THE ROLE OF TECHNOLOGY IN THE DEVELOPMENT OF CENTRAL ASIA

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Abstract: This article provides a broad overview of digital programs, policies, and innovation use in developing countries.

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Technology today defines the strength and development of nations, yet some developing countries still have a huge gap in their uses of digital tools, policies, and innovation. Specifically, for countries in Central Asia, a region that has historically been the center of trade and served as a bridge between East and West, digital modernization has become both a challenge and an opportunity. According to the surveys, citizens are increasingly aware of the gap between their regions and advanced economies, and the countries are slowly starting to place technology at the heart of development strategies, though with some limitations due to political and regional reasons. Understanding why it has been underdeveloped and what the young population of Central Asia can do to change this trajectory is essential to close the gaps.

In our survey, when participants (aged between 16-28) were asked to rate the level of technology in Uzbekistan, most placed it between 4 and 6 on a scale of 10, with only few rating it above 7. This sentiment can serve as a proxy for most Central Asian countries: while capitals such as Tashkent, Almaty, and Astana have modern to advanced digital services and expanding IT hubs, rural areas remain far behind. For example, The International Telecommunication Union has repeatedly noted the uneven spread of broadband access in the region, where mobile phones are widespread but fast internet and digital services are inconsistent; according to the World Bank, internet usage in Kazakhstan has reached around 90 percent, but in Tajikistan and Turkmenistan the figures remain far lower, often under 50 percent in rural areas. The survey results from Uzbek youth mirrors this uneven development: technology is seen as present, but far from fully modernized.

There are multiple reasons why Central Asia has not yet reached a high level of digital advancement. One factor is historical. Most Central Asian states only became independent in 1991, inheriting the Soviet-era infrastructure. Much of this equipment was outdated by the 2000s, and replacing entire communication and educational systems requires immense resources. Another reason is limited investment in research and innovation. For decades, economies in the region have depended on natural resources such as oil, gas, and cotton, leaving little incentive to spread into digital industries. The World Economic Forum ranks most Central Asian countries relatively low in innovation, largely because R&D spending remains only under 0.3 percent of GDP in many cases , compared to 2-3 percent in countries like South Korea.

Education is another critical barrier. While the region has a young and dynamic population, the quality of higher education in technology-related fields is still developing. Many universities lack up-to-date laboratories, advanced research facilities, and well-trained professors in computer science, artificial intelligence, and data engineering. As one respondent in the survey put it, "We don't have enough professors, and the ones who are good often leave." Talented engineers and IT specialists frequently move abroad, attracted by higher salaries and better opportunities. As a result, the region struggles to build a strong community of technologically-educated people.

Cultural and social mindsets also play a role. Some survey respondents described their societies as "old-fashioned," noting that older generations often view advanced technologies as unnecessary or even risky. Traditional attitudes sometimes slow down the adoption of new tools, especially in rural communities. Mostly developed countries are concentrated in a very dense area (Europe), and they have competition among them, unlike Central Asia, says one respondent, emphasizing the role of competition in technology. Furthermore, bureaucracy and regulatory uncertainty make it difficult for startups to thrive. Investors are cautious when intellectual property protection is weak or when policies can change suddenly. These structural barriers together explain why Central Asia has lagged behind in technological development.

Despite these challenges, the region is not standing still. In fact, over the past five years, Central Asian governments have launched ambitious projects to accelerate digital transformation. Uzbekistan has been particularly active. President Shavkat Mirziyoyev has made technology a cornerstone of his "Uzbekistan 2030" strategy. In a speech in 2024, he declared: "Without digital transformation, there will be no modernization of our economy. We must train one million leaders in artificial intelligence, create our own cloud technologies, and ensure that Uzbekistan becomes a regional hub of IT services." His government has already established more than 20 new data centers with a combined capacity of over 500 megawatts, while also digitizing hundreds of public services through the "Digital Government" platform. Between 2017 and 2024, the number of IT-exporting enterprises in Uzbekistan grew from 12 to over 650, showing concrete progress in building a new sector of the economy.

Alongside these state-driven reforms, several flagship projects are shaping the digital landscape of Uzbekistan. The "Digital Generation of Uzbekistan" program focuses on building a tech-savvy youth by introducing coding, robotics, and IT entrepreneurship into schools. The **IT Community of Uzbekistan**, with over 1,000 active volunteers, helps mentor young programmers, organize hackathons, and support regional tech initiatives. Efforts to close the gender gap are also visible through the "Women in Tech" initiative, which trains and empowers young women to enter IT professions. Innovative education projects like **School 21**—an international coding academy model—provide a new kind of peer-to-peer, project-based learning for programmers, making advanced training accessible without traditional professors. In addition, the **Digital.uz platform** serves as a national portal to unify e-government services, simplify business registration, and make public data more transparent. Together, these projects illustrate how Uzbekistan is not just planning digital reforms but actively building the infrastructure and communities that sustain them.

Kazakhstan has also positioned itself as a leader in Central Asia's digital revolution. The government's "Digital Kazakhstan 2025" program focuses on expanding e-government services, developing a digital economy, and improving digital literacy. The Astana Hub, a large

international technology park for IT startups, now hosts hundreds of companies from across the region. According to official reports, Kazakh IT exports reached $500 million in 2023, with strong growth in fintech and e-commerce. President Kassym-Jomart Tokayev has consistently emphasized the role of digitalization, stating in 2023: "Our future depends on technological progress. Kazakhstan must not remain a consumer of technologies; we must become producers and innovators." His call reflects a regional desire to shift from dependency to innovation.

Kyrgyzstan and Tajikistan, with fewer resources, have nonetheless pursued projects with international partners. The World Bank has supported broadband expansion in Kyrgyzstan, while the Asian Development Bank has financed digital education initiatives in Tajikistan. These projects, though smaller in scale, help reduce inequality between rural and urban areas. In Turkmenistan, where information access has traditionally been restricted, efforts have begun to modernize telecommunications infrastructure, although the pace remains slower compared to neighbors.

Regional cooperation is also emerging as a new driver of technological development. Uzbekistan has proposed the creation of an "Intellectual Silk Road," a platform for Central Asian states to exchange technological expertise and collaborate with partners like China and the European Union. This initiative includes exploring satellite internet to cover remote desert and mountain regions, which could dramatically improve access for underserved populations. Similarly, partnerships with South Korea and Singapore are helping train Central Asian specialists in advanced IT and e-governance.

Beyond government initiatives, technology is transforming society in more subtle ways. Social media use is expanding rapidly, giving young people exposure to global ideas and new forms of entrepreneurship. Small businesses across Central Asia now use platforms like Instagram and Telegram to reach customers, bypassing traditional barriers. In agriculture, digital platforms are being used to provide farmers with weather forecasts, crop prices, and efficient irrigation techniques. In healthcare, telemedicine is beginning to connect rural clinics with specialists in capital cities, reducing the need for costly travel. These changes demonstrate that technology is not only about building data centers or coding academies but also about improving daily life.

The progress, however, should not obscure the challenges ahead. Many of the region's digital projects are still in their early stages, and the risk of inequality between urban and rural populations remains high. Brain drain continues to threaten sustainability, as many of the best programmers and engineers still seek opportunities abroad. Cybersecurity risks are growing, and governments must develop stronger frameworks to protect data and infrastructure. Moreover, sustained political will is necessary. Initiatives launched with fanfare must be followed through with funding, monitoring, and adaptation to changing global conditions.

Yet the momentum is undeniable. Technology is increasingly recognized as the foundation of Central Asia's future development. As President Mirziyoyev argued, "We cannot build a modern state with outdated tools. The digital world is not a luxury—it is the oxygen of development." If Central Asian leaders maintain this commitment, the region has the potential to transform itself within a generation. With a young and ambitious population, abundant opportunities for regional cooperation, and growing investment from global partners, Central Asia can redefine its place in the global technological map.

In conclusion, technology in Central Asia is currently rated as moderate by its citizens, reflecting a reality of uneven progress. Underdevelopment stems from historical legacies, weak infrastructure, limited investment, and cultural attitudes. But governments have launched ambitious strategies, such as Uzbekistan's "Digital Uzbekistan 2030" and Kazakhstan's "Digital Kazakhstan 2025," alongside projects like the Astana Hub, data centers, e-government platforms, and AI training programs. In Uzbekistan alone, projects such as Digital Generation, the IT Community, Women in Tech, School 21, and Digital.uz are reshaping the digital ecosystem and providing models for regional growth. International partnerships are expanding access, while social media, agriculture, and healthcare innovations are improving lives. The path is far from complete, but the trajectory is clear. Technology is no longer peripheral in Central Asia; it is becoming central to its development. The Silk Road of the past carried goods and ideas across the continent. Today, a new digital Silk Road may once again connect Central Asia to the world, ensuring that the region not only catches up but also contributes meaningfully to global technological progress.

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