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STUDY OF THE STATE OF DIGITAL TRANSFORMATION OF SMES IN KAZAKHSTAN

The research examines digital transformation in Kazakhstan small and medium-sized enterprises (SMEs) through national digitalization policies and global digital economy integration. The research evaluates major accomplishments alongside obstacles and fundamental obstacles that prevent SMEs from implementing digital solutions. The authors use data from the Bureau of National Statistics and reports by the OECD and UNESCAP and scholarly publications from Kazakhstan and international researchers to analyze the «Digital Kazakhstan» program and e-government (eGov) impact on administrative procedure streamlining and business efficiency improvement. The analysis focuses on regional digital inequalities and infrastructure challenges together with entrepreneur digital competence deficits and expensive mobile data services. The research identifies three institutional barriers which include restricted telecommunications competition and limited investment access and insufficient cybersecurity measures. The research shows that a complete solution requires regulatory changes alongside ICT infrastructure support and specific digital competency training for SMEs. The research proves that digitalization of SMEs functions as both an economic modernization instrument and a fundamental driver of sustainable development and national economic competitiveness in Kazakhstan.

Keywords: digitalization, small and medium-sized enterprises, e-government, ICT infrastructure, Kazakhstan, digital literacy, public policy, telecommunications.

Introduction

The modern global economy features strong digitalization that creates both benefits and obstacles for enterprise competitiveness as well as national economy performance. SMEs function as the fundamental component of numerous economies which the digital transformation process aims to target. The government of Kazakhstan has identified digitalization of SMEs as a priority state policy because small and medium-sized businesses contribute greatly to both national economic development and the country's socio-economic progress.

This research aims to examine how SMEs in Kazakhstan currently implement digital transformation while determining essential patterns and obstacles and suggesting strategies for better digital transformation of SMEs.

The government launched the «Information Kazakhstan – 2020» program in 2013 to establish digitalization as its central economic diversification strategy (Government of Kazakhstan, 2017). The initial digital strategy worked to construct ICT infrastructure together with electronic public administration systems that simplified commercial operations (egov.kz, 2021). The initiative has substantially expanded digital connectivity throughout the entire country. The «Digital Kazakhstan» initiative launched in 2017 expanded digital tool adoption in private sector operations to maintain economic development through targeted programs in agriculture and energy and transport and e-commerce. The initiative introduced several new subprograms which included creating the international Astana Hub Technopark in 2018 together with building national cybersecurity through the «Cyber Shield Kazakhstan» program.

Digital competitiveness within Kazakhstan has experienced major improvements. The country achieved its highest position yet at number 32 in the IMD World Digital Competitiveness Ranking for 2021 from its previous ranking at number 38 in 2018 (IMD, 2022). These reforms in e-government as well as business models and digital societal engagement have led to a higher ranking than other regional countries. Kazakhstan has shown strong performance in the United Nations E-Participation and Online Services indices through its effective human capital development and e-governance initiatives. The Infrastructure Index of the United Nations (2020) showed that ICT access remains uneven across different regions.

The indicators of the digital economy remain at a modest level but demonstrate a continuous upward movement because ICT services within SMEs grew from 3.3 % in 2015 to 7.9 % in 2020. ICT services experienced a fivefold expansion in their volume relative to non-ICT services between 2015 and 2020 (Bureau of National Statistics, 2022).

The SME sector has become more dynamic and productive because of this growth. ICT-specialized SMEs demonstrated twice faster growth than non-ICT

SMEs from 2015 until now (117.9 % versus 59.8 %) although ICT SMEs still represent a minor segment of the economy with their share increasing from 5.2 % in 2015 to 6.9 % in 2020 according to the Bureau of National Statistics (2022) [1].

The research provides vital academic insights into Kazakhstan SME digital transformation by making important additions to existing knowledge about this topic:

The research presents the first complete empirical evaluation of Kazakhstan SME digitalization through analysis of current EGDI and OSI and E-Participation indices and national statistics from 2024.

The research reveals the particular digital transformation features of Kazakhstan SMEs by studying the national characteristics that include independent business owners and variable digital access across regions and their use of open government platforms and e-licensing systems.

Through statistical data the study reveals that ICT-oriented SMEs are expanding at a higher rate than traditional business models which demonstrates the development of new entrepreneurial patterns in digitalized conditions across Central Asia.

The research provides actionable recommendations that focus on improving digital infrastructure and enhancing digital services while increasing digital literacy among entrepreneurs to boost SME resilience and competitiveness in Kazakhstan.

The digital transformation of SMEs (Small and Medium-Sized Enterprises) has been a topic of research in recent years. In the international literature, there is a large number of studies examining the effects of digitalization on SMEs' economic performance, competitiveness and sustainable development (OECD, 2021; World Bank, 2022).

The OECD (2021) [2] has found that the digital transformation of SMEs both enhances their competitiveness and lays the foundation for sustainable development and innovation. World Bank reports (World Bank, 2022) also present similar findings, highlighting the impact of digitalization on increasing market accessibility, decreasing transaction costs and enhancing enterprise productivity [3].

The study of the current state of digital transformation in Kazakhstan is especially relevant against the background of the global trend of digital economy transformation. According to the UN E-Government Knowledgebase (UN E-Government Knowledgebase, 2024), Kazakhstan is among the countries with a high level of e-government development. According to the report, Kazakhstan has made substantial progress in the EGDI (Electronic Government Development Index) ranking, climbing to 24th place and demonstrating significant advancement in digital services and electronic interaction with citizens and businesses.

UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) in its publications (UNESCAP, 2024) underlines the importance of

developing digital services that meet the needs of SMEs. According to the study of the life cycle of enterprise development in Kazakhstan (figure of the ESCAP model), it is shown that digital services should be provided actively and as efficiently as possible at each stage of the enterprise development, from registration to restructuring or liquidation.

Kazakh scientists also actively work on the problems of digital transformation. Thus, Isabekov, B., Igilmanova, S., Khasanova, K., Anarbekov, N., Bakpayeva, A., & Shoshay, B. (2022) [4], note that the level of digitalization of SMEs in Kazakhstan is heterogeneous: despite the presence of developed infrastructure in large cities, rural enterprises face difficulties in the use of modern digital services due to the low level of infrastructure and low level of digital literacy.

Dzhanegizova, A. (2024) in his research identifies the main barriers to the digitalization of SMEs in Kazakhstan as low qualifications of staff, high prices of telecommunication services and low awareness of entrepreneurs about the available digital services [5].

They stress the importance of implementing training and support programs for the improvement of the digital competencies of entrepreneurs.

Turkyilmaz et al. (2021) in their research work highlighted that the implementation of Industry 4.0 concept in Kazakhstan has several barriers including the lack of technological resources and the unavailability of skilled workforce in SMEs [6].

The data from Kazakhstan support these findings: The Bureau of National Statistics of the Republic of Kazakhstan notes an increase in the share of SMEs oriented towards digital services from 3.3 % in 2015 to 7.9 % in 2020 (Bureau of National Statistics, 2022).

Sheryazdanova (2024) notes that despite the progress, the population still lacks digital skills and not all regions have equal access to digital services [7]. Most notably is the development of the e-licensing portal and e-government portal (egov.kz), which is supported by statistical data on the significant growth of online applications and shortening of the processing time for entrepreneurs.

Despite the positive changes, notes the existing gaps in the digital infrastructure, especially in remote regions of the country. The authors support that the government has to address these problems through the development of regional IT hubs and improvement of the communications infrastructure.

International examples of digitalization in countries with high levels of technological advancement. As a theoretical background we employed the research of such authors as Radanliev P. (Radanliev et al., 2020), Veselovsky M. Y., Nikonorova A. V., Gribanov Y. I., Choudary S., Parker J. and Alstin M. [8], which focus on the use of the concept of «Industry 4.0» and the creation of intelligent

production systems. The work of Sibel T. and Shu G. provides technological aspects of digital twin implementation and integration of production data within cyber-physical systems [9], while the work of Anderle R. and Saldan T. stresses on the necessity of adaptive business models and cross-industry networking platforms.

The research by Chaudhuri et al. (2022) demonstrates that digital transformation in Germany, the US, Japan, France and the UK occurs through government support which includes R&D investments and gas pedals and technology parks and tax preferences for high-tech industries [10].

The IDC and Strategy& report shows that India and China execute extensive government programs to modernize their production infrastructure and integrate AI technologies into production cycles [11].

The country launched two government initiatives named «Digital Kazakhstan» and «Industry 4.0» which focused on implementing digital solutions across major industrial enterprises. The analysis reveals substantial differences between large and small businesses regarding their digital maturity since small businesses face obstacles to obtain investment and technological resources for modernization.

The national context of digitalization is further analyzed by using statistical and legal data published on official platforms (www.bcg.com, www.idc.com, www.strategy2050.kz, www.akorda.kz). The sources demonstrate the speed of digital progress together with essential digital transformation metrics for Kazakhstan's economic development.

The analyzed regulatory sources include the Law of the Republic of Kazakhstan «On State Support of Industrial-Innovative Activity» and the state program «Digital Kazakhstan» (2018–2022) and the concept of Industry 4.0 development and the Strategy of Industrial-Innovative Development of the Republic of Kazakhstan until 2025.

The literature review demonstrates that digital transformation of SMEs in Kazakhstan presents a complex issue which needs extensive support from government entities together with business sectors and academic institutions. Digitalization demonstrates substantial potential to enhance SME competitiveness and efficiency but additional specific initiatives are required to eliminate current obstacles.

Materials and methods

A quantitative approach along with qualitative strategies was implemented to achieve the goal of this research. It aimed at analyzing the current state of digital transformation in SMEs in the Republic of Kazakhstan as well as at identifying factors which facilitate or hinder the successful implementation of digital solutions in SME business processes. This research used both primary and secondary data sources and combined quantitative and qualitative methods to achieve this goal.

At the beginning of the study, an analytical description was used to study macro-trends of digitalization. The data for this analysis were official statistical sources such as reports of the Bureau of National Statistics of the Republic of Kazakhstan (2022) and materials of the national program «Digital Kazakhstan». Indices from the United Nations E-Government Knowledgebase (2024) and ESCAP's life-cycle visualization model for SMEs were also used in the analysis to structure the assessment of digital readiness across business development stages.

In the second stage, a comparative analysis was conducted to determine the level of SME digitalization in different regions of Kazakhstan and in relation to international benchmarks. Advanced digital economies such as Germany, Japan, the United States, and South Korea (OECD, 2021; World Bank, 2022; BCG, 2022) served as reference models for contextual positioning of Kazakhstan's progress on the global digital transformation spectrum.

Additionally, the study conducted a content analysis of the literature of Kazakhstan researchers (Isabekov, B., Igilmanova, S., Khasenov, K., Anarbekov, H., Bakpayeva, A., & Shoshay, B., Turkyilmaz, A., Dikhanbayeva, D., Suleiman, Z., & Shaiholla, S. (2021).) and legal documents (e.g., the Strategy for Industrial Development until 2025 and the Law «On State Support of Industrial-Innovative Activities»). This allowed for the identification of institutional barriers and potential drivers of SME digitalization at the national policy level.

For the quantitative component, regression-based techniques were utilized. In particular, multiple linear regression was employed to study the effect of several independent variables such as enterprise ownership type, business size, geographical location and access to ICT infrastructure on the likelihood of digital transformation among SMEs. Aggregated regional data were extracted from open-source statistical databases and enterprise-level reporting (Bureau of National Statistics, 2022).

Furthermore, an index-based scoring method was applied to develop an integrated digital maturity indicator for SMEs. This composite index was based on five key components: (1) Access to digital services, (2) Electronic reporting systems, (3) CRM/ERP software, (4) E-commerce platforms, and (5) Digital literacy of personnel.

The research model includes 600 participants who are divided into two groups of 300 urban and 300 rural respondents to match the actual SME distribution based on the Bureau of National Statistics of the Republic of Kazakhstan (2024). The data collection tool consists of a standardized questionnaire containing 21 questions where 18 are closed-ended and 3 are open-ended. The research uses descriptive statistics and intergroup comparative analysis and aggregated indicator construction as analytical tools.

Moreover, geoinformation analysis was performed using ArcGIS and QGIS tools to visualize spatial disparities in digital infrastructure. This enabled the mapping of digital development hot spots and it was possible to observe the pronounced concentration of digitally oriented SMEs in major metropolitan areas (e.g. Almaty and Astana), and significant lag observed in rural and peripheral regions.

During the research process, the scientific principles such as validity, reliability, and data representativeness were followed strictly. The findings were validated by expert through consultation with academic professionals and business sector representatives to ensure the practical relevance and analytical rigor of the results.

In conclusion, the study used qualitative and quantitative methods such as structured interviews, regression modeling, geospatial visualization, content analysis, and index construction to provide a comprehensive picture of the current state of SME digital transformation in Kazakhstan. This robust methodological framework was used to develop practical policy recommendations to enhance digital maturity, reduce regional disparities, and promote inclusive economic development through technology.

Results and discussion

The digital transformation in Kazakhstan is gaining momentum and covers both the public sector and small and medium-sized enterprises (SMEs). By 2024, the country had made considerable progress in the development of digital services, improvement of digital infrastructure, and implementation of innovative solutions that contribute to the improvement of the efficiency and competitiveness of SMEs.

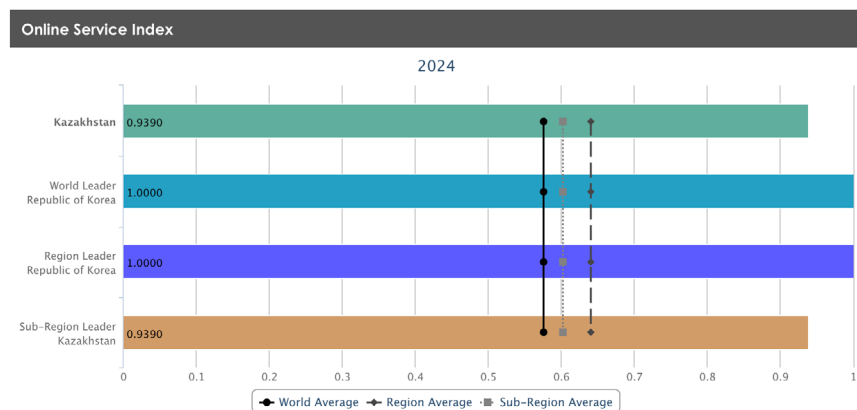


Note – United Nations E-Government Knowledgebase
Figure 1 – E-Government Development Index – Kazakhstan

Research into digital transformation of small and medium-sized enterprises (SMEs) in Kazakhstan demonstrates major advancements in international rankings and domestic development of infrastructure and digital services and human capital during 2024.

The United Nations E-Government Development Index (EGDI) positions Kazakhstan at number 24 in 2024 while the country advanced four positions from its 2022 ranking. The EGDI score of 0.9009 positions Kazakhstan among very high e-government development countries (VHEGDI).

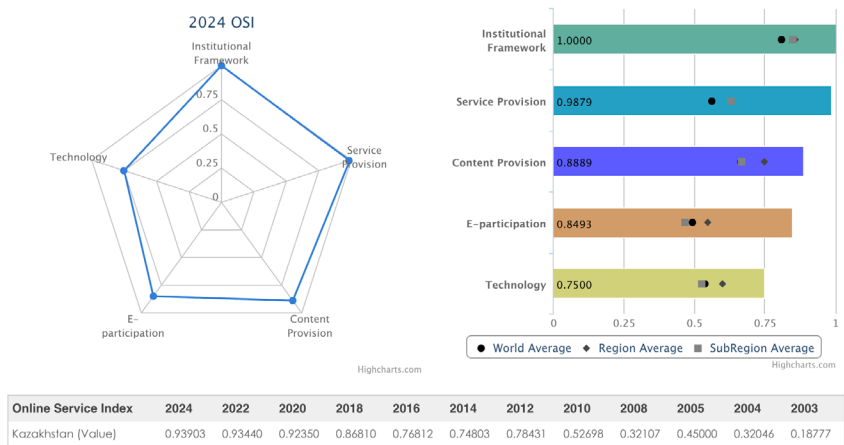
The subindices show significant improvements especially in human capital development and online service delivery and telecommunication infrastructure development. The E-Participation Index has experienced major growth because Kazakhstan advanced 12 positions to become the 27th ranked country worldwide with a score of 0.8493.



Note – UN E-Government Knowledgebase

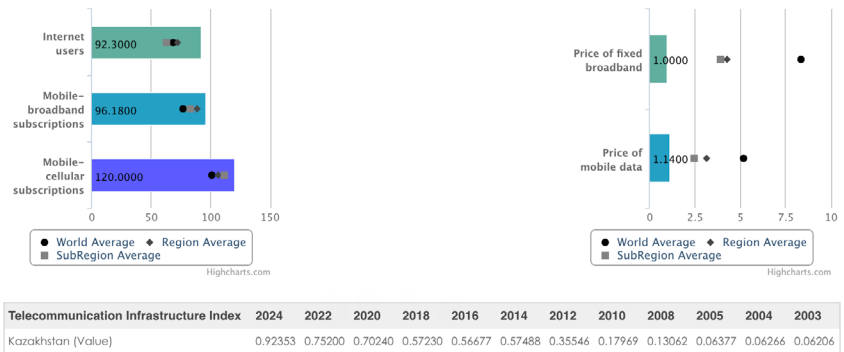
Figure 2 – Online Service Index (OSI)

The Online Service Index (OSI) shows Kazakhstan as one of the world leaders with a score of 0.9390 (Figure 2). This index assesses the accessibility and user-friendliness of online public services provided by government institutions. The OSI structure shows that Kazakhstan received the maximum score of 1.0000 for institutional framework and 0.9879 for service delivery which indicates the maturity and effectiveness of its digital public service infrastructure.



Note – UN E-Government Knowledgebase
Figure 3 – Online Service Subcomponents

The technological component of the index is slightly lower, with a score of 0.7500, which indicates the need for continued investment in the development of digital solutions and infrastructure (Figure 3). This indicates that while institutional and service-related aspects of e-government in Kazakhstan are well-developed, technological modernization still requires focused policy attention and resource allocation to sustain long-term digital transformation.



Note – UN E-Government Knowledgebase
Figure 4 – Telecommunication Infrastructure Index

The telecommunication infrastructure of Kazakhstan has experienced substantial development. The Infrastructure Index has reached 0.9235 which exceeds both regional and subregional averages. The combination of 92.3 % internet penetration and 96.18 % mobile broadband access and 120 % mobile cellular coverage creates a solid digital transformation foundation. The high mobile data pricing index of 1.1400 compared to the global average acts as a barrier to digital adoption speed especially for small and medium-sized enterprises (SMEs).

The classification of SMEs in Kazakhstan depends on their employee numbers and their annual revenue. The classification includes three types of small businesses: individual entrepreneurs (IEs), self-employed individuals who operate without legal entity (LE) and legal entities with 100 employees or less and annual income below 300,000 times the monthly calculation index (MCI) which equals about 2.5 million USD in 2024.

The definition of medium-sized enterprises includes IEs and LEs which have 100 to 250 employees and generate annual revenues between 300,000 and 3,000,000 times the MCI amounting to approximately 25 million USD.

Table 1 – SME Registration and Activity in Kazakhstan

Business Type	Total Registered (thousands)	Active (%)
Individual Entrepreneurs (IEs)	1,700	95 %
Legal Entities (LEs)	528	80 %

Table 1 shows that Kazakhstan had more than 1.7 million IEs as of April 1, 2024, and that 95 % of them were active. The most dominant sectors among these include:

- 1 Wholesale and retail trade; vehicle repair – 37.3 %
- 2 Provision of other services – 17.1 %
- 3 Agriculture, forestry, and fisheries – 15.8 %

The total number of legal entities was over 528,000 by April 1, 2024, and about 80 % of them were operating. Total SMEs represent about 98 % of the legal entities in the country. Over the period of 2014–2023, the average annual growth rate of SMEs was approximately 4.5 %.

The digital transformation of small and medium-sized enterprises (SMEs) in Kazakhstan is very much linked to the development of e-government. Digital solutions have greatly reduced administrative hurdles, simplified business-government agency communication, and enhanced the effectiveness of entrepreneurial activities. The E-Participation Index increase shows that the entrepreneurial environment is taking part in the digital transformation and using modern technologies more and more.

An important part of Kazakhstan's digital development is the e-government portal, eGov. In the «For Business» section, SMEs can use fully automated services for online registration, re-registration, and business liquidation. These processes can be completed in less than an hour, and most of them are completed within 15 minutes, which reduces administrative burden and decreases the possibility of corruption risks.

At the same time, the system allows for automated procedures for opening bank accounts in second-tier banks and insuring employees. Additionally, the E-Licensing portal offers 446 fully automated licensing procedures that are integrated with 55 databases, which have significantly reduced processing times and improved regulatory transparency. Since its inception, the portal has issued more than 569,000 licenses and approximately 8.6 million permits.

One of the most notable advancements is the integration of government digital services with commercial platforms such as Kaspi.kz and Halyk Bank apps, which simplify business registration, taxation, and licensing processes. This synergy has reduced transaction costs and time expenditures, thereby promoting entrepreneurial activity and stimulating economic growth.

The registration of intellectual property rights is managed through the Kazpatent platform under the Ministry of Justice. The number of applications submitted in 2021 was 23,180, 22 % higher than in 2020 and 29 % higher than in 2019, which indicates the growing importance of innovation and the need for intellectual property protection in the digital economy.

Digitalization also encompasses the information accessibility of SMEs. Through the «Open Government» initiative, platforms have been created to offer open access to public data, enable participation in legislative discussions and state budget reviews, and enable the evaluation of government agency performance.

An additional valuable service is the legal aid platform «E-Zan Komegi» which provides online consultations and automates the workflow of lawyers and legal consultants.

The life-cycle approach to public digital services for businesses is of particular note. The model assumes proactive and automatic service delivery tailored to each development stage of a business – from its initial registration to potential liquidation or restructuring.

The significant advancements made to date have not solved all the existing major problems. The most significant obstacles include expensive telecommunications services especially mobile data and limited digital skills among small and medium-sized business owners. The adoption speed and effectiveness of digital technology in entrepreneurial activities face direct consequences from these factors.

The research model based on sociological methods was developed to analyze digital transformation characteristics of small and medium-sized enterprises (SMEs) operating in the Republic of Kazakhstan. This method allows researchers to study digital maturity factors in business operations and detect regional differences in digital tool and service accessibility.

The research sample consists of 600 participants who include 300 urban SME representatives and 300 rural SME representatives. The sample distribution pattern matches the actual SME distribution throughout the country based on Bureau of National Statistics of the Republic of Kazakhstan data.

The data collection instrument used a structured questionnaire, which contained 21 questions that formed four thematic blocks:

- Access to digital infrastructure
- Use of digital solutions (CRM, ERP, e-commerce)
- Interaction with governmental digital services
- Staff qualifications and digital literacy
- Institutional barriers and investment intentions

The analysis used descriptive statistics together with comparative analysis that examined territorial differences in the data.

Table 2 – Comparative data on the territorial basis of SME digitalization.

Indicator	Urban SMEs (%)	Rural SMEs (%)
Availability of stable internet connection	94	53
Use of eGov and eLicensing platforms	87	41
Implementation of CRM / ERP systems	65	27
Existence of a digitalization strategy for the next year	72	44
Adequate digital literacy among personnel	78	32
Identification of ICT cost as a key barrier	36	61
Willingness to participate in training programs	59	84

The data collection shows substantial digital inequality exists between small and medium enterprises (SMEs) based in urban versus rural locations. The most notable differences appeared in these three categories:

- Infrastructure gap: The number of SMEs with reliable internet access reaches 94 % in urban areas but only 53 % in rural areas;
- The percentage of rural SMEs who use governmental digital platforms on a regular basis stands at 41 % whereas urban enterprises reach 87 %;

- The majority of rural SMEs (68 %) identify poor digital skills among their employees as the main reason they cannot implement digital solutions.
- Urban SMEs show plans to implement digital solutions at a rate of 72 % during the next 12 months but rural SMEs indicate similar plans at 44 % only.
- Rural respondents showed strong interest in specialized training programs to enhance their digital competencies at an 84 % rate.

The digital transformation of SMEs in Kazakhstan shows promising growth in urban agglomerations yet faces significant obstacles in rural areas due to systemic limitations. The main obstacles for digital transformation in regions stem from inadequate infrastructure development alongside expensive ICT services and insufficient entrepreneurial capabilities.

The research verifies that institutional and infrastructural obstacles prevent SMEs in Kazakhstan from undergoing digital transformation. The collected data provides a base for developing national SME digitalization programs that address regional differences and create specific support systems for rural businesses.

A comprehensive sociological study involving academic institutions and government bodies should be conducted to validate these findings. The transition from theoretical assumptions to evidence-based policy recommendations for digital business transformation in Kazakhstan's small and medium-sized enterprises can be achieved through this approach.

Small and medium-sized enterprises in Kazakhstan undergo digital transformation, which acts as a vital element of the country's national socio-economic development plan. The development process continues to face multiple enduring challenges despite its progress, which includes e-government service evolution and business-focused digital platforms and online public services implementation. This analysis examines these barriers in depth by identifying their source and suggests essential strategies for their resolution.

The main obstacle to digital services accessibility and quality remains as a significant barrier for businesses. The digital and broadband infrastructure shows strong penetration in major Kazakhstan cities yet faces major obstacles in the rural and remote areas. According to the Economist Intelligence Unit (EIU, 2022) Kazakhstan maintained steady improvements in network latency and internet accessibility from 2017 until 2022 but saw bandwidth capacity decrease in 2023 and failed to recover to former levels. The situation worsens specifically for small business operations that depend on mobile internet connections. These businesses struggle to use digital platforms in their daily operations because limited connectivity combined with reduced data transmission speeds restrict their operational capacity.

The expenses of telecommunications services especially mobile data services remain excessively expensive for businesses. The OECD (2022) documented that Kazakhstan charges its SMEs higher mobile internet prices than neighboring nations do which prevents these businesses from accessing digital technology. Mobile internet pricing at high levels in Kazakhstan restricts access to digital technologies for small and micro businesses, which operate with limited financial means.

Digital literacy among SME representatives stands as a major obstacle, which hinders progress. The introduction of training programs together with capacity-building initiatives has not solved the problem because numerous entrepreneurs including those in rural areas continue to lack fundamental digital tool competencies. According to Isabekov et al. (2022) the business community requires specific educational programs along with public awareness campaigns to establish digital fluency across all industries.

The digital environment faces a major structural barrier because of regulatory fragmentation as well as insufficient digital literacy among SME representatives and insufficient digital capabilities. The successful deployment of digital technologies requires laws that both respond to modern digital economies and maintain stability in their regulatory frameworks. The CABAR (2019) report shows that Kazakhstan's regulatory environment experiences constant changes and inconsistencies, which generate unpredictable legal conditions, and heightens administrative risks. The 2015 Law on Informatization together with the «Cyber Shield of Kazakhstan» program aim to protect data and cybersecurity but their execution faces significant limitations. The lack of internal resources for legal and technical compliance puts SMEs at higher risk in the digital environment.

The Kazakhstan telecommunications market suffers from insufficient competition among its operators. The U.S. Department of State (2021) indicates that market dominance belongs to several established operators who benefit from beneficial regulatory environments that prevent new providers from entering the market. The market structure with limited competition creates negative effects on service diversification and innovation incentives as well as infrastructure modernization. The high expenses required to extend networks throughout sparse territories prevent investors from expanding digital platforms past urban areas.

Cybersecurity stands as a critical area that requires immediate attention. SMEs in Kazakhstan maintain low digital threat defense capabilities despite the implementation of the «Cyber Shield» initiative. The lack of risk management policies within businesses combined with insufficient cybersecurity experts and infrequent utilization of certified security tools makes systems more exposed to threats. According to the OECD (2022) the private sector does not actively

participate in cybersecurity protocols which leads to decreased trust in digital systems and creates a significant risk to ongoing digital adoption.

Kazakhstan demonstrates digital inequality through an extensive gap between different regions of the country. The southern and western regions of Kazakhstan show much weaker digital service access than Astana and Almaty SMEs do. Business conditions must receive targeted policy solutions that focus on specific geographic areas to achieve equalization and promote inclusive digital development.

The survey results from table 2, demonstrate that urban and rural SMEs maintain distinct levels of digital access. The survey results show that 94 % of urban SMEs maintain reliable internet access but this figure decreases to 53 % in rural areas. Rural regions show lower adoption rates of digital government platforms (eGov and eLicensing) at 41 % compared to urban areas at 87 %. The research confirms that infrastructure problems together with unequal access to technology determine how fast digital transformation occurs and who gets included.

The survey data demonstrates that 68 % of rural SMEs face digital literacy challenges among their staff yet 84 % want to join government-training programs. The data shows the immediate need for policies that will expand digital infrastructure while creating specific capacity-building initiatives.

The survey reveals that 44% of rural enterprises lack defined digitalization strategies for the upcoming year but urban businesses show 72 % readiness. The data indicates that regional investment readiness and strategic awareness levels remain different from each other. The survey reveals that 61 % of rural SMEs face challenges from ICT service costs, which demonstrates how financial barriers combine with infrastructure and educational obstacles.

The research findings demonstrate the necessity of customized digital development plans which should focus on reducing geographic disparities while making digital opportunities accessible to all and building an entrepreneurial environment with digital competencies.

To address these challenges, the following policy recommendations are proposed:

- The telecom sector needs competition enhancement through market entry liberalization and reduced licensing obstacles and support for emerging telecommunications service providers.
- A nationwide initiative for SME digital literacy needs to start now through collaboration with universities and business associations and NGOs.
- The national cybersecurity framework needs improvement through mandatory information security standards and IT audit programs with regional response centers designed to protect SMEs.

Building a digital transformation for Kazakhstan SMEs demands a comprehensive policy framework, which unites infrastructure development with institutional frameworks and digital education systems. A digital economy based on equal digital resource access and competition promotion and regulatory barrier elimination will establish a foundation for enduring SME growth and competitive success.

The future research agenda should include SME digital maturity assessments across different regions together with evaluations of present government initiatives and methods to measure digital inclusion. Research should explore how platform-based solutions like eGov and e-Licensing and Kaspi help SMEs transform their business models while developing a strong entrepreneurial digital environment in Kazakhstan.

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Conclusions

This study delivers an extensive examination of digital transformation within small and medium-sized enterprises (SMEs) throughout the Republic of Kazakhstan while examining institutional barriers that impede digital progress in the sector. This research combines statistical information with international e-government indices as well as analytical reports and academic and regulatory sources to organize major challenges before establishing strategic directions to address them as part of Kazakhstan's national digital development goals.

The survey results confirm that SMEs operating in urban areas demonstrate superior digital adoption compared to SMEs based in rural areas. The survey shows that urban SMEs have better access to infrastructure and use digital tools and strategic planning. The large differences between urban and rural areas regarding internet access (94 % vs. 53 %) and digital platform adoption (87 % vs. 41 %) demonstrate the need for specific policy interventions.

Rural enterprises require targeted institutional support through training programs and digital service subsidies and public platform awareness initiatives. The current digital transformation policy needs to evolve from its universal approach to develop region-specific frameworks.

Kazakhstan has achieved significant progress in developing digital infrastructure and automation of government services while improving online platforms and ICT implementation for public and private institutions. The digital transformation of SMEs remains inconsistent because small enterprises face

ongoing challenges related to digital maturity and essential resource access when compared to larger businesses.

The main obstacles to digital transformation include: The main hurdles to digital transformation include: (1) The restricted availability of high-quality digital connectivity across rural and remote regions; (2) The telecommunications sector faces high prices and insufficient market competition; (3) Entrepreneurs lack sufficient digital literacy skills; (4) The current regulatory system remains underdeveloped and cybersecurity practices are not standardized. Each factor influences SME digitalization at multiple levels, which produces complex outcomes.

Sustainable development of SMEs through digital means requires an institutional environment that enables low transactional costs, efficient regulatory procedures, simple digital service access, and improved digital competencies for entrepreneurs according to the study.

A comparison with OECD countries and digitally advanced economies (e.g., Germany, South Korea, Japan, and the United States) demonstrates that SME digitalization success requires coordinated actions from government, private sector and academic community. Such efforts require strengthened support measures that include tax incentives and large-scale education and training programs together with regional digital hubs and SME accelerators.

Digital inclusiveness needs special attention because it requires closing the digital gap between urban and rural areas and between large and small market participants. Digital transformation will worsen socioeconomic inequalities and increase regional gaps if these disparities remain unaddressed.

This research brings significant academic value to the discussion about digital economy transformation in Kazakhstan's SME sector. Digital transformation needs a systematic digital policy framework that integrates technological aspects alongside legal frameworks and social and infrastructural requirements.

Future academic research needs to use quantitative methods to study how digital transformation affects small and medium-sized enterprise productivity as well as the effectiveness of particular digital public services and enterprise digital maturity indicators across industries and regions. Future research should focus on behavioral elements including how entrepreneurs trust digital platforms and their willingness to use new technologies.

The digital transformation of Kazakh SMEs requires more than technological advancement because it represents a strategic necessity, which needs comprehensive strategies and interagency coordination and ongoing monitoring. All stakeholders must work together to achieve sustainable outcomes that boost national competitiveness and drive innovation while advancing digital economic maturity.

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ҚАЗАҚСТАНДАҒЫ ШОК ЦИФРЛЫҚ ТРАНСФОРМАЦИЯСЫНЫҢ ЖАҒДАЙЫН ЗЕРТТЕУ

Зерттеуде ұлттық цифрландыру саясаты және жаһандық цифрлық экономика интеграциясы арқылы Қазақстандағы шағын және орта кәсіпорындардағы (ШОК) цифрлық трансформация қарастырылады. Зерттеуде ШОК-тардың цифрлық шешімдерді енгізуіне кедергі келтіретін кедергілер мен іргелі кедергілермен қатар негізгі жетістіктер бағаланады. Авторлар Ұлттық статистика бюросының деректерін және ЭЫДҰ мен БҰҰ ЭСКАТО есептерін, сондай-ақ қазақстандық және халықаралық зерттеушілердің ғылыми басылымдарын пайдаланып, «Сандық Қазақстан» бағдарламасы мен электрондық үкіметтің (eGov) әкімшілік процедураларды оңтайландыруға және бизнес тиімділігін арттыруға әсерін талдайды. Талдау аймақтық сандық теңсіздіктер мен инфрақұрылымдық қиындықтарға, сондай-ақ кәсіпкерлердің сандық құзыреттілігінің тапшылығына және қымбат мобильді деректер қызметтеріне бағытталған. Зерттеуде телекоммуникациялық бәсекелестіктің шектеулілігі, инвестицияларға қолжетімділіктің шектеулілігі және киберқауіпсіздік шараларының жеткіліксіздігі сияқты үш институционалдық кедергі анықталған. Зерттеу толық шешім

АКТ инфрақұрылымын қолдаумен қатар реттеуші өзгерістерді және ШОК үшін арнайы сандық құзыреттілік оқытуды қажет ететінін көрсетеді. Зерттеу ШОК цифрландыруы экономикалық жаңғырту құралы және Қазақстандағы тұрақты даму мен ұлттық экономикалық бәсекеге қабілеттіліктің негізгі қозғаушы күші ретінде қызмет ететінін дәлелдейді.

Кілтті сөздер: цифрландыру, шағын және орта кәсіпорындар, электрондық үкімет, АКТ инфрақұрылымы, Қазақстан, сандық сауаттылық, мемлекеттік саясат, телекоммуникация.

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ИССЛЕДОВАНИЕ СОСТОЯНИЯ ЦИФРОВОЙ ТРАНСФОРМАЦИИ МСП В КАЗАХСТАНЕ

В исследовании рассматривается цифровая трансформация малых и средних предприятий (МСП) Казахстана в рамках национальной политики цифровизации и интеграции в глобальную цифровую экономику. В исследовании оцениваются основные достижения, а также препятствия и фундаментальные барьеры, мешающие МСП внедрять цифровые решения. Авторы используют данные Бюро национальной статистики, отчеты ОЭСР и ЭСКАТО ООН, а также научные публикации казахстанских и международных исследователей для анализа программы «Цифровой Казахстан» и влияния электронного правительства (eGov) на оптимизацию административных процедур и повышение эффективности бизнеса. Анализ фокусируется на региональном цифровом неравенстве и проблемах инфраструктуры, а также на дефиците цифровой компетентности предпринимателей и дорогостоящих услугах мобильной связи. Исследование выявляет три институциональных барьера: ограниченную конкуренцию в сфере телекоммуникаций,

ограниченный доступ к инвестициям и недостаточные меры кибербезопасности. Исследование показывает, что для комплексного решения необходимы изменения в законодательстве наряду с поддержкой ИКТ-инфраструктуры и специализированным обучением цифровой компетентности для МСП. Исследование доказывает, что цифровизация МСП функционирует как инструмент экономической модернизации и фундаментальный фактор устойчивого развития и национальной экономической конкурентоспособности Казахстана.

Ключевые слова: цифровизация, малые и средние предприятия, электронное правительство, ИКТ-инфраструктура, Казахстан, цифровая грамотность, государственная политика, телекоммуникации.

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