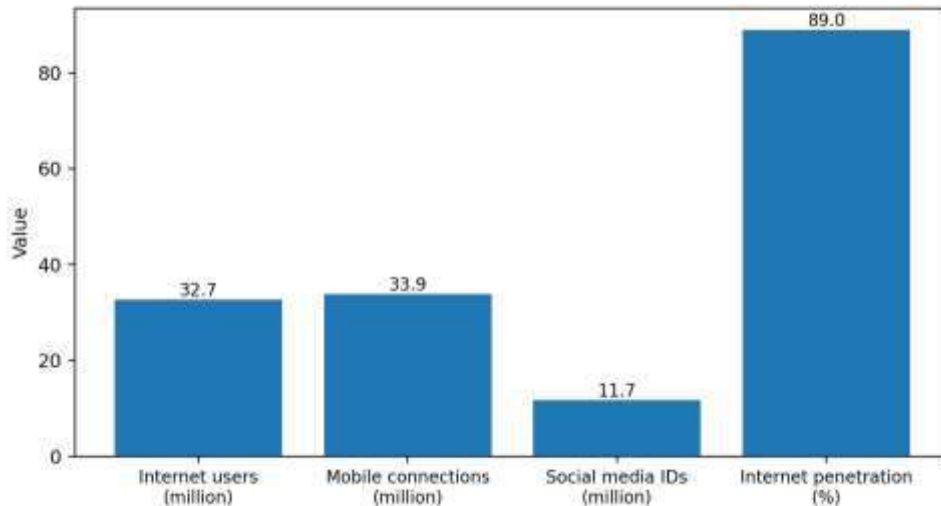


Figure 2. Digital adoption snapshot (2025)

Telecom services market output. Official statistics report growth in telecom services output from 2024 to 2025. This increase supports the idea that infrastructure investments drive the expansion of service markets, including broadband subscriptions, mobile data services, and business connectivity. The macroeconomic importance is twofold: (i) telecom services directly add value in the services sector; and (ii) they endorse productivity gains and better market access across other sectors such as trade, logistics, education, and finance.

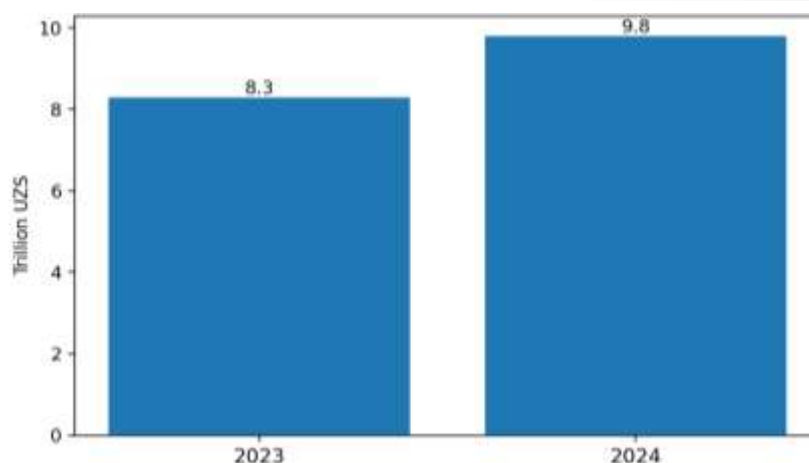


Figure 3. Telecom services output (2023–2024)

Discussion

The findings endorse a tripartite interpretation of the significance of the Digital Silk Road for Uzbekistan. Firstly, the transaction-cost channel: enhancements in connectivity diminish costs and improve the quality of information exchange, particularly for cross-border services and engagement in global digital platforms. Secondly, the market-expansion channel: greater adoption extends the market for digital services, thereby fostering innovation in fintech, e-commerce, GovTech, and business process outsourcing. Thirdly, the inclusion channel: improved coverage can reduce regional disparities in access to education, healthcare, and administrative services, consequently aiding in the development of human capital and augmenting labor-market participation beyond major urban centers.

Infrastructure-led digitalization can pose governance challenges. One major concern is market dominance if open-access rules are weak and wholesale backbone infrastructure access isn't transparently regulated. Cybersecurity and data management are also at risk: as user numbers and data volumes grow, so do the chances of fraud, breaches, and disruptions, which can damage trust and hinder adoption in high-value sectors like digital finance and cross-border e-commerce. Additionally, inclusion hinges on skills: digital literacy and STEM talent pipelines must match labor market needs; otherwise, increased digital consumption may not translate into productivity or employment gains.

The Uzbekistan-2030 strategy sets a clear, target-based framework focused on expanding fiber networks and fixed broadband coverage. The challenge lies in turning these targets into effective project selection, last-mile financing, and performance monitoring. International experience indicates that measurable service-quality KPIs (speed, latency, downtime), affordability metrics, and competition indicators (entry, switching costs) are essential to ensure that network expansion delivers widespread benefits. Moreover, diversifying supply chains and incorporating security-by-design requirements

in the procurement of network equipment can reduce dependency risks within the Digital Silk Road context.

Conclusion

This article examined the relationship between the Digital Silk Road agenda and Uzbekistan’s national digital transformation, using indicators and a clear conceptual framework. Evidence from 2023 and 2025 sources highlights significant progress in connectivity foundations and an expanding user base, along with growth in telecom services output. The analysis stresses that sustained benefits rely on complementarity: pro-competitive regulation, skills development, and strong cybersecurity. Data governance must advance alongside infrastructure investment. Future research should use regional panel datasets to estimate the causal effects of connectivity on productivity, firm performance, and labor outcomes across Uzbekistan’s regions.

Policy Recommendations

The results indicate that Uzbekistan’s current connectivity upgrades have been accompanied by a broadening user base and an expansion of telecom service output. At the same time, the findings highlight that infrastructure-led progress will not automatically translate into inclusive and productivity-enhancing results unless it is complemented by pro-competitive regulation, targeted last-mile instruments, stronger digital trust (cybersecurity and data governance), and capability-building policies. Building on these empirical patterns and the identified constraints, the following policy recommendations are proposed as implementable measures with clear monitoring anchors:

1) Last-mile financing and regional performance metrics.

To address spatial connectivity gaps, the policy shift should focus on last-mile delivery in low-density and hard-to-reach areas rather than intensifying the entire network. Using competitive PPP tenders and well-designed, targeted subsidies can be effective if they meet clear service-quality and affordability KPIs, such as minimum download/upload speeds, latency, uptime, and price-to-income ratios. To increase accountability and reduce information asymmetry, regulators should publish regional scorecards and mandate regular independent verification of KPI performance.

2) Open-access architecture and wholesale market regulation.

To prevent discriminatory pricing and lower barriers to entry, transparent wholesale access rules should be implemented for key network layers (backbone, backhaul, and last mile, where relevant). A clear regulatory framework for reference offers, cost-based or benchmarked pricing, and non-discrimination obligations can encourage competition while safeguarding investment incentives. When economically viable, infrastructure sharing (passive and, in some cases, active) should be promoted, provided that retail competition is maintained and consumer switching costs remain low.

3) Institutionalization of cybersecurity and data governance.

As connectivity and digital service usage expand, systemic cyber risks and data management challenges also grow; therefore, cybersecurity and data

governance must be considered vital complements to infrastructure investment. This includes increasing critical infrastructure security audits, strengthening national incident-response capabilities (such as rapid coordination protocols and information-sharing systems), and ensuring compliance with privacy and data-protection standards. Simultaneously, targeted digital trust initiatives like cyber hygiene training, SME toolkits, and awareness campaigns for households should be integrated to encourage adoption in high-value sectors such as digital finance and cross-border e-commerce.

4) Digital trade facilitation and logistics interoperability.

To convert connectivity improvements into tradable services and reduce trade costs, policy should focus on interoperable digital logistics solutions throughout the trade chain. Increasing e-documentation, real-time tracking, electronic queue systems, and customs interoperability can cut procedural delays, enhance predictability, and boost Uzbekistan’s competitiveness as a transit and service hub. Operationally, this demands harmonized data standards, secure cross-agency integration, and measurable process KPIs (e.g., clearance time, queue time, document-processing time) to assess impact.

5) Human capital deepening and innovation-ecosystem upgrading.

Infrastructure expansion must be paired with capability building to promote productivity and employment growth. TVET and university curricula should be aligned with the evolving digital labor market, including software, data, cybersecurity, cloud operations, and digital entrepreneurship, and should be supported by industry-linked certification pathways and hands-on learning. Regional innovation hubs should be expanded by combining grants, accelerators, mentoring, and export-focused programs for BPO/IT services. The impact of these efforts should be monitored using outcome indicators such as job placement, firm creation and survival, export revenues from digitally deliverable services, and regional participation rates.

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