

## Article

# The Power of Digitalization, the Hainan Free Trade Port, and Regulations for Modern Economic Development in Turkmenistan Are Significant

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**Abstract:** This study examines the effects of digitization on economic growth in Turkmenistan, emphasizing the legal framework and real-world applications. The definition of “digitalization”, an analysis of its impact on the nation’s economy, and a focus on its unique features are presented first. It then explores several critical issues regarding Turkmenistan’s digital economy’s progress, such as assessing its current economic situation, significant trends, innovation, and challenges. It examines the financial results of implementing the *Concept for the Development of the Digital Economy for 2019–2025* and the impacts of these policies. The report’s conclusion offers some recommendations and a breakdown of the challenges Turkmenistan faces as its digital economy expands, and how technology developments, digitization, and regulatory agendas affect Turkmenistan’s and the Hainan Free Trade Port’s economic growth in Turkmenistan. It examines the possible benefits of using digital technologies to promote trade facilitation and regional economic expansion. The potential and state of the country’s digital economy are better understood. The investigation also emphasizes how vital digital technologies are to advancing society and creating jobs, and this research emphasizes the need for digitization as a successful tool for economic growth and highlights the need for a market economy based on a solid legal framework. One of the central tenets of Turkmenistan’s economic strategy is the development of emerging digital technology. Considering China’s experience, the paper examines Turkmenistan’s digital economy’s legal approach to technology use. Turkmenistan can benefit from this experience just by starting its digital transformation journey.

**Keywords:** economic development; digital economy; digital transformation; legislative approach; innovation



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## 1. Introduction

Turkmenistan is engaging in international affairs and progressively building diplomatic ties with other nations based on principles of equality, good neighborliness, and cooperative mutual benefit while upholding the principle of positive neutrality. The commitment of Turkmenistan to promoting sustainable development at the regional and international levels is a noteworthy aspect of its foreign policy. It participates in international organizations, like the SCO, CIS, EU, UN, and OSCE, and promotes bilateral and multi-lateral communication. Turkmenistan maintains diplomatic ties with 151 countries and participates in 50 international organizations [1]. Turkmenistan has consistently pursued universal peace, security, and stability internationally and continues to actively develop cooperation with interested countries and neighboring states. It has also joined 11 UN bodies and commissions and participates in 178 international conventions and treaties [2]. In recent years, Turkmenistan has implemented several significant reforms to enhance population welfare, maintain macroeconomic stability, and attain sustainable development.

The digital economy is given particular consideration. The goal of the *Concept for the Development of Turkmenistan's Digital Economy for the Period 2019–2025*, put forth by the nation's president, Gurbanguly Berdimuhamedov, is to place Turkmenistan among the 30 most developed countries in the world by the middle of the next century [3].

Turkmenistan, a youthful nation in its third decade of independence, mainly concentrates on economic development, encouraging people and companies to use digital solutions, including cloud-based services, digital payments, and e-commerce, by offering incentives and support. Investment must be revived, sophisticated state management techniques must be put into place, new employment must be created, and information technology must be used to increase the productivity of all industries. Along with these benefits, this procedure also helps to build the financial system, modernize the banking industry, promote commerce, improve education, and digitize government services. However, in the context of the digital economy, Turkmenistan's economic changes nevertheless confront specific difficulties, despite many favorable elements [4]. Among these difficulties are the requirements for information security, workforce training in digital skills, and technology adaptation. Thus, researching the many facets of the digital economy's development and emergence in Turkmenistan is essential from a practical and scientific standpoint. The way that Turkmenistan's regulatory agenda prioritizes traditional trade practices, which may impede the adoption of digital innovations and limit opportunities for international trade, is a clear example of how the two countries approach digitalization and regulation in economic development differently. Hainan's Free Trade Port, on the other hand, embraces digital technologies to improve trade facilitation and streamline customs procedures, resulting in a more efficient and transparent trading environment.

Economists started recognizing the digital economy as a distinct field in the 1990s. Business analyst Don Tapscott coined the term "digital economy" in 1995 [5]. He views the digital economy as a form of economic activity based on network intelligence and closely related to virtual technologies. In recent years, several synonyms have been used to describe the digital economy, including "internet economy", "new economy", and "web economy". A widely recognized concept of the digital economy is the process of producing, selling, and delivering goods and services using computer networks. It represents a type of market where some or all stages of economic processes are carried out using information and communication technologies (ICT), demonstrating economic freedom, innovation, and the level of development of modern economies. Thus, it is essential to understand the difference between digitization, digitalization, and digital transformation in the context of the digital economy, as they define how digital technologies are applied in various aspects of business and society.

The digital economy is an ecosystem defined by a combination of devices, services, and technologies [6]. "The digital economy is an economy based on new methods of generating, processing, storing, and transmitting data, as well as digital computer technologies". A digital economy is a tool that ensures the efficiency and quality of economic relations but in no way replaces economic laws, professional engineering knowledge, or industrial work experience. Through digitization, scientists and practitioners promote the understanding of the conversion of information from analog to digital form, transferring it from physical carriers to digital ones. Thus, digitization represents the process of forming the initial information resource for subsequent structural changes in the processes and mechanisms of interaction among individuals under the influence of ICT development [7].

Three English terms—digitization, digitalization, and digital transformation—are often used in the literature on digitization. Even though these phrases have separate meanings, people frequently mix them. Information conversion to digital form is implied by the term "digitization". Digitalization uses digital technology and digitized information to transform corporate processes and business models. A total reorganization of business based on digital technologies is known as digital transformation. As the use of cutting-edge digital technology helps to raise the productivity and competitiveness of the national industry, digitization is crucial to modernizing the state's economy [8]. This approach strives

to guarantee the efficient use of information resources and enhance business operations at all levels of government. Incorporating digital advances into the nation's economy helps improve the standard of public services, simplify tax procedures, and raise citizen accountability and transparency. Thus, the national modernization and creative development agenda incorporates the digital economy's strategic growth.

## 2. Research Methodology

To gain a comprehensive understanding of the impact of digitalization on Turkmenistan's economic development, the suggested study combines quantitative and qualitative research approaches with a mixed-methods approach. Turkmenistan's national development concepts and legislative frameworks for the digital economy from 2019 to 2025 were thoroughly examined as part of the qualitative component. This would entail carefully examining all government initiatives, plans, and directives intended to encourage the use of new technologies and the digital transformation of diverse industries. Key themes, priorities, and implementation strategies would be identified by carefully examining and categorizing pertinent documents, including national development plans, roadmaps for the digital economy, and legislative and regulatory agendas. To evaluate the economic effects of digitalization, the study's measurable component would use statistical data that is now accessible. It could entail looking at data on productivity metrics, GDP growth, investments in digital infrastructure, and the rates at which different industries adopt technology [9]. A qualified study of the effects of regulation and digitization on the economic growth of Turkmenistan and the Hainan Free Trade Port may be necessary. To find trends, distinctions, and possible relationships between digitalization plans and economic outcomes, this approach would comprise gathering and evaluating data on trade laws, economic indicators, and digitalization projects in both regions. To guarantee the accuracy and validity of the dataset, the research team would, whenever feasible, try to acquire data directly from government agencies and global institutions like the World Bank and the International Telecommunication Union. Researchers provided a more comprehensive, fact-based knowledge of how Turkmenistan's economic development trajectory has been impacted by digitalization in their analysis, allowing for an in-depth exploration of the issue and the identification of various perspectives. A mixed-methods approach is used in this study to evaluate the effect of digitalization on economic growth. The primary analysis methods included comparative analysis, statistical modeling, and synthesis of existing literature. Our study's primary and secondary source materials encompassed diverse sources, including research books, articles, publications, official websites, statistical data, expert opinions, and governmental documents. The main research method and objective of our study is to gain a comprehensive understanding of the impact of digitalization on Turkmenistan's economic development. What are the main directions and priorities of Turkmenistan's national development concepts and legislative frameworks regarding the digital economy, and how does digitalization affect productivity metrics, GDP growth, and investments in digital infrastructure? This included an extensive analysis of government initiatives, plans, and directives aimed at promoting the use of new technologies and the digital transformation of various industries, through carefully examining and categorizing relevant documents, such as national development plans, digital economy roadmaps, and legislative and regulatory agendas. The quantitative part of the study involved using available statistical data to assess the economic effects of digitalization, investments in digital infrastructure, and the adoption rates of technology across different industries. To ensure the accuracy and validity of the dataset, we sought to obtain data directly from government agencies and international organizations, such as the World Bank, the International Telecommunication Union, the State Committee of Turkmenistan for Statistics, the Central Bank of Turkmenistan, the Ministry of Finance and Economy of Turkmenistan, and the Ministry of Education of Turkmenistan, whenever possible, along with the identification of various perspectives. Each statistical method was chosen based on its suitability for analyzing specific factors, for example, regression models were used to determine the

relationship between digitalization and GDP growth, while comparative analysis helped assess differences in technology adoption rates across different industries. It is understood that using official data from government and international organizations already provides a high degree of reliability and credibility. However, where available, cross-referenced data from multiple sources were employed to enhance the accuracy of our analysis. Official information obtained from reputable institutions, such as the State Committee of Turkmenistan for Statistics and the World Bank, serves as a reliable foundation.

### 3. Literature Review

Digital technologies, such as computers, the internet, and mobile devices, are now a necessary component of daily life in modern civilization and significantly influence many different areas, including healthcare, education, and business. The promising technologies that dramatically impact the digitization of the economy include big data analytics, artificial intelligence and robotics, machine learning, cloud computing, data storage, and the Internet of Things. However, they will not replace existing economic operations; they may help make them more efficient by unlocking untapped potential. The digital economy results from the modern information technology revolution embodied by computers, networks, and communications. The primary idea of the digital economy is the utilization of information technologies to enhance processes and services. Individuals, enterprises, and governments are critical participants in the digital economy, reflecting and supporting the need for constant innovation in information technologies, business models, and institutional structures [10]. Among the various components of the digital economy, e-commerce and e-government represent key elements and forces driving its development. Simultaneously, the digital economy encompasses many components, including infrastructure for cloud computing and big data analytics, digital finance, and innovative business models based on data, algorithms, and financing [11]. Digitalization provides opportunities for effective interaction with others, simplifies access to information, and automates production processes, contributing to an improved standard of living [12]. It is important to note that digital technologies promote innovative development and societal competitiveness, leading to increased productivity and an enhanced quality of life [13]. There is a consensus that ICT (Information and Communication Technology) is a crucial factor in these social and economic transformations, harnessing the endless possibilities of an empowered society [14]. Digital economics, as characterized by Li Yi, encompasses various sectors of economic activity, where digital knowledge and information play a crucial role in production processes, information networks serve as essential distribution channels, and the effective use of information and communication technologies contributes to increased efficiency and an optimized economic structure [15].

Digital technologies increase labor productivity, facilitate interaction between people, and overcome geographical barriers. Through digital transformation, access to information and services increases, fostering economic development and stimulating innovative processes. However, it is essential to recognize that modern technologies carry certain risks, necessitating appropriate security measures and responsible usage [16,17]. Particularly in the field of the digital economy, this becomes particularly relevant given the increasing amount of data processed and transmitted through digital platforms. While efforts to create regulations to address these issues are ongoing, they remain relevant and require attention [18]. Another issue in the field of the international digital economy is e-commerce, as it is an integral part of this sphere, including delays at borders, unclear return procedures, insufficient transparency in delivery and pricing information, and limited opportunities to change delivery location and time [19]. It can expose firms to political, legal, and security risks [20]. It also poses challenges in market competition, where companies risk losing customers and market share amidst rapid development and dynamic changes. The contemporary challenges of business, associated with increased competition, instability, and uncertainty in the external environment, require a transformation of existing management mechanisms. Such transformation's primary focus should be enhancing management

decisions' efficiency, flexibility, and relevance. Implementing digital technologies and tools in business is essential for achieving this goal [21]. These risks and problems are linked to underdeveloped official institutions [22]. Significant in this context are laws and regulations and effective enforcement [23].

### 3.1. Concept for the Development of the Digital Economy for 2019–2025

A strategy for the phased execution of the nation's digital revolution is outlined in the *Concept of Development of Turkmenistan's Digital Economy for the Years 2019–2025*. Each outlined phase has distinct aims and objectives within this approach [24]. In 2019, the initial stage begins, which involves formulating and implementing important strategic directions for the growth of the digital economy and establishing fundamental infrastructure and organizational components for further digital transformation (Figure 1). Next, there will be a significant push for projects and initiatives from 2020 to 2023 that aim to digitize different economic sectors and enhance service quality. There is also a greater focus on developing new technologies, building information infrastructure, and raising the general public's level of digital literacy. The Hainan Free Trade Port and digitalization and regulation's impact on economic development in Turkmenistan could explore existing studies on the role of digital technologies in trade facilitation, regulatory contexts in economic development, and the comparative analysis of trade policies between the two regions. It would be helpful for both countries with regards to international collaboration. The last phase, which spans 2024–2025, comprises finishing the primary tasks associated with the Concept's implementation, meeting key performance indicators and outcomes, assessing the efficacy of the actions carried out, and modifying the development plan for later times. Every one of these phases has specific goals and duties that are meant to foster an environment that would support Turkmenistan's digital growth [25]. Looking at each step in isolation seems sensible to better comprehend Turkmenistan's present economic condition. Turkmenistan vigorously pursued a plan to strengthen its economy in 2019, focusing on digital transformation as a top priority for resolving critical financial issues. Significant efforts were made to construct the foundations of the digital economy, commencing with the development of required regulatory and legal frameworks in this sector [26].

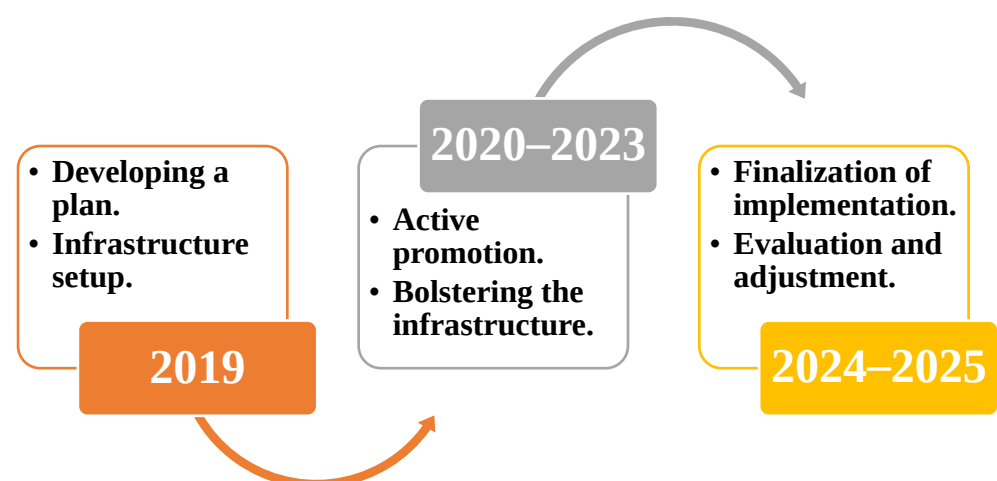


**Figure 1.** Central Bank of Turkmenistan, three stages of implementing Turkmenistan's *Digital Economy Development Concept for 2019–2025*. [https://www.sesric.org/central-bank-detail.php?c\\_code=54](https://www.sesric.org/central-bank-detail.php?c_code=54), accessed on 4 June 2024.

During this period, several legislative acts were adopted and amended, including a new version of the Law on Communications and laws on the legal regulation of internet development and provision of internet services, information, and its protection, information on personal life and its safety, and cybersecurity [27]. To further the transition to a digital

economy, Turkmenistan wants to develop the Caspian Sea Innovations and Technology Center, under which a “digital economic park” would be built to assist the digitalization of essential economic operations in the Caspian Sea area [28]. This step underscores the commitment to strengthening digital infrastructure and fostering regional innovation. In digital transformation, amendments have been made to laws concerning trade activities, innovation, and science and technology parks [29]. These legislation revisions aim to foster creative methods and technical solutions in the economy, offering more advantageous circumstances for investment and collaboration in digital technologies [30].

Thus, in addition to the Caspian Sea Innovations and Technology Center’s establishment, active efforts are underway to establish an institutional and legal framework that will support the growth of the digital economy and foster innovation in the Caspian Sea region [31,32]. Another noteworthy achievement was the passage of a resolution to create an interdepartmental commission for Turkmenistan’s digital economy growth to tackle practical challenges in this sector. The Türkmenaragatnaşyk Agency was designated as the authorized organization for developing the nation’s digital economy after the composition and regulations of the commission were adopted [33]. In 2020, Turkmenistan’s second phase of digital transformation got underway when the commission set up in 2019 convened for the first time to decide on the actions that should be prioritized in implementing the digital economy and to nominate responsible personnel [34]. The Türkmenaragatnaşyk Agency began registering websites with national domain names, protecting against cyber threats on a contractual basis. Additionally, to automate the production activities of local administrations and industry departments and improve services for citizens and businesses, the Unified State Services Portal of Turkmenistan was set up, e.gov.tm [35,36]. This portal represents an automated information system, functioning as a “single window” for providing government services in electronic format. The system allows for centralized acceptance of documents from applicants, monitoring the compliance of processing deadlines, and issuance of results. Currently, the assembled websites of government organizations reflect the level of transition to digitization in each ministry and department. Online provision of communication, transportation, utility payment services, and banking operations has become a reality, all thanks to the improvement of internet connectivity and the increase in the number of network users (Figure 2).

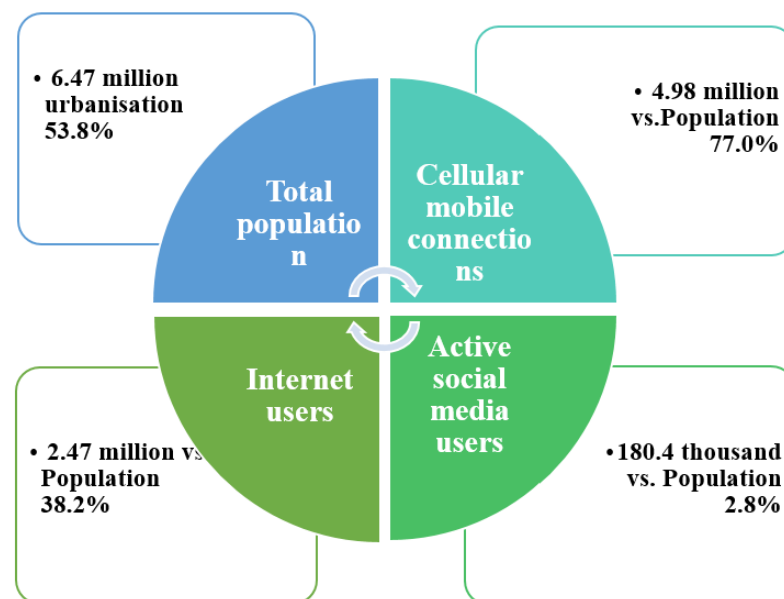


**Figure 2.** Essential digital headlines, January 2023, <https://datareportal.com/reports/digital-2023-turkmenistan>, accessed on 4 June 2024.

The Türkmenaragatnaşyk Agency also prepares projects for the Unified Information System for User Identification of the “Electronic Government” system and others [37]. “An important aspect of this process is the enactment of legislation regulating online commerce under Turkmenistan’s laws on Consumer Protection [38], Trade Activities [39], and Legal Regulation of Internet Development and Provision of Internet Services in Turkmenistan [40]. The Ministry of Trade and Foreign Economic Relations of Turkmenistan developed and introduced the Rules for Distance Selling of Goods in August 2020. These established regulations for online trading processes cover general provisions for remote sales, advertising goods, concluding sales contracts, delivery procedures, consumer rights, and other aspects essential for developing e-commerce in the country [41]. It is planned to establish modern equipment and IT platforms in Ashgabat and regional administrative centers. A competition for innovative projects, *Digital Solution-2020*, was announced to stimulate innovation [42]. Activities were also conducted to attract students to work in the field of digital economy. The Türkmenaragatnaşyk agency organized short-term specialized courses for training personnel in computer technology and cybersecurity [43]. Amendments were made to legislation concerning electronic documents, communication, and internet services. Additionally, a State Cybersecurity Service and a particular cybersecurity group were established. These steps demonstrate Turkmenistan’s comprehensive approach to digital transformation and contribute to achieving the set goals [44].

From 2024 to 2025 (the third stage of the Concept), Turkmenistan will direct its efforts towards consolidating the achieved results and developing new strategies for further development of the digital economy. The main focus is on implementing successful projects in various sectors of the economy and promoting widespread digitization, including trade, to ensure the country’s comprehensive integration into the international digital economic system at this stage, and harmonizing legislation in digital trade and related areas such as customs procedures and certification is planned [45]. Cooperation between supervisory authorities on digital trade and priorities in organizing cross-border flows is also essential to this stage. Furthermore, at this point, plans call for the creation of a regulatory framework to control the gathering and processing of personal data, the adoption of guidelines for the use of cash registers in Turkmenistan’s settlements, the regulation of payments made with QR codes, and the modification of logistical infrastructure to meet the needs of digital trade. These steps are intended to guarantee that the digital economy operates more effectively and foster an environment supporting its growth. Integrating digital technology into Turkmenistan’s economy still confronts several obstacles, albeit the notable advancements in this field [46]. While young people use the internet and digital services often, some older members still do not consider this standard practice, as can be seen in the Proportion of youth and adults with information and communications technology (Table 1) The geographical uniqueness of Turkmenistan between Asia and Europe opens up prospects for applying digital technologies to accelerate progress in various sectors, such as trade, tourism, transportation, and economic connectivity [47]. This allows the country and the region to utilize modern digital solutions to promote growth and development actively, ensuring the efficient functioning of economic corridors and contributing to the overall increase in economic activity [48]. For example, it could be advantageous for Turkmenistan and the Hainan Free Trade Port, in terms of digitalization, technologies, and regulations on economic development, to express cooperative initiatives for knowledge transfer and technology transfer. This study could look into how partnerships that benefit both parties in terms of digital technology adoption and regulatory frameworks can improve trade efficiency, innovation, and economic growth in both areas.

**Table 1.** ICT Adoption levels.

| Year | 18–29 Years | 30–44 Years | 6–17 Years | Proportion of Youth and Adults with Information and Communications Technology (ICT) Skills, by Type of Skill |
|------|-------------|-------------|------------|--------------------------------------------------------------------------------------------------------------|
| 2015 | ...         | ...         | ...        | ...                                                                                                          |
| 2016 | ...         | ...         | ...        | ...                                                                                                          |
| 2017 | ...         | ...         | ...        | ...                                                                                                          |
| 2018 | ...         | ...         | ...        | ...                                                                                                          |
| 2019 | ...         | ...         | ...        | ...                                                                                                          |
| 2020 | ...         | ...         | ...        | ...                                                                                                          |
| 2021 | 93.9        | 68.9        | 96.3       | 68.6                                                                                                         |
| 2022 | ...         | ...         | ...        | ...                                                                                                          |

Source: State Committee of Turkmenistan for Statistics <https://sdg.stat.gov.tm/en/indicator/4-4-1>, accessed on 4 June 2024.

### 3.2. The Current Economic Situation, the Digitization Banking System in Turkmenistan

In tax and budget planning, social protection of residents and sustainable economic prosperity are critical components. The primary goals are prioritizing the development of leading economic sectors, maintaining budgetary stability, and bolstering the state's financial resources. Significant advances in worker productivity and output volumes have coincided with recent expansions in production capacity. Compared to 13.7% in 2019, the overall amount of state revenue to GDP in 2022 was 16.4%. The primary focus of Turkmenistan's State Budget expenditure structure are social necessities, such as citizen social security, healthcare, and education. A separate focus is also placed on developing energy, water supply, transportation networks, and other contemporary, sustainable infrastructure aspects. Measures to improve market relations, encourage investment, and shift toward industrially innovative development have been stepped up in this environment [49,50]. An essential component of sustainable development is implementing and using digital technologies in various spheres of society. Turkmenistan is focusing efforts on accelerating the process of digitalization, including expanding communication infrastructure, digital television, and the internet. The number of internet users in the country exceeds three million, according to data from the Turkmenaragatnashyk Agency [51]. Key macroeconomic indices of the nation's economic development remain stable, and initiatives to strengthen credit and monetary policy are still underway. Furthermore, there is still active assistance for the manufacturing, export-oriented, and import-substitution businesses [52]. Innovation is being broadly incorporated into the banking sector, and collaboration with global financial organizations is growing (Table 2).

Using cutting-edge technology, banks are digitizing their operations to update their organizational structure, increase the variety of goods they provide, and improve client interactions. Banks in Turkmenistan regularly lend money to critical economic sectors, including long-term loans, mortgages, and loans to advance cutting-edge industrial techniques. Banking is studied in *Eastern Neighbor's and Central Asia Challenges and Opportunities* [53]. The digital transformation process makes it possible to expand the range of banking services and opportunities available inside the national payment system, making Turkmen banks more competitive. A vital element of the market economy is the financial system, which shows how open the nation is to change. Using alternative service channels, customers can receive faster service and save more time, thanks to the drastic shift in how banks and customers engage with each other in the banking services industry [54]. Mobile apps are becoming more and more significant as mobile internet technology advances and smartphone capabilities increase. Users go onto the network daily to manage credits, deposits, insurance, and balances and to see and make transfers and payments (Table 3).

**Table 2.** Macroeconomic dashboard.

| Year | Foreign Direct Investment (FDI) to GDP | Growth Rate of Exports of Commodities | Growth Rate of Gross Domestic Product in Comparable Prices | Official Exchange Rate (Unit of Local Currency per US Dollar) | Ratio of the Bank's Capital and Assets | Total Budget Balance, Percentage of GDP |
|------|----------------------------------------|---------------------------------------|------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------|-----------------------------------------|
| 2015 | 8.1                                    | 61.5                                  | 106.5                                                      | 3.5                                                           | 8.07                                   | −0.7                                    |
| 2016 | 5.1                                    | 61.8                                  | 106.2                                                      | 3.5                                                           | 7.44                                   | −1.3                                    |
| 2017 | 3.9                                    | 103.6                                 | 106.5                                                      | 3.5                                                           | 6.92                                   | 0                                       |
| 2018 | 3.2                                    | 149.6                                 | 106.2                                                      | 3.5                                                           | 6.54                                   | 0.2                                     |
| 2019 | 2.9                                    | 95.3                                  | 106.3                                                      | 3.5                                                           | 6.43                                   | 0.1                                     |
| 2020 | 2                                      | 69.3                                  | 105.9                                                      | 3.5                                                           | 6.87                                   | 0.2                                     |
| 2021 | 2.1                                    | 133.7                                 | 106.2                                                      | 3.5                                                           | 7.3                                    | 0.6                                     |
| 2022 | 2.1 *                                  | 142.7                                 | 106.2                                                      | 3.5                                                           | 7.9                                    | 3.4                                     |

Source: Central Bank of Turkmenistan, Ministry of Finance and Economy of Turkmenistan. <https://sdg.stat.gov.tm/en/indicator/17-13-1>, accessed on 4 June 2024. Foreign direct investment to GDP was the same at 2.1 \* in 2020 and 2022.

**Table 3.** The proportion of the population covered by a mobile network, by technology.

| Year | Turkmenistan | Rural | Urban |
|------|--------------|-------|-------|
| 2015 | 93.9         | 87.81 | 100   |
| 2016 | 95.31        | 90.63 | 100   |
| 2017 | 95.63        | 91.26 | 100   |
| 2018 | 96.5         | 93.01 | 100   |
| 2019 | 97.16        | 94.32 | 100   |
| 2020 | 97.76        | 95.52 | 100   |
| 2021 | 97.87        | 95.74 | 100   |
| 2022 | 98           | 96.01 | 100   |

Source: <https://sdg.stat.gov.tm/en/indicator/9-c-1>, accessed on 4 June 2024.

There has been a surge in non-cash payments since the introduction of digital banking cards, like Altyn Asyr, Millikart, Deposit Banking Cards, and Family, along with services like Internet Banking, Mobile Banking, and Contactless Payment. This phenomenon occurs in the context of Turkmenistan's economic digitalization, where the goal is to encourage online banking and foster cross-sector collaboration to maximize the potential of digital services in other sectors of the economy [55]. As the nation's banking system undergoes a digital transformation, more product lines and client engagement channels utilizing contemporary technology are added. There has been progress in creating digital banking and cross-sector digital solutions, as seen by the rise in the number of people using online banking and of plastic card holders between 2017 and 2022 (Figures 3 and 4).

As of 1 January 2023, there were over 5.1 million plastic cardholders and over 900,000 internet banking clients. Additionally, there has been a 65-fold increase in mobile banking clients, reaching over 60,000 users by the beginning of the year. Concurrently, there is a gradual increase in the use of QR codes as a modern means of communication [56]. Credit card payments through payment terminals and the receipt of accumulated interest are two common uses for gadgets and computer alternatives. Bank cards are used to pay for products and services, utility bills, fees for the Road Police Service (including vehicle registration and technical inspection), and costs for other governmental services, like passport renewal and acquisition (Figure 5).

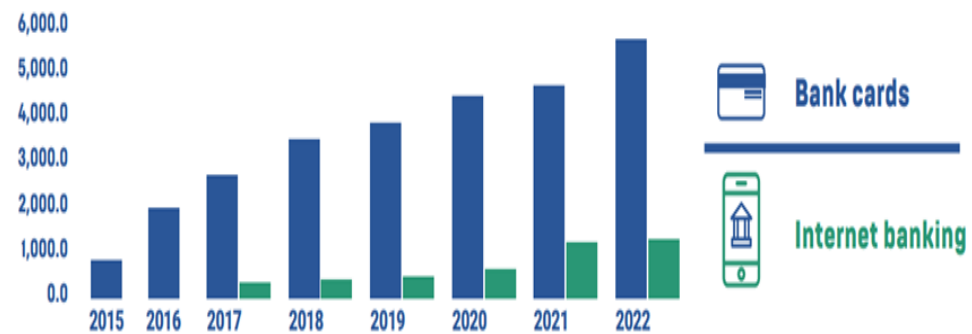


**Figure 3.** Number of users of digital banking products, in thousands, and central bank of Turkmenistan.

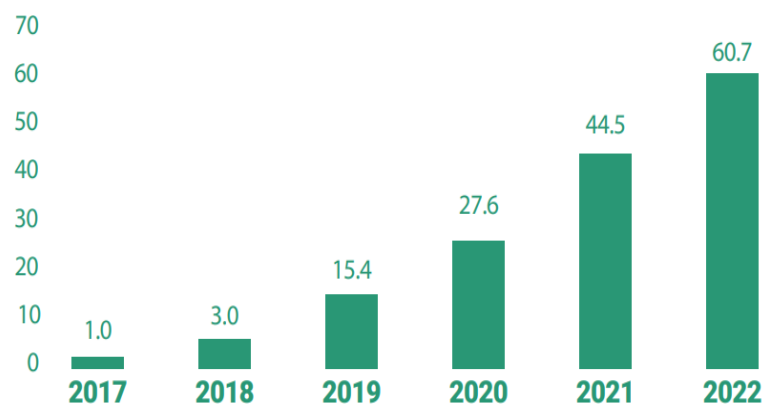


**Figure 4.** The dynamic growth of mobile banking users, in thousands, for Turkmenistan.

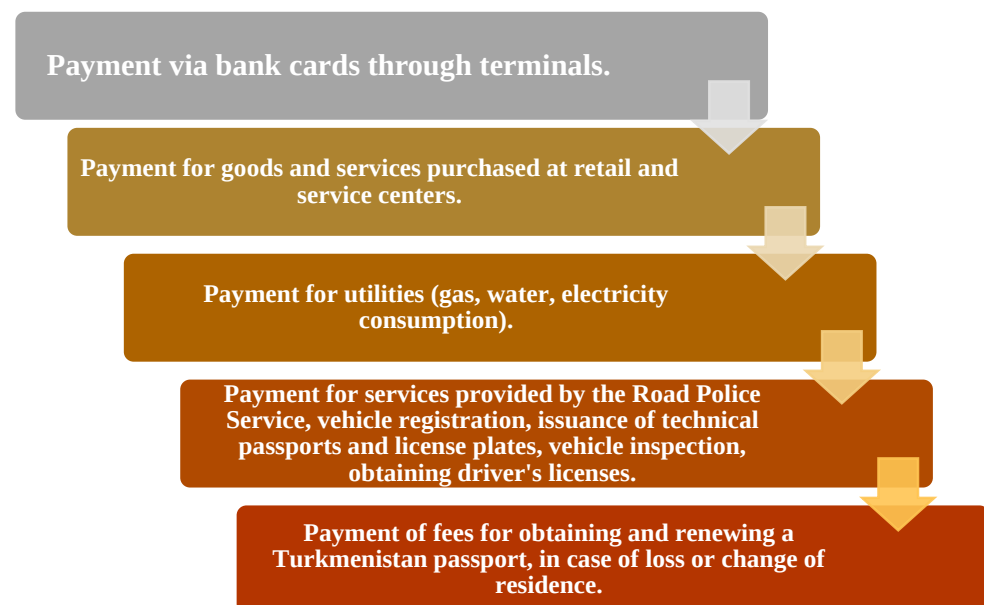


**Figure 5.** Payment via bank cards through terminals (model created by the authors).

A significant milestone in digitalizing banking operations was reached in 2020 when the State Commercial Bank, Halkbank, released the Halkbank terminal, a smartphone application for contactless payments. Installing this technology on a standard smartphone makes it possible to do away with large, cumbersome payment terminals [57]. The wide range of internet services encourages citizens to pursue additional education and enhance their professionalism through distance learning. Implementing digital education contributes to accumulating human capital, attracting innovative resources, and promoting societal

progress and prosperity [58]. Turkmenistan's integration into international projects, such as CAREN and the Virtual Silk Road, demonstrates the country's commitment to joining the global scientific and educational infrastructure. These initiatives, coordinated by the European Union and NATO's Science Committee, respectively, provide Turkmenistan with access to advanced technologies and high-speed internet services. CAREN, initiated in 2010, has established a Turkmen scientific and educational network that provides high-speed internet access for scientific and educational institutions. The main goal of the project is to establish joint scientific and educational work between universities in Central Asia and the European Union. Different approaches to digitalization and regulation in economic development are taken by Turkmenistan and the Hainan Free Trade Port. The goal of Hainan's Free Commerce Port program is to employ digitization to increase efficiency and transparency while fostering commerce and international investment by establishing a free and open market environment. On the other hand, the legislative framework for economic development in Turkmenistan might give priority to conventional sectors and centralized control over digital innovation. Turkmenistan's emphasis on regulation, in contrast to the Hainan Free Trade Port's more liberalized and digitally-driven approach, may affect the rate of digital transformation and global competitiveness.

### 3.3. Digitization in Education

Turkmenistan is undergoing significant educational changes to raise standards and earn a worldwide reputation. The Turkmen Ministry of Education is crucial in formulating the plan for the growth of the educational system and establishing its primary trajectories. Additionally, Turkmenistan favors computerizing educational facilities, giving all schools access to the internet and giving educators more computer-related training. According to the 2016 UNESCO Global Education Monitoring Report, Turkmenistan is among the twelve countries actively working towards achieving global education goals [59]. To ensure that all population segments have access to education and improve the quality of educational services provided by digital technology, Turkmenistan developed a plan in 2017 to create a digital educational system 90 (Figure 6). This tactic entails integrating educational institutions into a single network and technological resources into the teaching and learning process. Creating an educational system akin to industrialized nations and raising educational standards as a critical component of the nation's growth and competitiveness are the principal objectives of Turkmenistan's national education policy, which runs from 2011 to 2030. Deploying ICTs and digitalizing the educational process are vital strategic targets for Turkmenistan's educational growth [60].

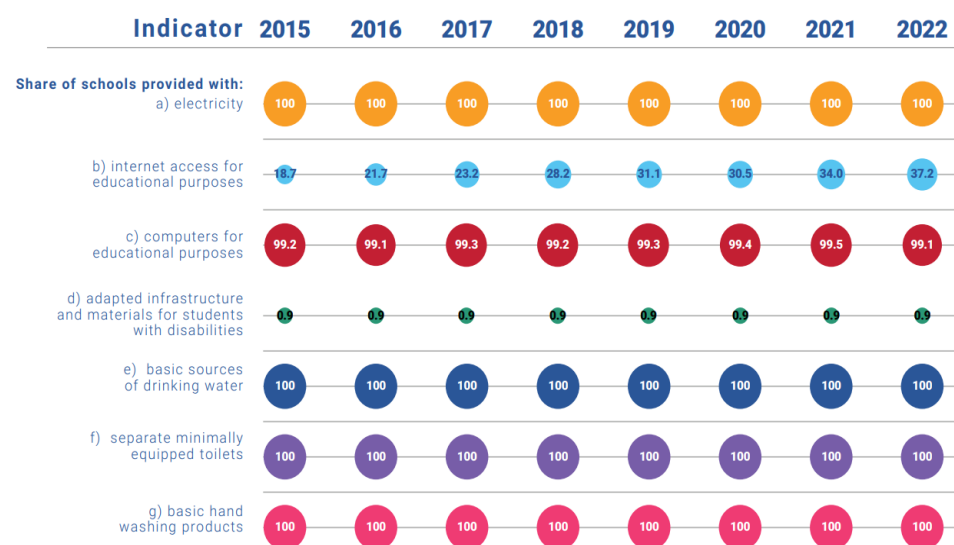


**Figure 6.** Provision of schools with basic infrastructure, % Source: Ministry of Education of Turkmenistan.

### 3.4. Digitization in Trade

The benefits of digital technologies are apparent in how they help the nation's economy flourish, and the idea of digitization is carefully included in important economic policies and all national projects. Digital resources are essential for solving various problems comprehensively and promoting sustainable economic growth. The digital market is one of the industries with the fastest growth and popularity among younger workers. Trade makes up more than ten percent of Turkmenistan's GDP and is a significant economic growth engine. This industry is essential to the digital context because it provides the groundwork for creating cutting-edge technological and creative solutions. The implementation plan includes many comprehensive initiatives to boost local manufacturers' competitiveness and expand e-commerce [61]. The national trade sector in Turkmenistan has established and enhanced its legislative framework for using digital tools in managing wholesale and retail networks, much like other sectors of the country's economy. The Ministry of Trade and Foreign Economic Relations has created and introduced Rules for Remote Sale of Goods, which are meant to regulate e-commerce procedures based on Turkmenistan's laws on Consumer Protection, Trade Activities, and *Legal Regulation of Internet Network Development and Provision of Internet Services in Turkmenistan*. In addition to specifying consumer rights and other issues, the regulations provide general provisions for establishing remote trade, including promoting items, completing buy and sale agreements, and delivery processes to the customer [62]. These guidelines apply to people involved in entrepreneurial activity without creating a legal entity. Currently, shifts in contemporary customers' characteristics and purchasing patterns are significant forces behind the digital revolution in commerce. The rapid advancement in technology, the creation of digital ecosystems, and creative business strategies are some factors contributing to this shift [63]. Experience shows that the most successful way to carry out these kinds of changes is to take a holistic strategy. For instance, to improve labor productivity in the retail industry, it is advised to examine staff needs and put systems in place for tracking and evaluating visitor behavior. Using digital technology makes it possible to increase operational efficiency, which lowers the cost of goods and increases their accessibility in the market [64]. According to several retail professionals, most customers are interested in technological advancements and are eager to employ them actively in retail establishments. As a result, services like smartphone apps for retail chains, contactless payment systems, and self-service cash registers are growing in popularity. Therefore, it is possible to identify two primary trends in Turkmenistan's digitizing trade: the increasing adoption of contemporary technology and the need to examine the clientele thoroughly [65].

### 3.5. Digitization in Media

A suitable procedure for transforming print media into electronic format has been created in line with the *Concept of developing the digital economy in Turkmenistan from 2020 to 2025*. This document gives information on the profitability of converting newspapers and magazines to digital format and describes the stages that should be prioritized to complete the tasks at hand. Website development for print media is significant from a political and economic standpoint. As a result, Turkmen media will be able to spread information about the nation more successfully worldwide. Additionally, websites provide the ability to publish audiovisual details in real-time in addition to textual content [66]. The shift to a digital format for newspapers and magazines resulted in substantial cost savings for printing companies, the preservation of printed products' resources, and less wear and tear on printing machinery. It will enable the reallocation of money saved by switching to digital format to other lucrative business endeavors. Media digitization not only helps create a competitive atmosphere within the domestic information market but may also facilitate entry into the international information market using the appropriate strategy. As a result, recruiting competent journalists, interpreters, and information technology experts is necessary [67]. A pragmatic approach to fostering an environment conducive to the shift toward the digital economy is the resolution creating the Interdepartmental

Commission for the Development of the Digital Economy in Turkmenistan. The commission's mandate is to promote the development of digital technology and its effective use at all governmental and public life stages. It is important to remember that a critical first stage in digital transformation is the ongoing development of infrastructure, scientific and technological capacity, and human resources. It is also essential to research advanced worldwide experience in this area, and it should be highlighted that Turkmenistan has both problems and promising opportunities on the route to the digital economy [68]. The implementation of digital economy policies in Turkmenistan from 2019 to 2022 has shown significant positive impacts on the economy. An analysis of the data reveals substantial growth in household incomes, increases in wages and pensions, positive changes in the production sector, and foreign trade turnover. One of the most notable outcomes is the 32.7% increase in monetary income per household. The average monthly wage in large and medium-sized enterprises increased by 34.6%, indicating positive changes in the standard of living for workers. The average monthly pension rose by 33.7% and state benefits by 48.2%, highlighting the enhanced social support for the population [69]. The effects of digital technologies on international trade practices, regulatory contexts, and economic growth can be investigated through research on trade digitization that focuses on Turkmenistan's economic development regulations and the Hainan Free Trade Port. Examining how digitalization improves the Hainan Free Trade Port's trade facilitation, efficiency, and transparency might shed light on effective digital transformation tactics. Comparatively speaking, examining Turkmenistan's legal framework for trade digitization might highlight potential problems as the country moves towards a more digital economy, including the influence of digital platforms, e-commerce, blockchain technology, and data governance on trade dynamics and regulatory agendas.

#### 4. Discussion and Analysis

Improving the nation's legal system may entail passing new legislation or changing already existing laws, providing more current and transparent legal frameworks that meet the demands of the modern world. Ensuring that rules are clear and easy to understand for individuals and corporations is also crucial. Adopting e-commerce legislation can help Turkmenistan's economy grow in important ways. First, it helps make goods and services more accessible to the general public via internet channels, which promotes market growth and increases competition, which may lead to cheaper pricing for products and services, improving the household budget. Second, enacting e-commerce legislation would increase international investors' trust in Turkmenistan's potential for economic growth. Establishing unambiguous guidelines and assurances for virtual commerce would encourage foreign direct investment and the development of national enterprises. It creates new opportunities for industry growth, including manufacturing, services, and tourism. Additionally, the implementation of an e-commerce law may have the effect of expanding the nation's internet and communication infrastructure [70]. The proposed model for digital economy development for 2019–2025 includes restructuring industrial sectors and the service system. This involves shifting from the production of low-tech and low-value industrial products to high-value-added products, with a focus on supporting high-tech industries; the ongoing process of privatization and conversion to joint-stock companies aims to reduce state ownership, and the reorganization of enterprises is integral to this model. The program incorporates adjustments to marketing strategies. Globalization and international integration open vast markets for businesses, allowing them to leverage the benefits of their investment projects fully [71]. The population's ability to use the internet may be significantly increased by lowering the network connection cost and expanding the number of internet service providers, leading to greater access to informative and educational resources and improved digital literacy. Furthermore, the growth of e-commerce helps to enhance the nation's transportation networks and logistics. Online trading needs effective delivery systems and logistical solutions to fulfill the demand for products and services [72]. As a result, investments in transportation infrastructure can be promoted, leading to enhanced market

accessibility and shorter delivery times. Finally, e-commerce development may enable the modernization of business operations and boost the competitiveness of firms. Online sales allow firms to extend their market and attract new clients locally and abroad [73]. This increases corporate income and promotes economic progress. Thus, an e-commerce law can benefit Turkmenistan's economic growth in many ways, such as making goods and services more accessible, drawing in investments, enhancing the country's internet and communication infrastructure, fostering logistics growth, and modernizing business procedures. Turkmenistan, endowed with significant natural resources, such as natural gas, is actively striving to diversify its economy and develop digital sectors. Recent surveys conducted among representatives of various economic sectors have shown positive results and prospects for the country's digital development, including opinion on the basic conditions and business environment in the country within the framework of the UNECE project. Innovation policies for SPECA countries have been strengthened in support of the 2030 Agenda for Sustainable Development in August 2020. Digital entrepreneurship in the country is gaining momentum. State enterprises and organizations are well-staffed and have a retraining system [74]. There are opportunities for creating small and medium-sized enterprises in the country, and experts note that favorable conditions are being created in Turkmenistan for the development of digital startups, also mentioned in the revolution (Table 4). The existing regulatory and legal framework in Turkmenistan generally meets the goals of digital activity development.

**Table 4.** Advancement of revolution.

| No Aspects of the Environment                                                                                                     | Medium Rank |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1. The authorities are making efforts to reduce administrative barriers to doing business                                         | 4.83        |
| 2. The authorities attach great importance to the development of SMEs, and SMEs have access to various forms of state support     | 4.36        |
| 3. Entrepreneurship is encouraged and the authorities support the development of an entrepreneurial culture                       | 4.55        |
| 4. It is relatively easy for entrepreneurs to start and develop a new business                                                    | 4.09        |
| 5. Enterprises collaborate with research and academic institutions to commercialize the results of their research and development | 3.73        |
| 6. Universities encourage the creation of start-ups and branches to commercialize innovative ideas                                | 3.82        |
| 7. Intellectual property rights of innovative entrepreneurs are well protected by law and regulations                             | 4.00        |
| 8. Innovative entrepreneurs and SMEs have access to public funds to support the early stages of commercializing their ideas       | 3.45        |
| 9. There are adequate private funding sources to support innovative entrepreneurs and SMEs in the early stages of business        | 3.00        |
| 10. SMEs have relatively easy access to bank loans and other commercial finance to grow their businesses                          | 3.73        |

Source: Science, Technology, and Innovation (STI) Gap Assessment for Turkmenistan [62].

#### 4.1. Economic Cooperation, and China's Experience as Inspiration for Turkmenistan

Given its position as a leader in the global economy and impressive track record in using digital technologies and innovations to achieve high levels of success in various fields, China can serve as a model for Turkmenistan. Turkmenistan can learn much from China's recent achievements in e-commerce, digital infrastructure, and artificial intelligence. Essential areas of collaboration were emphasized at the summit in China, which is noteworthy and may benefit Turkmenistan's growth. Particular focus was paid to education, investments, and green corridors, which contribute to more efficient commerce

and overall economic growth and provide ideal conditions for collaboration. Working with top Chinese firms, like Tencent, Alibaba, and Huawei, can help Turkmenistan transmit cutting-edge knowledge and technology, enabling it to create its own inventions and become more competitive internationally [75]. These companies are not only leaders in their industries but also platforms for innovation and development of new technologies, which can stimulate growth and promote the creation of joint projects. Collaborating with China can also help forge new transportation routes and commercial connections, bolstering the region's infrastructure and fostering economic growth. However, for Turkmenistan to effectively exploit China's example, it needs to evaluate the distinctive features of its nation and adopt personalized development policies appropriate to local conditions and requirements. All cooperation participants should be treated equally, and consideration should be given to both regional and national concerns [76]. Conclusively, collaboration with China offers noteworthy prospects for enhancing economic growth and elevating individuals' living standards. However, having a conversation based on mutual respect, openness, and consideration for the interests of all people involved is necessary to obtain good results. Experts claim that most difficulties in advancing research, education, and the application of innovation have previously been handled or are now being resolved based on a study of the state regulatory framework. Nonetheless, it is essential to note that the study has revealed some particular issues and problems that need more development and thorough answers [77].

#### 4.2. Digitization's Social Risks

Modern civilization quickly incorporates digital technology into its political, cultural, and economic spheres. Under these circumstances, the digitalization of education becomes a crucial component of the system's advancement. The increased interest in digital literacy indicates the shift to a knowledge-based society. However, sociological concerns about the population's lack of knowledge of digitization must be addressed if Turkmenistan is to undergo a digital revolution successfully. Enhancing the school system is one way to do this. One possible way to solve this issue is to include *Digitization of All Economic Sectors* in Turkmenistan's curricula. Students will be able to learn the fundamentals of how digital technologies are used in many facets of life [78]. However, success is uncertain when a new subject is added to the curriculum. To do this, Turkmenistan's universities must also draw international academics and specialists in economics and IT to instruct pupils. In the digital economy, students should be assisted to receive high-quality education and taught about cutting-edge global experience. However, there are other facets to the growth of Turkmenistan's digital economy besides schooling (Table 5). One of the significant issues is the inadequate amount of public and private support for the research industry. To address this issue, the government must spend more on experimental design work (R&D) and scientific research to fulfill domestic and international demand.

**Table 5.** Research and development expenditure as a proportion of GDP.

| Year | Turkmenistan |
|------|--------------|
| 2015 | 0.11         |
| 2016 | 0.16         |
| 2017 | 0.09         |
| 2018 | 0.08         |
| 2019 | 0.11         |
| 2020 | 0.13         |
| 2021 | 0.15         |
| 2022 | ...          |

Source: State Committee of Turkmenistan of Statistics <https://sdg.stat.gov.tm/en/indicator/9-5-1>, accessed on 4 June 2024.

Universities and research institutes greatly aid innovative activities; setting up conferences and seminars may help identify essential problems and look for answers. Profession-

als and students participating in these events can share ideas and experiences that lead to a greater comprehension of the issue and the investigation of workable solutions and, to overcome the societal issues brought on by digitalization in Turkmenistan, it is crucial to organize educational seminars, draw in international specialists, and improve the country's educational system. It is critical to remember that, while reaching objectives in this field may present some difficulties, success is still possible with suitable approaches and hard work [79].

#### 4.3. Legal Issues Regarding Digitalization

Economic digitization is thriving in Turkmenistan, but the speed at which technology is developing and progressing puts great pressure on industries. As a result, several important issues need to be addressed. The first is the development of legislation on electronic commerce. As economic digitization grows, laws governing online sales and purchases are required. These laws should address issues like data protection, transaction security, and the rights and obligations of sellers and buyers. The necessity of bolstering cybersecurity is the second issue. With the transformation of all procedures to the online format, securing data safety and confidentiality of purchasers' personal information becomes vital. Enhancing cybersecurity protocols to avert data breaches and illicit information usage is imperative [80]. The third issue is the absence of new regulatory actions to supplement current legislation. Specific laws that have already been adopted call for additional subordinate acts and instructions to make their practical application more precise and straightforward. This will make it easier for businesses and organizations to comprehend the law and use it to fund creative endeavors and scientific research.

The necessity for new legislation on creative enterprise brings us to our fourth concern. Creating new laws that would give start-up businesses specific advantages and incentives for the successful application of novel concepts is necessary to hasten the adoption of innovations in Turkmenistan's private sector. Venture funds founded on private capital are also crucial to assist creative projects. The requirement to create a governmental program to spur innovative growth brings us to our sixth issue. A comprehensive state program that would draw funding from both public and private sources is required to promote the creative development of the nation. It will enable more effective use of resources to fund creative ventures and research. Trade marks like "Gala", "Ýeňiş", "ADT", "Goza", "Wada", "Nusaý", "Bedew", "Bürgüt", "Arwana", "Miras", "Şypaly", "Şapak", "Eýjejik", "Akpamyk", "Merw", "Jeýtun", and "Mäne" will benefit from resolving these concerns since it will create a safe and favorable environment for their online presence and increase export prospects in the global market [81].

#### 4.4. Regulations in Turkmenistan

The *Scientific Intellectual Property LAW* of Turkmenistan (1992) aims to regulate matters regarding the development and use of intellectual property in science and technology via Turkmenistan's law *On Property in Turkmenistan*.

The *On Legal Protection of Algorithms, Programs for Electronic Computers, Databases, and Topologies of Integrated Circuits Law* of Turkmenistan No. 964-XII was passed in 1994. The goal is to regulate relationships concerning the development, application, and legal protection of databases, computer programs, algorithms, and integrated circuit topologies.

Turkmenistan's No. 4065 Presidential Decree, *On Increasing the Efficiency of Scientific Research and Training of Highly Qualified Personnel*, was issued in 1999. Its objective was to ensure efficient resolutions to pressing scientific and technological problems in key sectors of Turkmenistan's socioeconomic growth and raise the caliber of training and certification for highly skilled scientists.

Law No. 52-IV of Turkmenistan (2009) *On the Status of Scientific Workers* had the goal of providing clarity on the rights, obligations, and responsibilities of scientific workers, as well as the standards by which state authorities must uphold the freedom of scientific inquiry and the social protection of scientific workers.

The *On Scientific Organizations Law* of Turkmenistan (2012) aimed to classify the many scientific organizations in the nation, define their legal status, purposes, and powers, and ensure governmental regulation of their operations.

#### 4.5. Technical Issues of Digitalization

As with many other nations, Turkmenistan's economic development increasingly depends on digital technologies. However, technological obstacles must be removed to implement digital transformation successfully [82]. Slow internet is the first problem. There is just one ISP in the nation, which restricts the availability of fast internet. This impedes the usage of contemporary technology and the growth of businesses, education and internet services. Restrictions on access to particular online resources can become a big concern. It may impede the growth of companies, the sharing of knowledge between individuals and organizations, and the learning process. The absence of operational IT parks and the underrepresentation of colleges as business accelerators are further problems. This impedes the growth of the information technology infrastructure and expertise required to support the digital economy. Notwithstanding the benefits of digital transformation, such as better information accessibility and more effective corporate operations, several issues still need to be resolved. However, considering resources and efforts, these challenges may be remedied [83]. Taking the necessary precautions to prevent and manage any dangers and hazards from using digital technology, such as social inequality, cyberattacks, and data breaches, is crucial.

#### 4.6. Study Outcomes

An example of a hypothesis for Turkmenistan's Modern Economic Development might be that Turkmenistan's market-oriented reforms would increase foreign direct investment and economic growth.

Strong regulatory frameworks in Turkmenistan would promote transparency and accountability in the financial sector, fostering investor confidence, which is one possible theory regarding regulation.

One possible hypothesis for technical theories is that Turkmenistan's adoption of advanced technological infrastructure would boost the country's competitiveness and productivity in important industries.

*Modern Digital Marketing Technologies in the Digital Economy of Turkmenistan*, by Mere-dova and Kakayeva examines the economic impact of information and communication technologies (ICT) on the country, highlighting the convenience and advantages of online payments and e-services [84].

Additionally, in the 2012 article *The Role of ICT in the Social and Economic Development of Turkmenistan*, Orazbaev discusses the early stages of Turkmenistan's efforts in e-government and ICT implementation, outlining the primary objectives of the National Program of Socio-Economic Development (NPSED) for 2011–2030 and addressing key issues and potential challenges in its execution. Orazbaev's article also explores the role of ICT in the fields of health, science, education, and governance [85]. In *Foreign Aid and ICT Policy in Central Asia* by McGlinchey and Johnson, the authors explore changes in the ability of authoritarian states to control Information and Communication Technology (ICT). They investigate why Central Asian governments pursue internet-oriented policies, despite being equally repressive towards traditional media. The study finds that internet regulatory policies in Central Asian countries vary depending on the sources of financial capital for ICT development. Where the international community provides funding and assistance for ICT infrastructure, as seen in Kyrgyzstan and, to a lesser extent, Uzbekistan, the regulatory environment is more transparent, allowing for more open electronic media. In contrast, in Kazakhstan, Tajikistan, and Turkmenistan, where domestic actors fund ICT infrastructure development, regulation is unclear, and government oversight and involvement are more extensive [86].

## 5. Conclusions and Future Directions of Research

Turkmenistan's model of economic development has provided organizational information on the current status of digitalization. First, the analysis of the economy's current level of digitalization reveals important information. First, implementing the cutting-edge agendas and procedures for overseeing financial transactions described in the *Concept of Development of the Digital Economy from 2019–2025* would greatly boost Turkmenistan's economic potential. Second, innovation propels digital technologies forward, strengthening legal contexts along the way. Businesses need to actively adopt digital innovations and stay up-to-date with technological breakthroughs to survive in today's competitive market. The digital economy is becoming a more important component of the growth strategy in Turkmenistan and other countries. However, the digital economy also poses financial difficulties, some of which are specific to Turkmenistan. We must establish cybersecurity and e-commerce legislation to guarantee the security and privacy of personal information. This emphasizes how urgent it is to adopt cybersecurity legislation and give these issues top priority. Security and economic issues are related. Furthermore, strategic alliances with developed countries provide special opportunities for faster economic expansion. China's joint initiatives set an example for other nations, such as Turkmenistan, encouraging them to work together to promote the growth of their digital economies. The convergence of digitalization, theories, and hypotheses as engines of economic progress in Turkmenistan highlights the potential for transformation that arises from adopting digital innovations within certain economic, political, and social contexts. It underscores the importance of developing cybersecurity legislation and places these issues at the forefront of the agenda. As a result, we observed how interrelated and dependent economic and security issues are on one another. Finally, it is essential to remember that collaboration with industrialized nations provides unique chances for faster economic growth. China's experience is one example of this kind of cooperation, and it serves as an inspiration to many other countries, including Turkmenistan, when it comes to collaboration and the growth of the digital economy.

### 5.1. Future Direction of Study

Future research might examine Turkmenistan's long-term goals and policies for promoting digital economic growth from 2019 to 2025, building on the baseline created by this study. Examining the nation's legislative frameworks and national development principles concerning the digital economy would be beneficial. Scholars may focus more intently on specific businesses or sectors where digitalization has had the most prominent effects, looking at case studies to comprehend how adopting new technologies has fueled economic growth, efficiency, and productivity. Evaluating how the government might support this digital transition through partnerships, investments, and laws would be helpful. Additionally, Turkmenistan may find beneficial best practices and benchmarks from cross-country comparisons with other Central Asian countries pursuing digital growth. This more comprehensive regional viewpoint could inform more extensive policy proposals. The Turkmen government, in collaboration with the United Nations, is considering projects to reform and strengthen public administration, including macroeconomic regulation and e-government. Turkmenistan promotes the development of telemedicine, and the digitization of economic, industrial, and management activities would enable the development of Smart Cities. Turkmenistan has recently made substantial preparations for the transition to a digital economy. The information market is expected to become a crucial sector of Turkmenistan's economy, significantly influencing the growth of other sectors and macroeconomic processes. A notable milestone in this regard was the launch of a unified site for government services and operations, showcased at the international exposition Turkmenistan 2019 [87].

### 5.2. Limitation of This Investigation

The accessibility and accuracy of the data present in this study could be one of its possible limitations. Since the government frequently controls information, gathering thorough

economic and technological data from Turkmenistan can be difficult. It could be challenging for researchers to find precise, current data on adoption rates, digital infrastructure, and the effects of digitalization in various industries. One such constraint may be the rate of change. The sphere of digitalization is rapidly changing, and Turkmenistan's circumstances could change much more quickly than anticipated, based on the research. The study's conclusions could not hold for long before they must be reviewed and modified. The research must also consider Turkmenistan's distinct political and social background properly. Findings on the contribution of digitalization to the nation's economic progress may be significantly impacted by the authoritarian government's attitude toward technology and data sharing. It will be essential to take these contextual considerations into account.

### 5.3. Policy of Recommendations

It is crucial to acknowledge the revolutionary potential that digitalization and regulation technologies represent for Turkmenistan, China, and the Hainan free trade port when studying their effects on economic development in these locations. These regions can drive their economies towards sustainable growth and innovation by utilizing digital innovations and putting strong regulatory contexts in place. To optimize the advantages of digitalization, governments should invest in digital infrastructure, create an atmosphere that is favorable to technology integration, and encourage cooperation between government, business, and academia. Furthermore, promoting knowledge-sharing programs between China, Turkmenistan, and the Hainan free trade port can promote reciprocal education and promote synergistic economic growth. To make wise policy decisions and wise investments in the digital era, this research provides a rare chance to investigate the dynamic junction of digital technology and economic development.

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## References

1. Türkmenmetbugat. Available online: <https://turkmenmetbugat.gov.tm/en> (accessed on 16 May 2024).
2. Treaties and Other International Agreements: The Role of the United States Senate. Available online: <https://www.govinfo.gov/content/pkg/CPRT-106SPRT66922/html/CPRT-106SPRT66922.htm> (accessed on 16 May 2024).
3. Wang, S.; Li, Y.; Khaskheli, M.B. Innovation Helps with Sustainable Business, Law, and Digital Technologies: Economic Development and Dispute Resolution. *Sustainability* **2024**, *16*, 3910. [CrossRef]
4. Yang, L.; Liu, J.; Yang, W. Impacts of the Sustainable Development of Cross-Border E-Commerce Pilot Zones on Regional Economic Growth. *Sustainability* **2023**, *15*, 13876. [CrossRef]
5. Tapscott, D. *The Digital Economy: Promise and Peril In The Age of Networked Intelligence*, 1st ed.; McGraw-Hill: New York, NY, USA, 1997; ISBN 978-0-07-063342-1.
6. Bumann, J.; Peter, M. Action Fields of Digital Transformation—A Review and Comparative Analysis of Digital Transformation Maturity Models and Frameworks. In *Digitalisierung und Andere Innovationsformen im Management*; German Research Foundation: Bonn, Germany, 2019; pp. 13–40, ISBN 978-3-906129-97-6.

7. Digital Business Ecosystems—Publications Office of the EU. Available online: <https://op.europa.eu/en/publication-detail/-/publication/53e45e55-4bd2-42a4-ad25-27b339b051e0> (accessed on 29 June 2024).
8. Khaskheli, M.B.; Wang, S.; Yan, X.; He, Y. Innovation of the Social Security, Legal Risks, Sustainable Management Practices and Employee Environmental Awareness in The China–Pakistan Economic Corridor. *Sustainability* **2023**, *15*, 1021. [CrossRef]
9. Fan, M.; Liu, J.; Tajeddini, K.; Khaskheli, M.B. Digital Technology Application and Enterprise Competitiveness: The Mediating Role of ESG Performance and Green Technology Innovation. *Environ. Dev. Sustain.* **2023**, *25*, 1–31. [CrossRef]
10. Daojiong, Z.; Dong, T. China in International Digital Economy Governance. *China Econ. J.* **2022**, *15*, 187–201. Available online: <https://www.tandfonline.com/doi/abs/10.1080/17538963.2022.2067690> (accessed on 16 May 2024). [CrossRef]
11. Cheng, J.; Zeng, J. “Digital Silk Road” as a Slogan Instead of a Grand Strategy. *J. Contemp. China* **2023**, *32*, 1–16. [CrossRef]
12. Meyer, M.A.; Peter, M.K. Evolving Marketing Strategies for Swiss SMEs in the ICT Sector: A Marketing Strategy Canvas in Support of Digital Transformation. *Int. J. Technol. Mark.* **2024**, *18*, 91–112. Available online: <https://www.inderscienceonline.com/doi/abs/10.1504/IJTMKT.2024.135672> (accessed on 16 May 2024). [CrossRef]
13. Persaud, A.; Zare, J. Beyond Technological Capabilities: The Mediating Effects of Analytics Culture and Absorptive Capacity on Big Data Analytics Value Creation in Small- and Medium-Sized Enterprises. *IEEE Trans. Eng. Manag.* **2024**, *71*, 7147–7159. [CrossRef]
14. Yazov, B. Exploring the Status of ICT in Education in Turkmenistan for Achieving the Education 2030 Agenda. *Asia-Pac. J. Coop. Educ.* **2020**, *16*, 21–34. [CrossRef]
15. Zhang, W.; Zhao, S.; Wan, X.; Yao, Y. Study on the Effect of Digital Economy on High-Quality Economic Development in China. *PLoS ONE* **2021**, *16*, e0257365. [CrossRef]
16. Jimmy, F.N.U. Cyber Security Vulnerabilities and Remediation through Cloud Security Tools. *J. Artif. Intell. Gen. Sci. (JAIGS)* **2024**, *2*, 129–171. [CrossRef]
17. Hongdo, Q.; Khaskheli, M.B.; Rasheed, R.; Mukhtar, H. The Role of China in Influencing Indo-Pak Relations in Contemporary Era. *Eur. J. Econ. Law Pol.* **2019**, *6*, 55. [CrossRef]
18. McMullan, J. A New Understanding of ‘New Media’: Online Platforms as Digital Mediums. *Convergence* **2020**, *26*, 287–301. [CrossRef]
19. Bosona, T. Urban Freight Last Mile Logistics—Challenges and Opportunities to Improve Sustainability: A Literature Review. *Sustainability* **2020**, *12*, 8769. Available online: <https://www.mdpi.com/2071-1050/12/21/8769> (accessed on 16 May 2024). [CrossRef]
20. Grant, K.; Edgar, D.; Sukumar, A.; Meyer, M. ‘Risky Business’: Perceptions of e-Business Risk by UK Small and Medium Sized Enterprises (SMEs). *Int. J. Inf. Manag.* **2014**, *34*, 99–122. [CrossRef]
21. Appio, F.P.; Frattini, F.; Petruzzelli, A.M.; Neirotti, P. Digital Transformation and Innovation Management: A Synthesis of Existing Research and an Agenda for Future Studies—Appio. *J. Prod. Innov. Manag.* **2021**, *38*, 4–20, Wiley Online Library. Available online: <https://onlinelibrary.wiley.com/doi/abs/10.1111/jpim.12562> (accessed on 16 May 2024). [CrossRef]
22. Doh, J.; Rodrigues, S.; Saka-Helmhout, A.; Makhija, M. International Business Responses to Institutional Voids. *J. Int. Bus. Stud.* **2017**, *48*, 293–307. Available online: <https://link.springer.com/article/10.1057/s41267-017-0074-z> (accessed on 16 May 2024). [CrossRef]
23. Clegg, J. International Business Policy: What It Is, and What It Is Not. *J. Int. Bus. Policy* **2019**, *2*, 111–118. Available online: <https://link.springer.com/article/10.1057/s42214-019-00025-w> (accessed on 16 May 2024). [CrossRef]
24. Утверждена Концепция развития цифровой экономики в 2019–2025 годах (The Concept for the Development of the Digital Economy Has Been Approved in 2019–2025). Available online: <https://turkmenistan.gov.tm/ru/post/32599/utverzhdena-kontseptsiya-razvitiya-tsifrovoy-ekonomiki-v-2019-2025-godakh> (accessed on 16 May 2024).
25. Закон Туркменистана от 12 марта 2010 года № 93-IV «О связи» (с изменениями и дополнениями по состоянию на 13.11.2021 г.) (Law of Turkmenistan Dated March 12, 2010, No. 93-IV “On Communications” (with Amendments and Additions as of 13 November 2021)). Available online: [https://online.zakon.kz/Document/?doc\\_id=31342032](https://online.zakon.kz/Document/?doc_id=31342032) (accessed on 16 May 2024).
26. Law of Turkmenistan. About Legal Regulation of Development of the Internet and Rendering Internet Services in Turkmenistan. Available online: <https://cis-legislation.com/document.fwx?rgn=71997> (accessed on 16 May 2024).
27. Закон Туркменистана от 20 декабря 2014 года № 159-V «О правовом регулировании развития сети Интернет и оказания интернет-услуг в Туркменистане» (с изменениями и дополнениями по состоянию на 13.11.2021 г.) (Law of Turkmenistan dated December 20, 2014 No. 159-V “On the Legal Regulation of the Development of the Internet and the Provision of Internet Services in Turkmenistan” (with Amendments and Additions as of 13 November 2021)). Available online: [https://online.zakon.kz/Document/?doc\\_id=31648447](https://online.zakon.kz/Document/?doc_id=31648447) (accessed on 16 May 2024).
28. Anceschi, L. *Turkmenistan’s Foreign Policy: Positive Neutrality and the Consolidation of the Turkmen Regime*; Routledge: London, UK, 2008; ISBN 978-0-203-89231-2.
29. Kuldosheva, G. *Challenges and Opportunities of Digital Transformation in the Public Sector in Transition Economies: Examination of the Case of Uzbekistan*; ADBI Working Paper Series; Development Bank Institute: Tashkent, Uzbekistan, 2021.
30. Nechaev, A.S.; Morozevich, O.A.; Kuznetsova, O.N.; Na, B. The Impact of Digitalization in the Economy on the Infrastructure of North and Central Asia. In *Proceedings of the Digital and Information Technologies in Economics and Management*; Gibadullin, A., Ed.; Springer International Publishing: Cham, Switzerland, 2022; pp. 190–201.

31. China and Central Asian Countries Jointly Building the Digital Silk Road: Foundations, Challenges and Paths 82 China International Studies 2020. Available online: <https://heinonline.org/HOL/LandingPage?handle=hein.journals/chintersd82&div=14&id=&page=> (accessed on 16 May 2024).
32. Satymov, R.; Bogdanov, D.; Breyer, C. The Value of Fast Transitioning to a Fully Sustainable Energy System: The Case of Turkmenistan. *IEEE Access* **2021**, *9*, 13590–13611. [CrossRef]
33. Kassen, M. Promoting Public Cooperation in Government: Key Drivers, Regulation, and Barriers of the e-Collaboration Movement in Kazakhstan. *Int. Rev. Adm. Sci.* **2019**, *85*, 743–762. Available online: <https://journals.sagepub.com/doi/abs/10.1177/0020852317735595> (accessed on 16 May 2024). [CrossRef]
34. Çağlayan Akay, E.; Akay, E.Ç.; Oskonbaeva, Z. Does Wagner’s Hypothesis Explain the Dynamics of Health Expenditures in Transition Countries? *Transylv. Rev. Adm. Sci.* **2024**, *20*, 44–62. [CrossRef]
35. Knox, C.; Orazgaliyev, S. Sustainable Development Goals and Good Governance Nexus: Implementation Challenges in Central Asia. *Public Adm. Dev.* **2024**, *44*. Available online: <https://onlinelibrary.wiley.com/doi/abs/10.1002/pad.2038> (accessed on 16 May 2024). [CrossRef]
36. Batool, U.; Kayani, S.; Riaz, M.A.; Maryam, A.; Khaskheli, M.B. Comparative perceptions of teachers and students about the use of competencies by teachers in the classroom. *Int. J. Res. Humanit. Arts Lit.* **2018**, *6*, 2347–4564.
37. Stages of Transition to e-Government in the Digital Economy. Available online: <https://cyberleninka.ru/article/n/stages-of-transition-to-e-government-in-the-digital-economy/viewer> (accessed on 16 May 2024).
38. Semenova, Y.; Lim, L.; Salpynov, Z.; Gaipov, A.; Jakovljevic, M. Historical Evolution of Healthcare Systems of Post-Soviet Russia, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Armenia, and Azerbaijan: A Scoping Review. *Heliyon* **2024**, *10*, 26. [CrossRef] [PubMed]
39. Liu, H.; Xu, C.; Lim, G. The China Effect on Regional Economic Integration: A Longitudinal Study of Central, South, and Southeast Asia. *J. Asia Pac. Econ.* **2023**. Available online: <https://www.tandfonline.com/doi/full/10.1080/13547860.2023.2258018> (accessed on 16 May 2024).
40. Kertiev, K.; Jumaev, R.; Allamuradov, M. Turkmenistan in the Modern World Market. *E3S Web Conf.* **2023**, *376*, 05004. [CrossRef]
41. Economic and Social Commission for Asia and the Pacific; Zaveri, S. Evaluation of the Project on E-Commerce Capacity Building for Women-Led SMEs in South Asia. **2023**. Available online: <https://hdl.handle.net/20.500.12870/6515> (accessed on 16 May 2024).
42. Khan, H. Externalisation of Domestic Economic Constraints: China’s Spatial Fix in Kazakhstan and Turkmenistan. *SINERGI J. Strateg. Stud. Int. Aff.* **2023**, *3*, 6–26. Available online: <https://sinergiukm.my/jou/index.php/sei/article/view/75> (accessed on 16 May 2024). [CrossRef]
43. Dadakhonov, A.O. The Effectiveness of Foreign Aid in the Sphere of Media and Information Literacy in Central Asian Countries. *Adv. J. Commun.* **2024**, *12*, 48–72. [CrossRef]
44. Technology Advancement and International Law in Marine Policy, Challenges, Solutions and Future Prospective—ProQuest. Available online: <https://www.proquest.com/openview/45b1d47de49d3618c80f6bb4e24a7dfe/1?pq-origsite=gscholar&cbl=2049538> (accessed on 24 January 2024).
45. An Exploration of Paperless Trade Implementation in UN and Other International Conventions Involving Cross-Border Exchange of Trade-Related Data and Documents. Available online: <https://repository.unescap.org/handle/20.500.12870/6809> (accessed on 16 May 2024).
46. Khaskheli, M.; Bishaw, A.; Mapa, J.; Santos, C. TOW Environmental Migrants in the International Refuge Law and Human Rights: An Assessment of Protection Gaps and Migrants’ Legal Protection. *Sci. Jurid. Sci.* **2020**, *3*, 52–59. [CrossRef]
47. Majid, S.; Zhang, X.; Khaskheli, M.B.; Hong, F.; King, P.J.H.; Shamsi, I.H. Eco-Efficiency, Environmental and Sustainable Innovation in Recycling Energy and Their Effect on Business Performance: Evidence from European SMEs. *Sustainability* **2023**, *15*, 9465. [CrossRef]
48. Nurashava, K.K.; Shalabayev, I.I.; Abdikerimova, G.I.; Kulanova, D.A.; Mergenbayeva, A.T. Capital Inflow and Investment Attractiveness of Central Asian Countries (on the Example of Kazakhstan). *Reg. Sci. Policy Pract.* **2024**, *15*, 100039. [CrossRef]
49. Bishaw, A.A.; Khaskheli, M.B. Chinese Unprecedented Move Towards Its One-Belt –One- Road Initiative (OBOR): Unfolding the Mythic Realities of Chinese Sphere of Legal Influence in the International Legal Order. *Int. Aff. Glob. Strategy* **2019**, *70*, 21.
50. World Bank Open Data. Available online: <https://data.worldbank.org> (accessed on 3 June 2024).
51. Hussain, F.; Hussain, Z.; Khan, M.I.; Imran, A. The Digital Rise and Its Economic Implications for China through the Digital Silk Road under the Belt and Road Initiative. *Asian J. Comp. Politics* **2024**, *9*, 238–253. [CrossRef]
52. Supporting Digital Transformation in Banking. Available online: <https://www.undp.org/turkmenistan/projects/supporting-digital-transformation-banking> (accessed on 3 June 2024).
53. Banking in the Eastern Neighbours and Central Asia—Challenges and Opportunities. Available online: <https://hdl.handle.net/10419/88942> (accessed on 3 June 2024).
54. Yan, X.; Khaskheli, M.B.; Wang, S. The Requirements for Filing a Consumer Public Interest Litigation in China. *MEJM Middle East J. Manag.* **2022**, *11*, 23–42. [CrossRef]
55. OECD. *Improving the Legal Environment for Business and Investment in Central Asia: Progress Report*; OECD: Paris, France, 2023; ISBN 978-92-64-51239-9.

56. Turkmenistan Discloses Number of Mobile Banking Service Users. Available online: <https://www.azernews.az/region/205563.html> (accessed on 3 June 2024).
57. Session of the Government: Main Vectors of Foreign Policy, Strategy of Diversification of Economy | Mazar-i-Sharif, Islamic Republic of Afghanistan–Consulate of Turkmenistan. Available online: <https://mazari.tmconsulate.gov.tm/en/news/63706> (accessed on 3 June 2024).
58. Ao, L.; Bansal, R.; Pruthi, N.; Khaskheli, M.B. Impact of Social Media Influencers on Customer Engagement and Purchase Intention: A Meta-Analysis. *Sustainability* **2023**, *15*, 2744. [CrossRef]
59. UnescoPhysicalDocument. Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000245752> (accessed on 3 June 2024).
60. Turkmenistan Releases Its Second Voluntary National Review on the Sustainable Development Goals. 2023. Available online: <https://www.undp.org/turkmenistan/press-releases/turkmenistan-releases-its-second-voluntary-national-review-sustainable-development-goals> (accessed on 3 June 2024).
61. Erkan, A.Ç. The West Alternative in Turkmenistan’s Energy Security. *MJSS* **2023**, *12*, 691–715. [CrossRef]
62. Trunk, A. Some Notes on the Law of Sales Contracts in the Region of the Caucasus and Central Asia. In *Law of International Trade in the Region of the Caucasus, Central Asia and Russia*; Brill Nijhoff: Leiden, The Netherlands, 2022; pp. 235–241, ISBN 978-90-04-35783-9.
63. Saleem, H.A.R.; Khaskheli, M.; Fareed, S. Legal Framework for Gene Editing in Human Genome “World’s First Mutant Twins by China”. *IOSR J. Humanit. Soc. Sci. (IOSR-JHSS)* **2019**, *24*, 25–32.
64. Digitalization in Central Asia: Progress and Potential. SpringerLink. Available online: [https://link.springer.com/chapter/10.1007/978-3-031-50966-7\\_4](https://link.springer.com/chapter/10.1007/978-3-031-50966-7_4) (accessed on 3 June 2024).
65. Kepbanov, Y.; Horák, S.; Ovezmyradov, B. *The Investment Climate in Turkmenistan: Challenges and Possible Ways of Attracting Foreign Investment*; Research report in Sociology of Law 2022:3; Sociology of Law, Lund University: Lund, Sweden, 2022; ISBN 978-91-7267-461-5.
66. Kreishan, A.K. Media in Dictatorial Regimes: Case Study of North Korea, Turkmenistan, and Russia. *Eximia* **2022**, *5*, 717–733.
67. Turkmenistan: Stability Through Regime Mobilisation | SpringerLink. Available online: [https://link.springer.com/chapter/10.1007/978-981-15-9093-1\\_5](https://link.springer.com/chapter/10.1007/978-981-15-9093-1_5) (accessed on 3 June 2024).
68. Penchuk, A.; Tur, O. Development of Foreign Trade Relations between Ukraine and Turkmenistan. 2020. Available online: <https://dspace.nuft.edu.ua/handle/123456789/38765> (accessed on 3 June 2024).
69. Voluntary National Review of Turkmenistan | United Nations in Turkmenistan. Available online: <https://turkmenistan.un.org/en/196377-voluntary-national-review-turkmenistan> (accessed on 29 June 2024).
70. Legal Regulation of the Internet Around Post-Soviet Space | SpringerLink. Available online: [https://link.springer.com/chapter/10.1007/978-3-031-32507-6\\_3](https://link.springer.com/chapter/10.1007/978-3-031-32507-6_3) (accessed on 3 June 2024).
71. Heidari, A.; Navimipour, N.J.; Unal, M. Applications of ML/DL in the Management of Smart Cities and Societies Based on New Trends in Information Technologies: A Systematic Literature Review. *Sustain. Cities Soc.* **2022**, *85*, 104089. [CrossRef]
72. Altunisik, N.; Gencoglu, S.; Turkmen, D.; Sener, S. Assessing Public Awareness and Perception of Teledermatology via Survey. *Dermatol. Pract. Concept.* **2024**, *14*, e2024093. [CrossRef]
73. Nourin, S.; Tran, V.; Jiang, X.; Bock, K.; Feamster, N.; Hoang, N.P.; Levin, D. Measuring and Evading Turkmenistan’s Internet Censorship: A Case Study in Large-Scale Measurements of a Low-Penetration Country. In *Proceedings of the ACM Web Conference, New York, NY, USA, 30 April 2023*; Association for Computing Machinery: New York, NY, USA, 2023; pp. 1969–1979.
74. Heidari, A.; Jafari Navimipour, N.; Unal, M. The History of Computing in Iran (Persia)—Since the Achaemenid Empire. *Technologies* **2022**, *10*, 94. [CrossRef]
75. Myrat, H.; Jun, Y.Z. Natural Gas Trade between Turkmenistan and China in the Context of the BRI. *Int. J. Bus. Mark. Manag.* **2023**, *8*, 121–130.
76. Aripin, Z.; Paramarta, V. Kosasih between innovation and challenges: Utilization of blockchain and cloud platforms in the transformation of banking services in the digital era. *J. Jabar Econ. Soc. Netw. Forum* **2024**, *1*, 1–16.
77. Linn, A.; Shrestha, P.; Bezborodova, A.; Hultgren, A.K. *Current Practice in English-Medium Education in Higher Education: Case Studies from Kazakhstan, Turkmenistan, Bangladesh and Nepal*; British Council: London, UK, 2021; ISBN 978-0-86355-992-1.
78. Ting, C.; Rugiadi, M.; Wordsworth, P. Towards an Integrated Approach to Studying the Stratified Ceramics from Dandanakan/Daş Rabat, Turkmenistan (9th–12th Centuries a.d.). *J. Field Archaeol.* **2023**, *48*, 502–517. [CrossRef]
79. Jumayev, B.A.; Nazarov, S. Implementation Strategy of IT-Integrated STEM Methodology at Higher Education Institutions: Case of Turkmenistan. In *Proceedings of the 24th International Conference on Computer Systems and Technologies, New York, NY, USA, 12 September 2023*; Association for Computing Machinery: New York, NY, USA, 2023; pp. 157–163.
80. Isakov, A.; Urozov, F.; Abduzhapporov, S.; Isokova, M. Enhancing cybersecurity: Protecting data in the digital age. *Innov. Sci. Technol.* **2024**, *1*, 40–49.
81. Mihr, A.; Wittke, C. *Human Rights Dissemination in Central Asia: Human Rights Education and Capacity Building in the Post-Soviet Space*; Springer Nature: Berlin/Heidelberg, Germany, 2023.
82. Deryaev, A. Prospect Forecast for Drilling Ultra-Deep Wells in Difficult Geological Conditions of Western Turkmenistan. *Sustain. Eng. Innov.* **2023**, *5*, 205–218. [CrossRef]
83. Razzaq, A. Impact of Fintech Readiness, Natural Resources, and Business Freedom on Economic Growth in the CAREC Region. *Resour. Policy* **2024**, *90*, 104846. [CrossRef]

84. Digitalization of the Economy as a Factor of Sustainable Development–DigEco. Available online: <https://events.pstu.edu/digeco/en/2021/05/28/digitalization-of-the-economy-as-a-factor-of-sustainable-development/> (accessed on 28 June 2024).
85. IOS Press Ebooks–The Role of ICT in Social and Economic Development of Turkmenistan. Available online: <https://ebooks.iospress.nl/volumearticle/26112> (accessed on 28 June 2024).
86. China’s Foreign Aid to Central Asia States. Available online: <https://www.imemo.ru/en/publications/periodical/meimo/archive/2018/3-t-62/china-domestic-and-foreign-policies/chinas-foreign-aid-to-central-asia-states> (accessed on 28 June 2024).
87. Concept of Development of Digital Economy for 2019–2025 Is Approved. Available online: <https://turkmenistan.gov.tm/index.php/en/post/11799/concept-of-development-of-digital-economy-for-2019-%E2%80%93-2025-is-approved> (accessed on 29 June 2024).

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