Digitalisation in Central Asia and material/financial assistance of South Korea

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Abstract
The study provides a comprehensive review of digitalisation initiatives implemented in Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan, Tajikistan, and evaluates financial and material support from South Korea. The main results showed that digitalisation programmes significantly affected the economic development of these countries, in particular, about 120 thousand new jobs were created in Kazakhstan, and the level of internet access increased to 97%. Uzbekistan received support in training specialists in the information sphere. A project with electronic identification cards was implemented in Kyrgyzstan. In turn, Turkmenistan received investments of Korean companies in projects totalling USD 4.99 billion. Tajikistan has implemented a USD 50 million project aimed at creating digital infrastructure and improving Internet access. Overall, the results showed that digitalisation in Central Asia not only stimulates economic development, but also improves the quality of life of the population, contributing to the integration of the region into the global digital economy.
Keywords: technological innovations, economic development, information transformations, international cooperation, project initiatives.

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1. Introduction

Despite the growing role of digitalisation in the global economy, Central Asian countries face numerous challenges in implementing modern

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technologies due to underdeveloped infrastructure, low levels of digital literacy, and limited financial resources. Although various digital initiatives are being implemented in the region, the impact of these programmes on economic development remains poorly understood, including the role of international support, in particular South Korea's assistance, in this process.

For example, Ternov et al. (2024) analysed the impact of digital technologies on the development of financial inclusion in Kazakhstan, which contributes to improving access to financial services through online platforms and mobile applications, increasing the efficiency and convenience of financial transactions. In addition, Mukambaeva et al. (2023) focused on the digitalisation of Kyrgyzstan's educational system, emphasising the importance of introducing information and communication technologies to improve the quality of education, and also stressed the need to create new platforms for cooperation between the state, the private sector, and the population, which will contribute to improving digital literacy and provide new employment opportunities, supporting the socio-economic development of the country. In turn, Mukimova et al. (2022) examined the impact of digitalisation on the energy sector of Tajikistan, in particular, the introduction of smart energy accounting systems, and noted that digitalisation contributes to improving the efficiency and viability of energy companies.

Khamzaeva et al. (2020) analysed the digital strategies of Central Asian countries, including the priorities and penetration rate of electronic services. Despite some progress in the sustainable development of digital technologies, she stressed the need to increase funding and overcome regional barriers to improving infrastructure. Niyazbekova et al. (2023) evaluated the digitalisation policies of Central Asian countries, identifying key limitations and potential areas of development in the field of digital technologies and artificial intelligence. Moreover, Arifianti and Sakapurnama (2024) analysed the digitalisation of public services in Indonesia and compared it with the experience of South Korea, highlighting the importance of integrated digital solutions for improving the efficiency of public services and equal access to digital technologies, which is key to economic growth. Thus, previous studies have considered various aspects of digitalisation in Central Asia, but have not focused on a comprehensive analysis of its impact on the sustainable economic development of countries in the region in the context of economic support for South Korea, so this was chosen as the goal of this study.

2. Materials and Methods

In the context of Kazakhstan's analysis, attention was focused on the "Digital Kazakhstan" programme, which is an example of successful digitalisation in the region (Ministry of Digital…, 2020). The main areas of the programme were investigated and key components were considered, special attention was paid to the transfer of public services to an online format. The key areas of cooperation were outlined and how Kazakh universities implement experience exchange programmes with Korean educational institutions were investigated.

The strategy "Digital Uzbekistan 2030" was considered, which is aimed at turning the country into a digital leader of the region (Decree of the…, 2020). The study analysed the main objectives of the programme and considered Uzbekistan's cooperation with South Korea. The importance of training qualified personnel for the successful implementation of digital initiatives in the country was emphasised, and the training programmes of the Uzbek delegation organised with the support of the Korea Association of Technoparks and the Korea International Cooperation Agency, which contributed to the implementation of Technopark models in Uzbekistan, were noted.

Attention was focused on initiatives that support the improvement of digital literacy and the development of technological opportunities, in particular, projects aimed at distance learning and e-commerce. The key initiative Digital Kyrgyzstan 2019-2023 (2019) was studied. The paper also analysed the cooperation between Kyrgyzstan and South Korea, which began with the initiative of Korea Minting, Security Printing & Identity Card Operating Corp, which upgraded the system of passports and electronic identification cards, and also considered the impact of this project on improving administrative services and improving the standard of living of the population (Bekmuratov et al., 2024). Special attention was paid to the Concept of Digital Economy Development in Turkmenistan for 2019-2025 (2019). In addition, Turkmenistan's interaction with international organisations such as the United Nations (UN) and the EU, which provide support for the development of the digital economy, was investigated. Attention was also focused on Turkmenistan's cooperation with South Korea. The section on Tajikistan examined important steps that the country is taking to modernise its digital infrastructure, including the National Development Strategy 2030 (UNCTAD customs automation…, 2022).

3. Results

3.1. Digitalisation in Central Asia and its impact on economic development

Kazakhstan demonstrates some of the highest rates of digital development in the region thanks to its state programme "Digital Kazakhstan" (Ministry of Digital…, 2024). The programme focuses on two key areas: modernisation of traditional sectors of the economy and creation of an innovative digital infrastructure, including the development of human capital and the introduction of new technologies to increase productivity (Figure 1). Furthermore, it aims to provide 300,000 job opportunities, establishing Kazakhstan as a competitive entity in the global digital economy while promoting sustainable technological advancement.

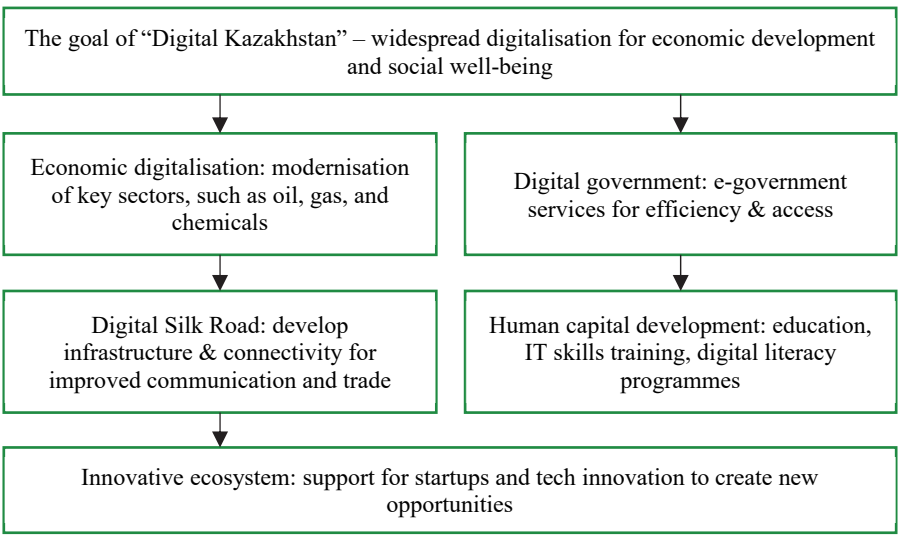

Figure 1 – "Digital Kazakhstan" programme

In turn, Uzbekistan is actively moving towards digitalisation, trying to adapt modern technologies to various spheres of the economy and public administration. The main focus is on modernising infrastructure, increasing internet access, and developing electronic services for citizens and businesses. One of the key initiatives is the Strategy "Digital Uzbekistan 2030", which aims to turn the country into a digital leader in the region (Decree of the…, 2020) (Figure 2).

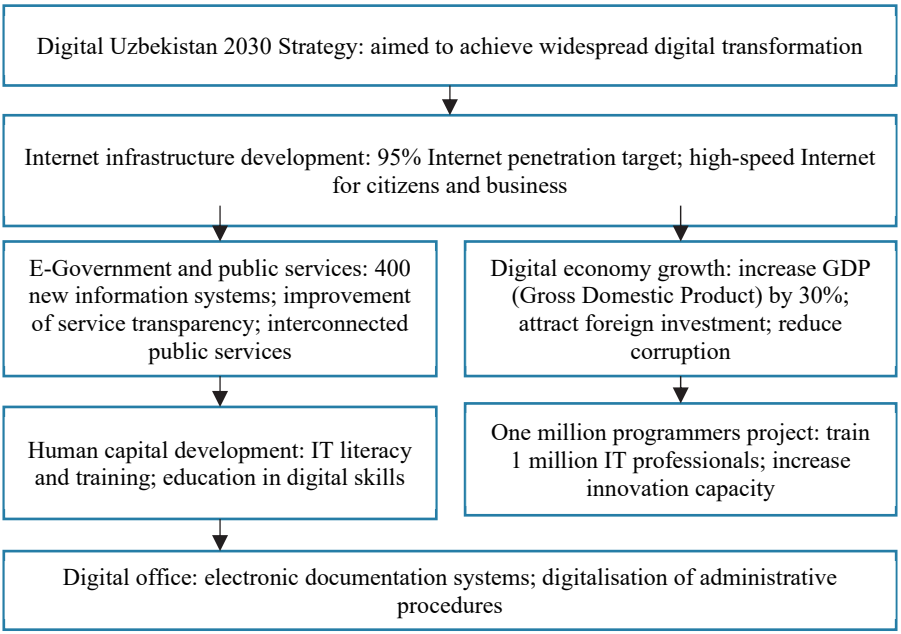

Figure 2 – "Digital Uzbekistan 2030" strategy

Kyrgyzstan is advancing in sustainable digital transformation by emphasizing digital literacy and technology-driven economic growth, despite its financial difficulties and limited infrastructure. One of the key projects was the Digital Kyrgyzstan 2019-2023 (2019) initiative, which aims to simplify citizens' access to public services through the introduction of digital technologies and management systems (Figure 3).

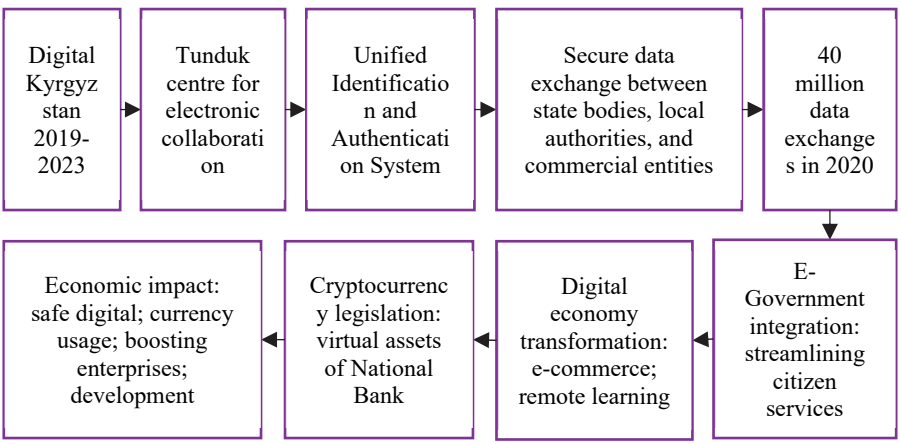

Figure 3 – Digital Kyrgyzstan 2019-2023 project

The government of Turkmenistan has launched large-scale initiatives to develop the digital economy, which include both improving infrastructure and introducing modern digital services for citizens. An important initiative is the concept of digital economy development for 2019-2025 (Figure 4).

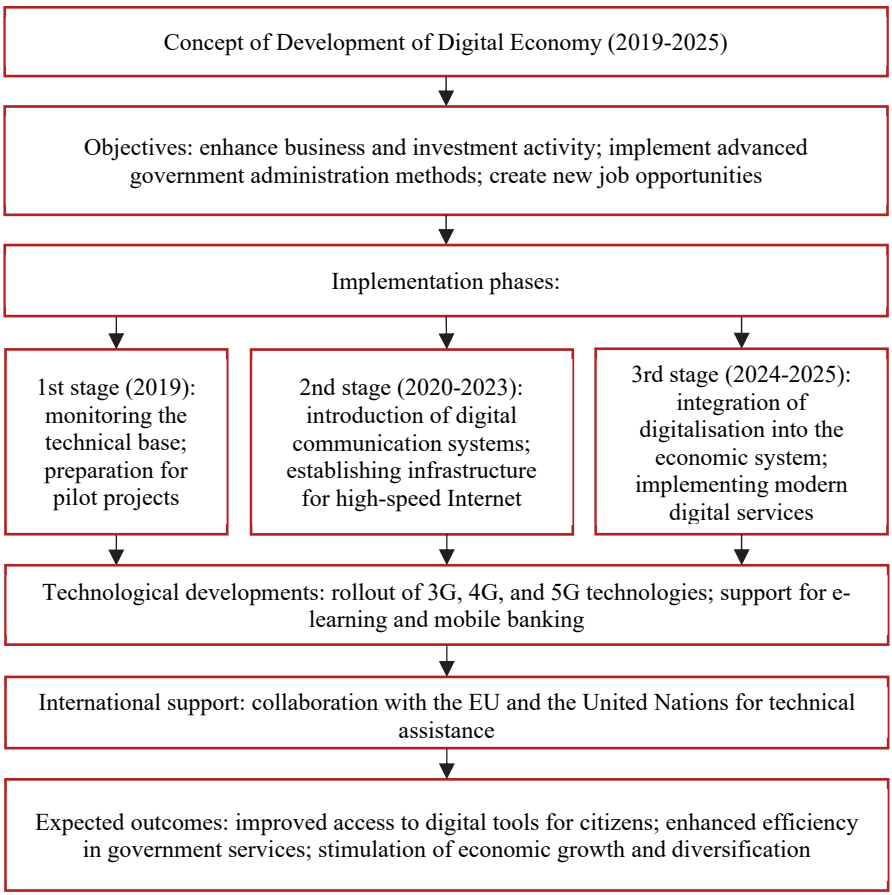

Figure 4 – Digital economy development concept for 2019-2025 in Turkmenistan

An important step for Tajikistan is the "National Development Strategy 2030", which provides for an integrated approach to digital transformation, and the introduction of an electronic customs management system developed with the support of the UN Conference on trade and development and the World Bank. The strategy focuses on creating a digital environment to support innovation and develop a skilled IT workforce (Figure 5).

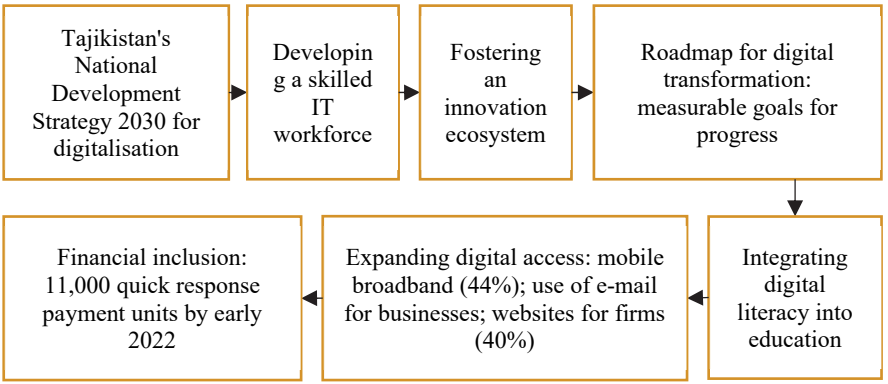

Figure 5 – National Development Strategy 2030 in Tajikistan

Kazakhstan is a leader in the introduction of digital technologies, while Uzbekistan, Kyrgyzstan, Turkmenistan, and Tajikistan are gradually taking important steps in modernising their economies. All of these countries focus on developing digital infrastructure, improving public administration efficiency, and stimulating innovation (Table 1).

Table 1 – Comparison of digitalisation in Central Asian countries

Country	*Key digitalisation initiatives*	*Main areas*	*Challenges*
Kazakhstan	"Digital Kazakhstan"	Modernisation of the economy, digitalisation of public services, development of infrastructure through the "Digital Silk Road", improvement of human capital, creation of an innovative ecosystem	Integration into global markets, the need to improve digital literacy in rural areas
Uzbekistan	"Digital Uzbekistan 2030"	95% Internet penetration, development of e-government, training of 1 million IT specialists, improvement of the business climate	High level of bureaucracy, insufficient digital infrastructure in some regions
Kyrgyzstan	Digital Kyrgyzstan 2019-2023	Promotion of the development of e-government, digitalisation of public services, introduction of a unified identification and authentication system, regulation of digital currency	Low Internet penetration, weak infrastructure, economic difficulties
Turkmenistan	Digital economy development concept for 2019-2025	Introduction of 3G, 4G, 5G technologies, integration of digital communication systems, improvement of infrastructure for mobile banking and electronic services	The slowest Internet connection in the region, limited access to digital tools for the population

Tajikistan	National Development Strategy 2030	Development of Internet infrastructure, integration of digital technologies into public administration, promotion of innovation and introduction of quick response payments, expansion of internet access in rural regions	The high cost of digital communication, poor quality of infrastructure, and the need to improve digital literacy

3.2. The role of South Korea's economic assistance in digitalising Central Asia

Focusing on improving digital competence among the population and supporting industrialisation, the South Korean government has developed a multi-level approach to creating a "Digital Korea" (Korea to come…, 2023). This strategy covers short-, medium-, and long-term plans, ensuring sustainable infrastructure development and cutting-edge technology implementation across key sectors (Figure 6). An important element of the strategy is to ensure digital literacy of all age groups, which allows citizens to take advantage of the new opportunities provided by the digital economy. The main objectives of the strategy are to improve the internet infrastructure to meet new technological requirements, provide digital education for all citizens, develop influence on virtual platforms, and create an export-oriented group to strengthen the country's global presence in technology sectors.

South Korea plays an important role in supporting Kazakhstan's digitalisation by promoting key aspects of digital infrastructure and innovation. Their cooperation began at the official level in 2017, when they discussed plans to integrate Korean experience into the concept of "Digital Kazakhstan" and develop public-private partnerships to support these initiatives (Ministry of Digital…, 2024). To implement this concept, the government of Kazakhstan has invested approximately USD 80 million, which has created 120 thousand jobs. It was also planned to invest another USD 150 million in the development of the digital ecosystem to increase the level of Internet use to 97%.

South Korea not only provides technological assistance, but also promotes the training of specialists in the field of IT. Kazakhstan, in particular, actively participates in the experience exchange programme with Korean universities and educational centres. The government of Kazakhstan actively cooperates with Korean experts in the framework of the project of digitalisation of public services. South Korea and Kazakhstan have concluded dozens of agreements, memoranda of cooperation and commercial contracts worth more than USD 430 million (President Yoon Suk…, 2024) (Figure 7).

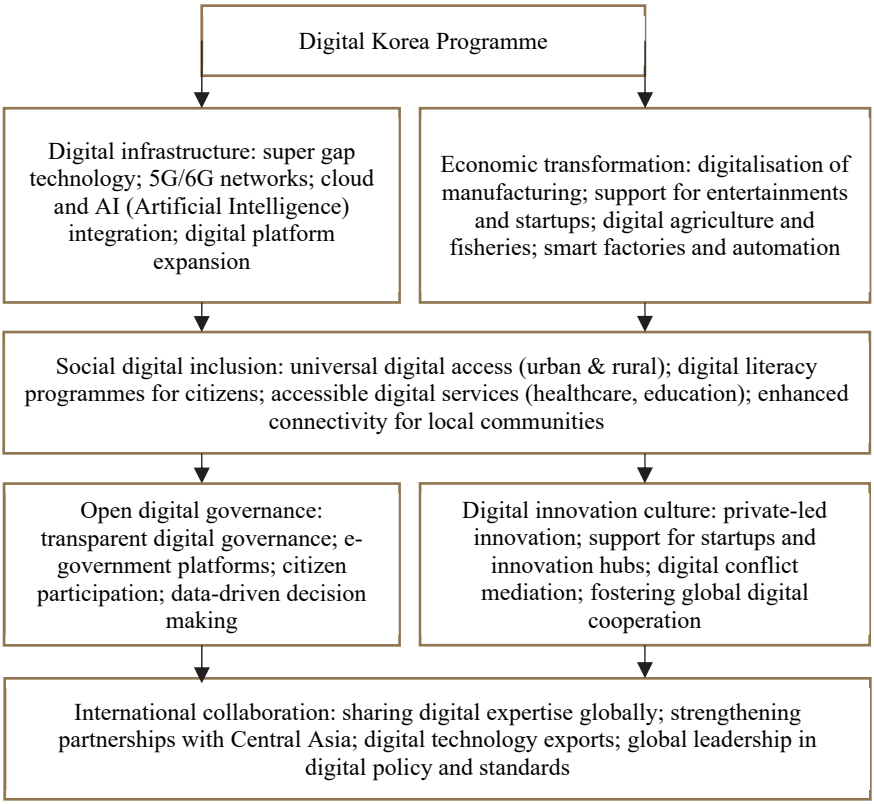

Figure 6 – Digital Korea Programme

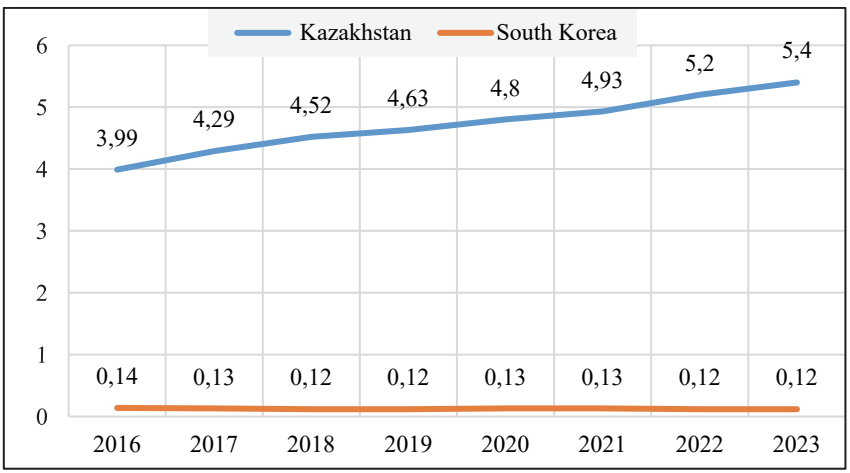

Figure 7 – South Korea and Kazakhstan's spending on science, technology, and innovation in 2016-2023, gross domestic expenditure on research and development as a percentage of gross domestic product

South Korea began its cooperation with Uzbekistan in the field of digitalisation in 2014, when the Inha University campus was opened in Tashkent, which trains specialists in the field of Computer Science and IT. In 2023, with the support of the Korea Association of technoparks and the Korea International Cooperation Agency, a programme was organised to improve the skills of the Uzbek delegation in the process of digitalisation in Korea (Uzbekistan strengthens IT…, 2023). At the initiative of the leaders of the two countries, Korea International Cooperation Agency provided USD 4.5 million for the development of an IT park in Uzbekistan (South Korean KOICA…, 2022). In 2023, the volume of bilateral trade between Uzbekistan and Korea reached USD 2.5 billion, and Korean investment exceeded USD 7.5 billion (South Korea hopes…, 2024).

In general, Uzbekistan's budget in the technology sector in 2020 was approximately USD 56 million (World Bank, 2023). In 2021, it increased to USD 89 million, reflecting the continued implementation of strategic initiatives. Then, in 2022, Uzbekistan received approximately USD 100 million for further digitalisation, including investment in infrastructure and e-services development. In 2023, the budget for digitalisation reached almost USD 120 million, focusing on improving e-government services and developing the digital economy (Figure 8).

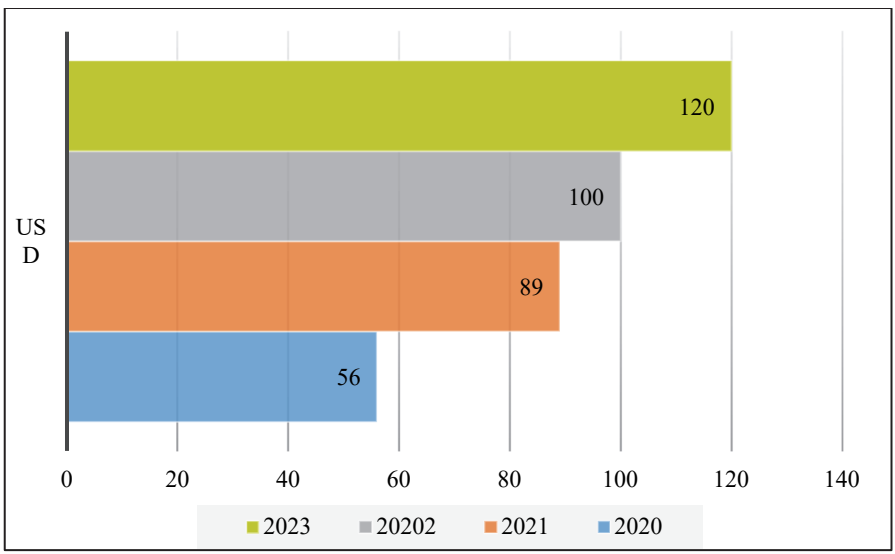

Figure 8 – South Korea's monetary assistance to Uzbekistan in 2020-2023

Additionally, in 2024, the Korean group Hancom signed an agreement on the development of digital education in Uzbekistan, implementing a pilot

project using classrooms in digital technology training centres, where classes on artificial intelligence, application development, Korean and English are taught, including improvement of the skills of Uzbek IT mentors (Hancom Group to…, 2024). Kyrgyzstan's collaboration with South Korea in digitalization commenced in 2016 under the idea of the Korea Minting, Security Printing & Identity Card Operating Corp to modernize the passport and electronic identity card system (Bekmuratov et al., 2024). Korea Minting, Security Printing & Identity Card Operating Corp executed a project to distribute three million electronic identity cards in Kyrgyzstan, facilitated the establishment of a resident registration system, and launched mobile identification cards. A collaboration between prominent South Korean firms BC Card and Smartro resulted in the creation of BC Card Kyrgyzstan, enabling innovative payment technologies such as SoftPOS (Point of Sale) terminals and rapid response systems. Moreover, during the "Digital Resilience Technical Assistance Programme" (2020-2022), Kyrgyzstan received a grant of USD 2 million from the Korea-World Bank Partnership (World Bank, 2020) (Figure 9).

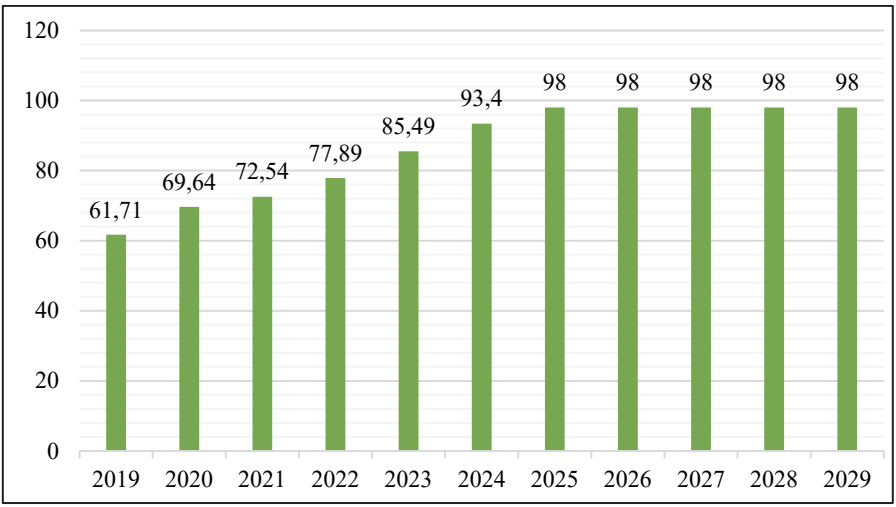

Figure 9 – Internet penetration rate in Kyrgyzstan for 2019-2024 and forecast for 2025-2029, %

Cooperation between Turkmenistan began with the visit of South Korean President Moon Jae-in in 2019, when issues beyond energy and economy were discussed, with a focus on strengthening Turkmenistan's telecommunications infrastructure (S. Korean President…, 2019). To implement this task, a memorandum of understanding was signed between

the relevant departments, which allowed Korean companies to start a project to modernise the telecommunications infrastructure in Turkmenistan. In 2023, Turkmenistan and the Korean company Hyosung Corporation signed an agreement on the modernisation of automated teller machines, the production of new software, and the development of banking infrastructure (Korean company helps…, 2023) (Figure 10).

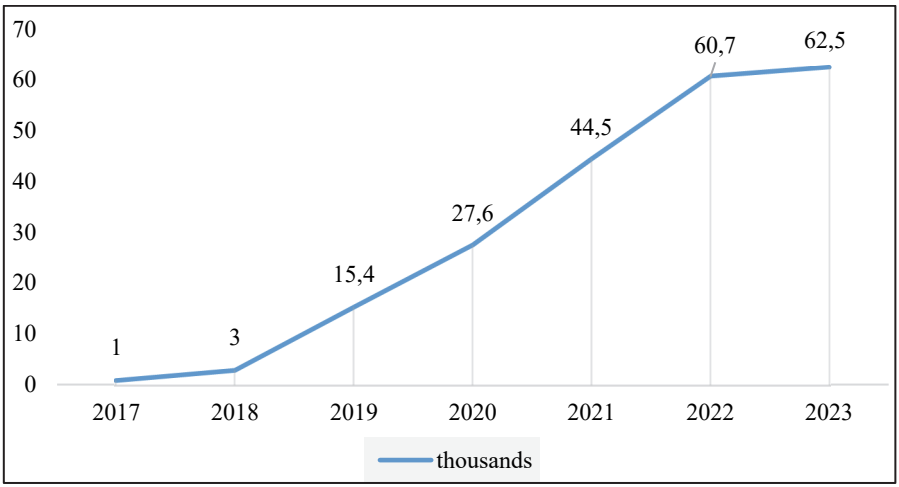

Figure 10 – Dynamic growth of mobile banking users in Turkmenistan in 2017-2023, thousands of users

Notably, Turkmenistan is an important partner for South Korea, because Korean companies, over the past decade (2014-2024), have joined numerous projects in Turkmenistan worth USD 4.99 billion (Min-hyung, 2024). This is the largest amount among South Korea's main partners in Central Asia. One of the most significant projects is Digital CASA Tajikistan, which provides for the creation of a modern digital infrastructure in the country and support for the Smart City Dushanbe initiative (Min-hyung, 2024). This project worth USD 50 million was an important step towards Tajikistan's digital transformation, including through the country's integration into regional digital networks, improving computer literacy among the population, and introducing e-government services.

In 2019, the Tajik-Korean Innotech Invest forum was held. At this event, representatives of 50 Korean companies discussed opportunities for cooperation in the fields of digitalisation and industrial development of Tajikistan. The forum became an important platform for strengthening economic ties between the two countries, and also contributed to the discussion of prospects for the introduction of 5G technologies in Tajikistan.

However, at other Tajik-Korean forums, it was noted that the volume of foreign trade between Tajikistan and South Korea in the first five months of 2019 reached USD 12.9 million, which is significantly more than USD 9.3 million for the same period of 2018 (Kerimkhulle et al., 2023). According to the digitalisation report in Tajikistan for 2020-2024, the number of internet users increased from 2.42 million in 2020 to 4.1 million in early 2023, social media users – from 0.66 million to 1.1 million, and the number of mobile connections remained stable at about 10 million (Figure 11).

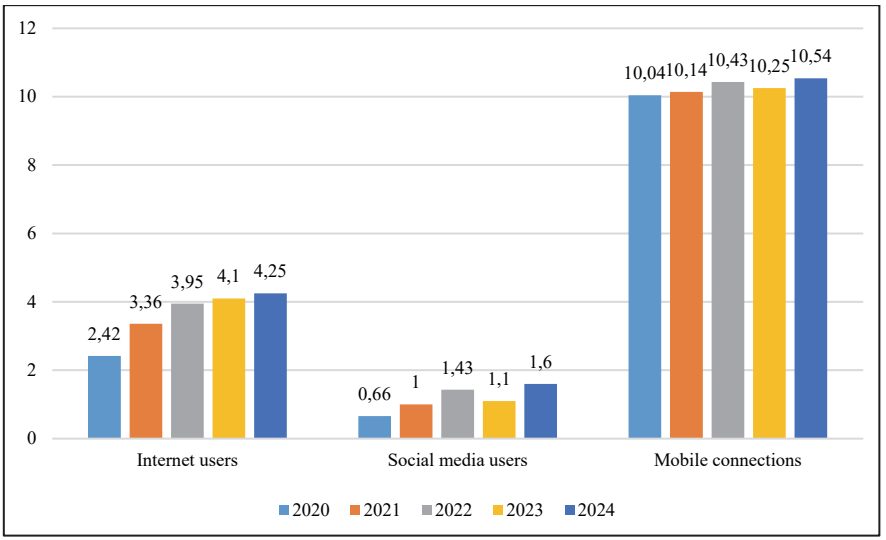

Figure 11 – Report on digitalisation in Tajikistan for 2020-2024, millions of users

Source: compiled by the authors based on Digital in Tajikistan (2024).

4. Discussion

This study examines how Zaman (2022) advocates for government-driven digital economy initiatives, while identifying South Korea's comprehensive support as the decisive catalyst for Central Asian digital transformation and economic growth. The findings partially align with Makhazhanova et al. (2024) regarding digital finance's empowerment of small businesses during global challenges, though this research adopts a more holistic perspective on Central Asian digitalization with emphasis on South Korea's foundational contributions. The study confirms digitalization's role in enhancing Central Asian economic sustainability through improved infrastructure and digital service accessibility. While Park et al. (2023)

similarly recognized digitalization's economic importance, their focus remained on South Korean manufacturing processes, particularly supply chain traceability. This research extends their findings by highlighting the significance of public service digital initiatives for sustainable regional development, transcending Park's et al. more industrially-oriented context.

In academic discourse, South Korea's engagement with Central Asia, as explicated by Khamzin et al. (2022), denotes a significant paradigm for technological diffusion and digitalization facilitation within the region. Khamzin emphasized the establishment of socio-cultural and diplomatic relations as foundational elements upon which digital initiatives and economic assistance are predicated, thereby facilitating digital transformation across Central Asia. Hajiyev et al. (2025) empirically examined digitalization's influence on labor productivity throughout Asian economies, concluding that digital technologies substantially enhance workforce efficiency. However, the current investigation encompasses a more expansive analysis of digitalization's impact relative to Hajiyev et al.'s work, encompassing both economic development trajectories and societal transformations within Central Asian nations.

Khoda et al. (2024) research demonstrates South Korea's advanced technological capabilities in e-procurement innovation, confirming its instrumental role in facilitating digital transformation across various countries, including those in Central Asia. These findings align with our current analysis, highlighting the significance of comprehensive international support encompassing both financial assistance and transferable digital policies and innovations applicable to the Central Asian context. Quliyev`s et al. (2024) investigation of digital economy development disparities among Muslim-majority nations corroborates our findings regarding digitalization's positive economic impact. However, the present study provides enhanced insight into these mechanisms through detailed examination of specific digitalization programs implemented across the region. While Quliyev's conclusions generally correspond with our findings, notable distinctions exist: our research identifies socioeconomic and infrastructural challenges as primary factors influencing digital progress in Central Asia, whereas Quliyev primarily attributes variations to differing levels of economic development.

While Tleubayev et al. (2024) emphasize the significance of macroeconomic variables and governance frameworks for digital transformation in the Asia-Pacific region, particularly through enabling policies, our investigation partially corroborates these findings. Our research confirms digitalization's developmental importance, albeit with specific reference to South Korean intervention mechanisms. Basnayake et al. (2024)

similarly demonstrate the positive correlation between digital technology adoption and economic advancement across Asia-Pacific, with particular emphasis on financial inclusion benefits. In contrast to Basnayake et al.'s focus on financial inclusion, our research expands the analytical framework to encompass broader dimensions of digitalization – including public service enhancement and digital technology accessibility – thus contributing to a more holistic understanding of digital technologies' impact on economic development trajectories.

Kolbayev et al. (2024) establish digital transformation as a critical catalyst for inclusive and sustainable development paradigms, with particular emphasis on digital access disparities and digital divide mitigation strategies. Their research provides complementary validation of technology accessibility as a determinant factor, yet fails to address specific international support vectors – financial assistance programs, infrastructure investment initiatives, technical capacity building, and international organizational partnerships – which significantly influence digitalization efficacy in Central Asian economies. Bisenovna et al. (2024) highlights that digitalisation has a positive impact on the social processes of Asian countries, in particular, on increasing the participation of citizens in political life and access to information. However, sustainable economic development through digitalisation is broader than the aspect of public diplomacy discussed by K. Bisenovna, emphasising the importance of not only the social, but also the economic benefits of digitalisation.

Alishli et al. (2024) examined South Korea's collaboration with Kazakhstan and Uzbekistan in several industries, including energy, infrastructure, and education. This study concentrates on economic support for digital transformation, highlighting the significance of contemporary technology in fostering sustainable growth, despite conventional industries attracting greater investment than digitalization. In addition, this paper complements the study by Turemuratov et al. (2024), which focused on the impact of digital initiatives on the economic development of Central Asian countries through the promotion of trade and international cooperation, since in both studies digital initiatives were considered as a key factor in stimulating economic growth and integrating the region into the world economy. However, A. Lis et al. (2024) investigated the impact of digitalisation on productivity and competitiveness, which is an important aspect for the analysis in this study.

Conclusions

Digitalisation is a key factor influencing the economic development of

Central Asian countries. It significantly improves productivity in various sectors, promotes the modernisation of public administration, improves access to electronic services and encourages the creation of new jobs. South Korea plays an important role in this process, providing financial and technical support aimed at developing digital infrastructure and educational programmes to improve digital literacy of the population. Digital projects supported by South Korea have a long-term impact on human capital development through training initiatives and technology grants, helping to increase the level of competence among young people and professionals. However, uneven access to high-quality data on digitalisation processes and the lack of a unified approach to measuring its results in the region makes it difficult to conduct an accurate analysis of the impact of digital technologies on the economy, and complicates the comparison of their effectiveness across countries and sectors. On the other hand, the study mainly focused on macroeconomic indicators, so its results do not fully cover the micro-level impact of digitalisation on individual enterprises and social groups. Based on the results obtained, it is advisable to continue studying the impact of digitalisation on small and medium-sized enterprises, since they are the driving force behind economic growth and job creation in the region.

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