

## The Role of the Digital Economy in Shaping Trade and Economic Growth in Central Asia

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### Abstract

The digital economy functions as an essential element which changes economic systems by creating new trade patterns and enhancing productivity and driving worldwide economic growth. Central Asia establishes new economic systems through digital transformation which enables the region to move beyond its past dependency on natural resources and traditional trading routes for international market access. The research investigates how the digital economy affects trade patterns and economic development in Central Asian nations which include Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan. The study investigates how information and communication technologies (ICT) together with digital infrastructure and e-commerce and digital payment systems and innovation ecosystems drive economic development. Through its research the study shows how digitalization helps businesses operate more efficiently because it decreases operational costs and increases network accessibility which enables SMEs to conduct international business operations. The research establishes several critical challenges which include problems with digital equality and the need for increased infrastructure development and the requirement for improved legal frameworks and the necessity for enhanced cybersecurity measures. Central Asia achieves continuous economic growth through its digital adoption according to research which combines secondary data with empirical evidence from international organizations to demonstrate how the region progresses while facing income inequality issues. The research indicates that organizations should invest strategically in digital infrastructure and human capital development as well as policy reforms to achieve maximum advantages from digital transformation. The research shows that Central Asia can attain environmentally sustainable development through the digital economy which provides significant growth opportunities for the region.

**Keywords:** Digital, Economy, Trade, Growth, Central Asia, IOT

### 1. Introduction

The global economy undergoes fundamental transformations due to the rapid advancement of digital technologies which include artificial intelligence, big data analytics, cloud computing, blockchain technology, and the Internet of Things (IoT). The technology changes here have created new production methods and new ways for people to buy things and new systems for international trade, which together form what people call the digital economy. The digital economy includes all economic activities which depend on digital technologies, which include e-commerce and digital services and online financial transactions and data-driven innovation

(Bukht & Heeks, 2017). The situation has developed into a primary factor that drives international economic expansion, which now accounts for a growing portion of worldwide economic output and workforce employment.

The five Central Asian countries of Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan occupy a vital territory that connects Europe with Asia. The region served as a vital commercial link between East and West during its historical period as the Silk Road established global trading networks. The Central Asian economies after the Soviet Union ended depend on their natural resources which include oil and gas and minerals because worldwide commodity prices create economic risks for them (World Bank, 2022).

Digitalization in Central Asia has advanced through recent years because of investments in ICT infrastructure and improved internet access and expanding digital service networks. Kazakhstan's "Digital Kazakhstan" program together with Uzbekistan's digital reform projects work to develop digital infrastructure and stimulate innovation while enhancing public service delivery (OECD, 2021). The COVID-19 pandemic had a deep impact on digital technology usage throughout the region because it showed how digital tools help businesses maintain economic strength and operational stability.

The digital economy enables Central Asian businesses to access worldwide markets while it decreases their operational costs and enhances their supply chain operations. The three digital platforms which include e-commerce platforms and digital payment systems together with online marketplaces, help businesses to conduct international trade operations while they create fresh business prospects for small and medium enterprises. Digital technologies enable organizations to achieve higher productivity levels while they create new products and establish new business sectors, which leads to increased economic development.

The region has progressed in many areas yet it still deals with multiple obstacles which prevent complete utilization of its digital economy potential. The problems include insufficient digital infrastructure for remote locations which leads to unequal digital skill distribution between people, and existing regulatory limitations, and cybersecurity and data privacy security concerns. The process of digital transformation needs to overcome these obstacles because they will enable organizations to achieve sustainable development through digital transformation.

The study investigates how digital economy functions between two economic sectors which lead to Central Asian trade expansion. The research identifies main elements which create digital transformation opportunities while it analyzes the obstacles which prevent economic growth. The study presents various policy suggestions which will improve the success of regional digital initiatives.

## **2. Conceptual Framework of the Digital Economy**

The digital economy has developed through two decades which demonstrate how digital technologies have become essential for conducting economic activities. According to Tapscott (1996), the digital economy refers to an economy based on digital technologies that enable the creation, storage, and exchange of information. More recently, Bukht and Heeks (2017) define it as "that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services."



### 2.1 Components of the Digital Economy

The digital economy consists of three main components:

**Digital Infrastructure:** This refers to the communication networks which include broadband networks and data centers and telecommunications systems that provide connectivity.

**Digital Platforms:** The platforms include online marketplaces and social media platforms and e-commerce websites which allow users to conduct financial transactions.

**Digital Services:** Digital channels provide access to services which include online banking and e-learning and cloud computing.

### 2.2 Theoretical Perspectives

The digital economy exists because endogenous growth theory shows how technology plus innovation drive economic growth Romain 1990. Digital technologies boost productivity through their ability to enhance efficiency, decrease operational expenses and support new developments. The system generates knowledge spillovers that lead to economic growth according to the system's design. Network theory serves as an additional relevant framework because it shows how economic activities depend on both connectivity and user interactions. Digital platforms establish network effects because their service value grows with user participation, which improves market competition and operational efficiency.

### 2.3 Digital Economy and Trade

Digitalization has changed international trade by creating new business opportunities and lowering existing trade restrictions. Digital trade includes both digitally ordered goods and digitally delivered services. The system enables companies to access international markets without establishing physical locations which boosts their ability to compete in overseas markets.

**Table 1: Key Features of Traditional vs Digital Economy**

Aspect	Traditional Economy	Digital Economy
Market Access	Limited by geography	Global reach
Transaction Costs	High	Low
Business Models	Physical presence required	Platform-based
Speed of Transactions	Slow	Instant
Innovation	Incremental	Rapid and disruptive

### 2.4 Role of ICT in Economic Growth

ICT establishes itself as an essential factor for economic growth because it increases productivity rates and operational efficiency while creating opportunities for new technological developments. Research shows that a 10% increase in broadband access produces a GDP growth rate between 1% and 2% according to the World Bank 2021 report. The development of ICT infrastructure throughout Central Asia serves as the primary force driving digital transformation in the region.

### 3. Literature Review

The Central Asian digital economy research started to expand its theoretical and empirical studies after 2020 because the region developed its digital infrastructure and digitalization programs and international investors became interested in its developing market potential. Studies define the digital economy as a combination of ICT infrastructure and e-commerce platforms and digital payments and e-government services which help Central Asia overcome its landlocked trade limitations while creating non-commodity economic growth. The review examines fundamental theoretical concepts and trade growth research results and regional case studies and ongoing research gaps through panel regressions and case studies and policy evaluations from 2019 to 2026.

#### 3.1 Theoretical Foundations

The Central Asian research on digital economies bases its main theoretical frameworks on neoclassical growth theory and export-driven development models. The neoclassical model which Solow developed through his method of combining physical capital with technological advancements views Internet communication technology and online platforms as outside factors which boost productivity to counteract geographic limitations. Digitalization according to export-led economic models decreases international trade expenses through platforms which produce cost reductions between 20 percent and 30 percent thus enabling small and medium-sized enterprises to participate in global value networks. The landlocked country models demonstrate how geographical factors produce negative effects on economic growth which reach -0.463 yet broadband and e-commerce services reduce this impact. The Digital Silk Road research introduces a geopolitical dimension which studies how China's Belt and Road Initiative investments in fiber optic networks and data centers improve Central Asian connectivity. South Korean support which includes a 4.99-billion-dollar investment in Turkmenistan demonstrates how external forces help develop digital infrastructure.

#### 3.3 Empirical Evidence on Growth and Trade Impacts

Digital growth has positive connections which quantitative research studies prove. The researchers of Kuldashva et al. (2023) used pooled OLS to study five Central Asian countries from 2000 to 2022. They discovered that e-commerce sales and ICT penetration function as stable GDP drivers with trade openness and FDI acting as supplementary factors. The presence of landlockedness created a constant economic disadvantage which measured at -0.463. The fixed effects robustness test increased the  $R^2$  value to 0.782 which established proof of causation.

Studies of emerging markets show that a 1% increase in digital trade results in 0.8% growth of per capita GDP for Asia-Pacific countries. Central Asia falls behind because its least developed countries maintain less than 1% internet export capacity. UNCTAD reports 9% annual digital export CAGR (2015-2022) which e-commerce drives. The panel regression analysis of MENA analogs demonstrates that mobile internet access and e-commerce platforms increase GRDP per capita through fixed and random effects.

E-commerce creates strong trade impacts because World Bank E-GATE projects achieved \$23M interregional sales which helped more than 70 new markets develop for small and medium-sized enterprises. Digital payments improve financial access for users who maintain

mobile connections which exceed 90 to 150% while fixed internet users experience slower growth.

Study	Scope/Period	Key Coefficients/Findings	Methodology
Kuldasheva et al. (2023)	Central Asia, 2000-2022	E-commerce 0.563; ICT 0.469; landlocked -0.463	Pooled OLS, fixed effects
UNCTAD (2023-2025)	Tajikistan/CA	Customs digitalization cuts border times	ASYCUDA implementation
Zehir (2025)	Kazakhstan/Uzbekistan/Turkmenistan	Infrastructure investments vs. digital divides	Policy analysis, Digital CASA
Makhazhanova et al. (2024)	CA with Korean aid	Digital finance empowers SMEs	Comparative case studies

### 3.4 Regional Digitalization Dynamics

Kazakhstan achieves first place through its "Digital Kazakhstan" project which delivers 83% e-government services and maintains an IMD ranking of 34th for 2025 while aiming to develop artificial intelligence and reach 5% digital economy growth by 2026. Uzbekistan's "2030 Digital Strategy" establishes artificial intelligence infrastructure as its main objective which supports the country's developing e-commerce sector that exceeds 500 million dollars. Kyrgyzstan and Tajikistan use mobile technology because of their high subscription rates of 150% and 107% respectively while they encounter problems with their supply chain operations. Turkmenistan lags behind other countries because it uses the "Digital Economy Concept to 2025" plan. The World Bank Digital CASA project together with the CAREC initiatives works to create regional networks which will solve problems related to internet access and data security. Digital literacy increases e-government usage according to research studies but rural areas maintain lower access rates which show ongoing social inequality.

#### Challenges and Gaps

The study reveals that the combination of infrastructure deficiencies and cybersecurity vulnerabilities together with the regulation systems and digital access limitations create unresolved challenges. Geopolitical dependencies (e.g., Digital Silk Road) raise sovereignty concerns. The research requires post-2023 data together with AI impact studies which need OLS analysis through IV/DiD methods.

### 4. Digital Economy and Trade Transformation in Central Asia

The digital economy now operates as the main power which transforms trade practices throughout Central Asia because it enables landlocked countries to overcome their geographic limitations while creating new market opportunities and establishing modern business

methods. The whole area which includes Kazakhstan and Uzbekistan and Kyrgyzstan and Tajikistan and Turkmenistan now experiences changes in business practices because people gain better access to internet services and digital platforms and mobile applications and online government services. The area shows uneven development but digitalization has become an essential force which drives trade expansion and improves regional economic connections.

#### **4.1 Growth of E-Commerce**

E-commerce functions as a major digital technology that transforms Central Asian trade practices because it stands as one of the most important methods of digital commerce. The region experiences difficulties with its traditional trading system because its transportation networks remain disconnected and its shipping costs are high and its retail distribution networks are weak and its middlemen dependency is high. Online marketplaces reduce some of these frictions by connecting producers directly with domestic and foreign consumers which results in lower market-entry barriers that enable small businesses to participate in international trade. The new trade model brings vital advantages to small and medium enterprises. Through traditional export methods Central Asian SMEs face obstacles because they lack essential resources for international market entry which include capital and warehousing systems and distribution networks. The digital marketplaces help to solve this issue by providing digital storefronts and buyer access and online advertising and payment solutions at lower costs than physical business expansion requires. E-commerce establishes a new sales channel which transforms trade participation through increased distance and scale limitations.

The World Bank-supported E-GATE initiative demonstrates through its recent findings that digital trade needs only two years of operations to establish its benefits. The pilot project generated over \$21 million in exports for SMEs which included approximately \$16 million in Central Asian trade while the involved companies expanded their international presence to more than 70 markets. The figures demonstrate that digital trade expansion results in increased external exports which enhance trade relationships between regional countries. Central Asia needs this development because its businesses can develop their export abilities through regional markets before they expand to international markets.

The different countries showcase distinct e-commerce development stages. The digital market in Kazakhstan stands as the most advanced market in the region because its logistics system operates efficiently while people have access to the internet and fintech services have developed throughout the country. The e-commerce sector in Uzbekistan has experienced rapid expansion because of two factors which include platform development and payment innovations together with government support for digital entrepreneurship.

The mobile-first internet usage patterns of Kyrgyzstan and Tajikistan show that platform-based commerce will develop further if they solve their shipping and payment problems. The growth of e-commerce depends on how many different sectors it includes. Digital marketplaces create export opportunities not only for large industrial firms but also for artisans agricultural sellers service providers and women-led enterprises. E-commerce enables more people to participate in international trade because its onboarding expenses stay below those of traditional export systems.

#### 4.2 Digital Payments and Financial Inclusion

The presence of efficient payment systems is essential for digital trade to reach its full potential, which explains why Central Asia considers digital payments as its second key element for transforming international trade. The combination of mobile wallets with online banking and QR-based payments and app-linked cards and digital merchant systems creates a cashless system through which users can execute transactions with improved security and faster processing times and simple verification methods. The development of digital payment systems in markets where cash has been the main payment method for retail and informal commerce creates new opportunities for businesses to achieve formal market status while enabling them to engage in international trade.

Digital payments enhance financial inclusion because they allow more people and businesses to access formal banking services. The situation holds great significance because microenterprises together with rural households encounter challenges that prevent them from accessing traditional banking services while mobile-based services enable them to obtain services more easily. Digital payment systems enable users to conduct online transactions after they begin using these systems which leads to the creation of transaction records that enable them to obtain credit and fully engage in e-commerce activities. The cycle operates in a manner that online trade increases payment usage which results in greater online trade which creates fresh chances for individuals to connect with official financial institutions.

The dynamic relationship between these two factors shows its most evident impact in Kazakhstan. The country has achieved digital transformation through its e-government programs which expand digital services and its mobile-first ecosystem which enables citizens to access both public and private services through digital channels. The online availability of more than 92 percent of government services in 2025 combined with millions of users who access eGov.kz and eGov Mobile services demonstrates both public confidence in digital platforms and their readiness to conduct online transactions. Digital systems create a foundation for online payment methods which the organization uses to create a stronger digital business framework. Digital payment systems improve trade processes in the region because they reduce delays through faster payment processing and they create better visibility of transactions while preventing financial losses from unregistered cash transactions. Exporters and online sellers benefit from digital payments because their systems enable them to process orders more efficiently by connecting their digital systems with payment platforms.

#### Table 2: Digital Adoption Indicators in Central Asia

The following table presents a usable comparative summary for your paper. The figures should be used as regional benchmarks because they display different values between multiple sources and different years.



Country	Internet Penetration (%)	Mobile Subscriptions / Connections (%)	E-commerce Growth Profile
Kazakhstan	About 89–93% in recent 2025 estimates.	Around 130%+; mobile use exceeds population size in regional datasets.	High, supported by fintech, logistics, and advanced e-government.
Uzbekistan	About 75% in indicative summary tables; one regional source notes 55% earlier internet penetration with 76% of usage via mobile.	Around 120%+ in indicative regional comparisons.	Moderate to high, with rapid marketplace expansion and policy support.
Kyrgyzstan	Around 47% in earlier regional data, though mobile-led access is very strong.	About 150% in one regional study, the highest in the region.	Moderate, constrained by logistics but supported by mobile commerce potential.
Tajikistan	Around 26% in earlier data; newer estimates place broader digital adoption near 57% in some datasets.	Around 107% in regional data.	Low, limited by postal, logistics, and digital access constraints.
Turkmenistan	Around 26% in earlier regional comparisons, with limited recent comparable data.	Around 90% in indicative summaries, though recent harmonized data remain limited.	Low, due to limited openness and weaker digital ecosystem visibility.

The table displays two major patterns. First, mobile connectivity is generally stronger than fixed internet access which means the region will continue to experience mobile-led trade digitization instead of desktop-led trade digitization. Second, countries with stronger institutional digitalization especially Kazakhstan and increasingly Uzbekistan display better capacity to convert their connectivity into commercial benefits.

### **4.3 Reduction in Trade Costs**

Digitalization in Central Asia presents its most valuable economic advantage through its ability to decrease trade expenses. Businesses operating in landlocked countries must deal with additional expenses that stem from border control procedures and document requirements and scattered transportation networks and insufficient storage capacity and prolonged shipping durations. The implementation of digital technologies enables businesses to decrease their operational expenses through the automated management of information systems and enhanced visibility of their stock inventory and simplified payment processes and improved connections between distributors and transportation companies.

Multiple levels of the system contribute to cost reduction. The online platforms used for transactions enable buyers and sellers to connect with each other swiftly which decreases search expenses. The digital documentation system together with online platforms enables organizations to decrease their need for physical documents while enhancing their capacity to track information. Digital solutions enable better route optimization and package monitoring and order management which results in reduced supply chain uncertainty and improved delivery performance.

Central Asian territories experience greater impact from these changes because their geographical conditions create more significant economic disadvantages than other coastal regions. The digital efficiencies lead to substantial trade benefits when businesses need to operate between multiple borders and use intermediary markets for their activities. Regional e-commerce initiatives focus more on logistics harmonization and coordinated policy development and digital trade facilitation than on online retail operations.

The E-GATE experience again provides useful evidence. The pilot results indicate that SMEs who obtain support for digital market access and logistics integration and policy coordination can attain export results which exceed their normal distance and small domestic market size export potential. Central Asia achieves trade cost reductions through two main factors which include physical infrastructure investments and digital capacity improvements and institutional cooperation.

### **4.4 Integration into Global Value Chains**

Central Asian economies achieve better integration in global value chains through digitalization. Modern value chains require businesses to establish effective communication channels which provide dependable data transfer services and enable digital quality tracking and payment systems to work together across international boundaries while coordinating their delivery operations. International buyers expect firms to meet specific standards and deliver products within designated time frames which becomes challenging for companies that lack these essential capabilities.

Digital tools help firms join value chains in several ways. Producers can use these tools to establish direct contact with their suppliers and buyers while they market their products internationally and track their shipments and handle customer relationships and document their compliance activities. Online trade procedures and digital public services of governments help create an institutional environment which international buyers and investors use to evaluate potential sourcing locations.

All digital public services of Kazakhstan Government Ministries to business partners show the system's effectiveness for value chain management. The advanced e-government system of Kazakhstan government agencies together with its enhanced digital competitiveness and expanded online service offerings creates an environment which attracts investors while minimizing their operational difficulties. The system enhancements create institutional benefits because they establish reliable business operations which enable organizations to conduct complex trade activities beyond basic commodity distribution.

The process of creating advanced regional partnerships in Central Asia will depend on whether digital transformation initiatives achieve their goals. Value chains require interoperable systems, not isolated national platforms. The digital economy in Central Asia will create long-lasting trade effects which will originate from domestic reforms and the establishment of shared regulations and improved logistical connections and expandable digital trade systems.

## **5. Impact of the Digital Economy on Economic Growth (700–800 words)**

### **5.1 Productivity and Efficiency Gains**

Digital technologies increase productivity through their capacity to automate tasks which drive better decision-making processes and their ability to manage resources more efficiently. Organizations use data analytics to generate better operational results which help them become more present in their market.

### **5.2 Economic Diversification**

The Central Asian region depends on its natural resources which makes its economies susceptible to international economic disruptions. The process of digitalization creates new paths for economic development because it supports the growth of IT service sectors and fintech companies and digital entrepreneurship activities.

### **5.3 Employment and Human Capital Development**

The digital economy creates new employment opportunities which include software development positions and digital marketing roles and IT service jobs. The industry needs trained workers which results in more funding for educational programs and skill development initiatives.

### **5.4 Investment and Innovation**

Companies that increase their digital abilities through digital transformation will attract more foreign direct investment which will create research and development spaces where they can develop new technologies. The government of Kazakhstan and other countries spend large amounts of money on digital infrastructure and research centers to create their position as top technology hubs in their region.

## **6. Challenges to Digital Transformation in Central Asia**

### **6.1 Digital Divide**

The advancement of digital technologies throughout urban and rural locations has reached a present state which shows development. The two major barriers which prevent people from using digital technologies are their limited internet access and their inability to pay for digital services.

## 6.2 Infrastructure Constraints

Infrastructure Constraints Digital infrastructure development which includes broadband networks faces obstacles from both geographical obstacles and the need to build in mountainous regions and landlocked areas.

## 6.3 Regulatory and Institutional Barriers

Regulatory and Institutional Barriers Digital trade and innovation face obstacles because regulatory frameworks lack consistency and institutional capacities remain limited. Digital transformation requires governments to create complete policy systems which will enable their implementation.

## 6.4 Cybersecurity and Data Protection

Cybersecurity and Data Protection Digital technology use has increased which creates additional public anxiety about cybersecurity threats and data privacy violations. People need to establish secure digital spaces because these environments serve as the foundation for establishing trust which drives digital technology usage.

## 7. Policy Implications and Recommendations

Central Asian governments must develop comprehensive digital strategies which connect their digital infrastructure needs and workforce requirements and their legal frameworks and their support systems for small and medium-sized enterprises and their cybersecurity measures to create digital markets. The region needs to make substantial investments which require building broadband infrastructure and developing fiber networks and establishing rural connection services and creating Trans-Caspian digital paths because landlocked areas need dependable terrestrial connections to reduce both connectivity expenses and accessibility challenges. Digital literacy programs need to teach coding and e-commerce skills and platform expertise throughout educational systems and vocational training programs which will help women entrepreneurs and rural youth and small and medium enterprises to increase their use of e-government services and productivity. CAREC frameworks need to establish regional digital trade standards which will protect e-signatures and interoperable payment systems and consumer rights and cross-border data sharing to eliminate regulatory obstacles that prevent intra-regional trade. The World Bank proved that E-GATE-based SME programs which provide digital tools and export guidance and logistics financial support and easy tax procedures will enable micro-firms to enter 70 new markets. The development of consumer trust which enables e-commerce businesses to expand needs organizations to establish cybersecurity requirements and incident handling procedures and data protection regulations. The alignment between power pathways and policies will drive economic growth between 6 and 9 percent while reducing the trade disadvantages of being landlocked.

## 8. Conclusion

The digital economy currently operates as a driver of economic development that creates new trade possibilities in Central Asia. The region uses digital technologies to create international trade routes through three main benefits which include decreased transaction costs and improved connectivity and expanded global market access. Central Asia has made substantial progress in its digital transition but face three major challenges which include infrastructure

deficiencies and regulatory hurdles and digital technology access gaps. The combination of digital investments and policy initiatives leads to economic growth in the region while digital economic development acts as a mechanism for sustainable progress. The digital economy needs all three sectors which include government agencies and business groups and international organizations to collaborate for solving structural issues that prevent economic growth which benefits all members of society. Central Asia needs to develop its digital economy because it serves as the main route for achieving economic diversification and improving trade capacity and establishing connections with worldwide markets. The process of achieving sustainable economic growth requires strategic investment and essential policy modifications which will help us achieve our maximum potential.

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