

## SOCIAL INEQUALITY AND NEW POVERTY IN THE ERA OF DIGITALIZATION: TOWARDS THE FORMATION OF THE DIGITAL SOCIETY PARADIGM IN KAZAKHSTAN

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**Abstract.** The article examines how digitalization in Kazakhstan simultaneously expands opportunities and increases social inequality, leading to the emergence of the phenomenon of “new poverty”. The aim of the work is to propose a sociological framework for assessing digital policy in a transitional economy, focusing on three key aspects of exclusion: access, skills and outcomes, as well as a new challenge the “AI gap”. The research methodology includes a review of theories (digital inequality, digital capital), an analysis of international and national statistics (Internet prevalence, mobile communications, accessibility of services) and a synthesis of empirical data on Kazakhstan during the COVID-19 period, including the experience of teachers, schoolchildren and school leaders. The novelty of the work lies in the fact that the focus is not only on coverage and connectivity, but also on institutional access (schools, FAPs, PSC), quality of use (intensity of online interaction) and social outcomes (education, work, health). The results show that formal connection does not guarantee real inclusion. Equipment, licenses, stable internet, and support in rural and vulnerable regions are critical; lack of practical skills and low digital confidence among female caregivers, the elderly, and rural residents widen the gap. In addition, algorithmic practices without ethical and methodological guarantees can turn digital inequality into an “algorithmic” stratification of the labor market and access to services. The practical significance of the work consists in proposals to change digital policy indicators from “connectivity” to “results”, the introduction of targeted vouchers for devices and the Internet, on-site training programs, as well as mandatory equity and DPIA audits for AI modules in education, social support and employment. The theoretical contribution is the formation of an integrative paradigm of a digital society for transition economies, taking into account infrastructural, institutional, cultural and gender aspects. The work also sets the agenda for future monitoring and evaluation necessary to reduce the risk of digital poverty entrenching at the intergenerational level.

**Keywords:** socio-economic determinants; digitalization; digital divide; new poverty; digital confidence; AI-divide.

## ЦИФРАНДЫРУ ДӘУІРІНДЕГІ ӘЛЕУМЕТТІК ТЕҢСІЗДІК ЖӘНЕ ЖАҢА КЕДЕЙЛІК: ҚАЗАҚСТАНДАҒЫ ЦИФРЛЫҚ ҚОҒАМ ПАРАДИГМАСЫНЫҢ ҚАЛЫПТАСУЫНА ҚАРАЙ

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## СОЦИАЛЬНОЕ НЕРАВЕНСТВО И НОВАЯ БЕДНОСТЬ В ЭПОХУ ЦИФРОВИЗАЦИИ: НА ПУТИ К ФОРМИРОВАНИЮ ПАРАДИГМЫ ЦИФРОВОГО ОБЩЕСТВА В КАЗАХСТАНЕ

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**Аңдатпа.** Бұл мақалада Қазақстандағы цифрандыру үдерісі бір жағынан жаңа мүмкіндіктер ашып, екінші жағынан әлеуметтік теңсіздікті күшейтіп, «жаңа кедейлік» құбылысын тудырып отырғаны талданады. Зерттеудің мақсаты – өтпелі экономика жағдайында цифрлық саясатты бағалауға арналған социологиялық негіз ұсыну. Негізгі назар үш деңгейдегі айырмашылыққа аударылған: қолжетімділік, дағдылар және нәтижелер, сонымен бірге жаңа қауіп – «AI теңсіздігінің» (жасанды интеллектке тең қолжетімділіктің болмауы). Әдістемесі теориялық тұжырымдарды (цифрлық теңсіздік, цифрлық капитал) сараптауды, халықаралық және ұлттық статистиканы талдауды (интернет пен мобильді байланысқа қолжетімділік, қызметтердің арзандылығы), сондай-ақ COVID-19 кезеңінде Қазақстанда жүргізілген эмпирикалық зерттеулерді қамтиды. Жаңалығы – тек қосылу деңгейіне емес, институционалдық қолжетімділікке (мектептер, ФАП-тар, ХҚКО), пайдалану сапасына (онлайн өзара әрекеттесудің қарқындылығы) және әлеуметтік маңызы бар нәтижелерге (білім беру, еңбек, денсаулық) басымдық берілуінде. Нәтижелер көрсеткендей, ресми түрде интернетке қосылу толыққанды қатысуды қамтамасыз етпейді. Ауылдық және осал аймақтарда жабдық, лицензия, тұрақты интернет және қолдау аса маңызды. Әйел күтушілер, зейнеткерлер мен ауыл тұрғындарының тәжірибелік дағдыларының

**Аннотация.** В статье рассматривается, как цифровизация в Казахстане одновременно расширяет возможности и усиливает социальное неравенство, приводя к возникновению феномена «новой бедности». Цель работы - предложить социологическую основу для оценки цифровой политики в условиях переходной экономики, сосредоточив внимание на трех ключевых аспектах изоляции: доступе, навыках и результатах, а также на новой проблеме – «неравенство в области искусственного интеллекта». Методология исследования включает обзор теорий (цифровое неравенство, цифровой капитал), анализ международной и национальной статистики (распространенность Интернета, мобильная связь, доступность услуг) и обобщение эмпирических данных о Казахстане в период распространения COVID-19, включая опыт учителей, школьников и руководителей школ. Новизна работы заключается в том, что основное внимание уделяется не только охвату и подключению, но и институциональному доступу (школы, ФАПы, ЦОНЫ), качеству использования (интенсивности онлайн-взаимодействия) и социальным результатам (образование, работа, здравоохранение). Результаты показывают, что формальное подключение не гарантирует реальной вовлеченности. Оборудование, лицензии, стабильный Интернет и поддержка в сельских и уязвимых регионах имеют решающее значение; отсутствие практических навыков и низкая уверенность в цифровых технологиях у

жетіспеуі және цифрлық сенімділіктің төмендігі нәтиже алшақтығын күшейтеді. Сонымен қатар, этикалық және әдістемелік бақылаусыз енгізілген алгоритмдік тәжірибелер еңбек нарығы мен қызметтерге қолжетімділікте «алгоритмдік стратификацияға» әкелуі мүмкін. Практикалық маңызы – цифрлық саясаттың көрсеткіштерін тек «қамтудан» «нақты нәтижелерге» көшіру, интернет пен құрылғыға мақсатты ваучерлер беру, жергілікті деңгейде оқыту бағдарламаларын енгізу, сондай-ақ білім, әлеуметтік қолдау мен жұмыспен қамту салаларындағы жасанды интеллект модульдеріне міндетті түрде теңдік пен DPIA аудитін жүргізу. Теориялық үлесі – өтпелі экономикалар үшін цифрлық қоғамның интегративті парадигмасын қалыптастыру. Ол инфрақұрылымдық, институционалдық, мәдени және гендерлік өлшемдерді ескереді. Сонымен қатар, цифрлық кедейліктің ұрпақаралық орнығу қаупін азайту үшін себеп-салдарлық бағалау мен ұзақ мерзімді мониторинг жүргізудің маңыздылығын көрсетеді.

**Кілт сөздер:** әлеуметтік-экономикалық детерминанттар; цифрландыру; цифрлық алшақтық; жаңа кедейлік; цифрлық сенімділік; ЖИ қолжетімсіздік.

женщин, осуществляющих уход, пожилых людей и сельских жителей увеличивают разрыв. Кроме того, алгоритмические практики без этических и методологических гарантий могут превратить цифровое неравенство в «алгоритмическое» расслоение рынка труда и доступа к услугам. Практическая значимость работы заключается в предложениях по изменению показателей цифровой политики с «подключения» на «результаты», внедрению целевых ваучеров на устройства и Интернет, программ обучения на месте, а также обязательных аудитов equity и DPIA для модулей искусственного интеллекта в образовании, социальной поддержке и занятости. Теоретическим вкладом является формирование интегративной парадигмы цифрового общества для стран с переходной экономикой, учитывающей инфраструктурные, институциональные, культурные и гендерные аспекты. Эта работа также определяет повестку дня для будущего мониторинга и оценки, необходимых для снижения риска укоренения цифровой бедности на уровне поколений.

**Ключевые слова:** социально-экономические детерминанты; цифровизация; цифровой разрыв; новая бедность; цифровое доверие; ИИ-неравенство.

## Introduction

Digitalization has become an integral dimension of social transformation, changing not only economics and communications, but also the mechanisms of social stratification. Previously, poverty was primarily determined by the level of material resources, but today the ability to integrate into the digital environment is becoming increasingly important. The lack of Internet access, technology skills, and opportunities to participate in the digital economy creates new forms of vulnerability, which are referred to in the literature as “new poverty.”

This problem is particularly sensitive for Kazakhstan. On the one hand, government programs such as Digital Kazakhstan are actively developing infrastructure and digital services. On the other hand, significant differences remain between regions, generations, and social groups in the level of digital literacy and the quality of access. These differences threaten to turn digitalization not into a modernization tool, but into a factor of reproduction of social inequality.

International studies point to the contradictory effect of digitalization: It can simultaneously expand educational and economic opportunities and widen the gap between those who are able to use them and those who remain excluded. This ambivalence shows the risk of the formation of a “digital precariat” and the deepening of marginalization.

This article analyzes how the processes of digitalization in Kazakhstan are related to changes in the structure of social inequality and the formation of the phenomenon of new poverty. Both global theoretical approaches and the national context are considered, which makes it possible to clarify the prospects for the development of a digital society in a transitional economy.

### **Literature review**

In modern sociological literature, digitalization is interpreted not only as a technological process, but also as a social phenomenon that radically changes the development trajectories of societies. It creates new lines of differentiation that are no longer limited to income or property resources, but are related to access to digital infrastructures, skills and opportunities for inclusion in the digital economy. This transition allows us to talk about the phenomenon of “new poverty” arising from digital exclusion. Unlike classical forms of material deprivation, it manifests itself in the inability to use digital services, educational platforms and online labor markets.

There is a consensus that digital technologies and ICT have become key drivers of the transformation of society since the concept of post-industrial society (Bell, 1973) and Masuda’s ideas of the “information society” (1983) [1;2]. The classic works of Castells (1996; 1998) consolidated the paradigm of a networked society, where social connections and institutions are organized around digital networks. However, as modern research highlights [3;4], technological progress is twofold: it improves the quality of life and access to education and medicine, but at the same time increases the risks of privacy, cybersecurity and, most importantly, reproduces social inequality [5].

According to the research of Van Dijk, 2006; Van Deursen & Van Dijk, 2014, the key analytical concept in the modern discourse of digitalization is the “digital divide” [6;7]. It refers not only to differences in access to basic Internet infrastructure, devices, and network resources, but also to deeper inequalities related to technology use skills and the ability to convert digital opportunities into socially meaningful outcomes. Thus, digital divide is a multi-level system in which technical access is only the first step, while competencies, cultural context and socio-economic conditions that influence the integration of individuals and groups into a digital society become decisive. At the first level, economic parameters (income, education, age, gender) are crucial [8;9]. On the second, competencies and cultural context [6;10]. On the third, the ability to convert digital access into real social and professional achievements [11]. The situation of the COVID-19 pandemic made this problem particularly acute: the lack of Internet access actually meant social exclusion, which was confirmed by the UN statements on the “issue of life and death” [12;13]. From that moment on, digital inclusion began to be considered as a social determinant of health [14;15].

The concept of “new poverty” is of particular importance in countries with economies in transition and pronounced regional asymmetries. In European studies (Holmes, 2022), it is associated with limited access to digital services and the formation of “secondary citizenship” when the lack of digital skills actually deprives people of basic social rights [16]. In Central Asia, these manifestations are even more pronounced: during the COVID-19 pandemic, families in rural areas of Kazakhstan,

Kyrgyzstan, and Uzbekistan were excluded from distance education due to a lack of devices and stable Internet, which exacerbated intergenerational gaps and perpetuated social marginalization. In Tajikistan, low digital literacy increases the vulnerability of migrant workers who do not have access to online services and financial instruments. Thus, the “new poverty” here is not limited to income, but manifests itself in the inability to integrate into the digital infrastructure, which reflects a broader risk, the formation of new lines of social inequality in the context of catching-up modernization.

An important dimension of the discussion about the new poverty is that digital exclusion is increasingly viewed not only as a consequence of social status, but also as a factor in its reproduction. In modern societies, lack of access to digital services leads to limited legal and political participation.: Individuals are losing the opportunity to use electronic public services, exercise labor rights on digital platforms, make transfers/payments/any banking transactions through digital technologies (smartphones), and participate in civic initiatives. In Kazakhstan and other Central Asian countries, this is reflected, for example, in the difficulties of rural residents when registering benefits or seeking medical help online. Thus, digital inequality is not a secondary issue, but is becoming a key social risk affecting long-term mobility, trust in institutions, and social cohesion.

In the research of Ragnedda, 2017; Ragnedda & Ruiu, 2020, an important step in theorizing was the introduction of the concepts of “digital capital” [17;18], which is compared with economic, cultural and social capital (Bourdieu, 1986) [19]. This resource becomes an independent source of benefits, but it is equally unevenly distributed. Robinson and colleagues (2020) emphasize the multidimensional nature of digital inequality, which includes not only economic class, but also gender, ethnicity, age, disability, and even civic engagement [20]. It is important to note here that digital inequality does not eliminate traditional barriers, but intertwines them with new forms of exclusion based on algorithms and platforms.

Empirical studies show that even the same online time has a different “quality”. Thus, users with a low level of education are more likely to spend time on leisure activities (games, social networks), while groups with a higher social status use digital resources for education, professional development and healthcare [7;21]. This confirms the thesis that the digital environment does not smooth out differences, but can enhance them. Especially significant in this context is the introduction of the concept of digital confidence (Bentley et al., 2024) [22], which emphasizes the psychological dimension of digital inequality: a lack of confidence in skills forms internal barriers and deepens exclusion [23].

The phenomenon of “new poverty” fits into this discourse. Van Dijk (2006) notes that digital poverty reproduces traditional barriers, but in new forms [6]. The pandemic has clearly demonstrated that low-income families in Central Asia, including Kazakhstan, often did not have access to online learning technology, which increased intergenerational differences in capital. National statistics data confirm that in rural regions of Kazakhstan, the proportion of households with access to high-speed Internet is significantly lower than in Almaty and Astana. Here, digitalization, proclaimed a strategic priority, paradoxically strengthens territorial differences and lays the foundation for the reproduction of “new poverty.”

Thus, the literature emphasizes that digitalization is not a universal modernization tool, but a process with contradictory consequences. On the one hand, it expands opportunities for education, mobility, and inclusion. On the other hand, it creates new forms of exclusion and stratification, which is especially noticeable in societies of catching-up modernization, including Kazakhstan. In our opinion, it is precisely this duality that requires the development of a new analytical framework that would take into account not only technical and economic, but also socio-cultural and psychological aspects of digital inequality.

The development of artificial intelligence (AI) technologies represents a new phase of digitalization, increasing both the prospects and risks of social stratification. According to forecasts, the volume of investments in AI will reach \$160 billion by 2025 [24], which indicates the rapid introduction of these technologies into various spheres of life. However, in parallel with this, there is a threat of “AI-divide” of uneven distribution of access and benefits from the use of AI [25;26; 27].

Early empirical studies indicate that the perception and use of AI varies depending on socio-economic characteristics, including income, gender, and education [28]. In this context, AI becomes not only a tool for increasing productivity, but also a new marker of social inequality. In our opinion, the critical risk lies in the fact that social groups already in the zone of digital vulnerability will face an additional barrier: limited ability to adapt to algorithmically managed labor markets and services.

There are still no large-scale studies of the AI-divide phenomenon in Kazakhstan, however, given the previously identified structural differences in the level of digital skills, it can be assumed that new technologies will reproduce and deepen existing digital divide lines. This poses the challenge of considering the introduction of AI not only as an economic driver, but also as a social policy factor that requires targeted strategies to reduce digital inequality.

#### ***Digitalization and the formation of a new poverty***

Modern concepts emphasize that poverty in the digital age is taking on a new dimension. Eruchalu (2021) defines digital poverty not as a shortage of material resources, but as a lack of access, skills and opportunities to use ICT, which can marginalize even economically prosperous groups [29]. This approach allows us to understand poverty as a more complex social phenomenon that goes beyond the traditional economic categories.

This line of reasoning is developed by Ragnedda (2022), which shows that digital poverty is formed at the intersection of socio-economic status (SES), age, education, and place of residence [30]. As a result of the lack of digital resources, certain groups are effectively becoming “second-class citizens.” Holmes (2020) empirically demonstrates this process: in the UK, the lack of digital skills and access to the Internet leads to the exclusion of people from key social benefits such as education, healthcare and employment [16].

These differences were particularly evident during the COVID-19 pandemic, when a study by the Universities of Liverpool and Loughborough showed that 45% of families with children did not meet minimum digital standards, which significantly deepened social inequality.

At the same time, the literature records the positive effect of digitalization. Spulber et al. (2022), analyzing panel data from 35 countries, conclude that an increase in the level of digital development correlates with a decrease in the proportion of the poor population [31]. Similar results are presented in Lechman (2022), which showed that in 40 developing countries over the period 1990-2019, ICT contributed to economic growth and poverty reduction [32]. These studies point to the ambivalence of digital transformation.: It can be both an inclusion factor and an exclusion factor.

Heeks (2021) introduces the critical concept of inverse digital incorporation, describing a situation where the benefits of digitalization are unevenly distributed and predominantly go to privileged groups [33]. In this context, digital transformation may not only reduce poverty, but also deepen social stratification. Journalistic data (Reuters, 2024; The Guardian, 2024) confirm the magnitude of this problem: more than 2.6 billion people remain without access to the Internet, which increases social marginalization and hinders inclusion in the digital economy [34].

Thus, the concept of new poverty reflects the complex interaction between economic and digital factors. In our opinion, the key challenge is to transform digital policy from a narrowly technological to a socially oriented one, focusing on literacy, infrastructure and the protection of vulnerable groups. For Kazakhstan, which is in the logic of catch-up modernization, this is especially critical: ignoring these aspects risks perpetuating digital marginalization at the generational level.

#### ***Synthesis: towards a digital society paradigm***

Summarizing the existing research, we can identify several stable conclusions. First, digitalization inevitably increases social inequality if there are no compensatory mechanisms. Secondly, the new poverty is increasingly determined not by material factors, but by digital exclusion. Thirdly, in the context of catch-up modernization, Kazakhstan demonstrates a unique intertwining of global and local factors. Finally, the future of digital inequality is linked not only to the underlying infrastructure, but also to the development of AI and the platform economy, which carry both opportunities and risks.

From our point of view, it is precisely these trends that lead to the need to develop a new sociological paradigm of digital society that will take into account the intersection of technological, social and cultural dimensions, as well as critically assess the social consequences of digital innovations.

#### ***Conclusions and research gap***

The literature review demonstrates that the phenomena of the digital divide and the new poverty have been significantly developed in academic discussions. The researchers analyzed in detail the levels of digital inequality [6; 7], expanded the conceptual framework through the concept of “digital capital” and identified new forms of social stratification associated with the platform economy and the introduction of AI [30]. There is also extensive empirical evidence on the relationship between digitalization and poverty in different countries [16; 32; 31], including evidence of both the inclusive and exclusionary effects of technology.

Nevertheless, unresolved issues remain. First, research is mainly focused on developed countries or global statistics, while the contexts of transition economies such as Kazakhstan remain only partially explored. Secondly, considerable attention

is paid to basic access and skills, but less has been studied about the socio-cultural factors influencing the ability to transform digital resources into real forms of social capital. Thirdly, the scientific literature has so far poorly developed mechanisms for the relationship between digitalization and the reproduction of inequality in the context of catch-up modernization, precisely where technological progress is adjacent to social asymmetries.

Thus, a research gap arises: it requires an analysis of how digitalization in transitional societies simultaneously opens up new opportunities and perpetuates social differences, forming specific manifestations of the “new poverty”. This article contributes to this discussion by focusing on the Kazakh context and suggesting that digitalization be viewed not only as a modernization tool, but also as a socio-cultural process fraught with new forms of marginalization. Thus, we are approaching the development of a digital society paradigm capable of explaining the duality of digital transformations and defining directions for future empirical and policy research.

### **Materials and methods**

The methodological basis of the research was built taking into account the interdisciplinary nature of the stated topic. Understanding digitalization as both a technological and a social process required a combination of various research strategies, from the analysis of theoretical concepts and a bibliographic review to the critical interpretation of statistical data and expert assessments. This approach allowed us not to limit ourselves to describing infrastructural changes, but to consider how digital practices are integrated into the social fabric of Kazakh society and form new lines of inequality.

#### ***The logic of research***

The subject of this study is the relationship between digitalization, social inequality and the phenomenon of “new poverty” in Kazakhstan. The choice of methodology was determined by the need to combine theoretical and conceptual analysis, a review of empirical data and a comparison of national and international sources. This approach allowed not only to describe the social consequences of digital transformation, but also to identify research gaps that require further development.

The main research questions were formulated as follows:

1. How can modern theories of digital society (Bell, Masuda, Castells, Van Dijk, Ragnedda, etc.) explain new forms of inequality?
2. What characteristics of Kazakhstan’s digital development are recorded in international rankings and national statistics?
3. How does the “new poverty” manifest itself in the Kazakh context, through access to infrastructure, digital skills, and participation in the digital economy?
4. What risks and contradictions do experts and researchers identify in relation to digitalization?
5. Is it possible to approach the formation of a digital society paradigm for transition economies based on the collected material?

#### ***Materials used***

The study was based on several types of sources:

International indexes and surveys: Network Readiness Index (2022-2023), ITU Digital Inclusion Index, as well as global reports from the United Nations, the World Bank and the OECD on digitalization and social inequality.

Sociological research: the results of the conducted research in Kazakhstan.

Scientific publications: theoretical works by foreign authors (Bell, 1973; Masuda, 1983; Castells, 1996, 1998; Van Dijk, 2006; Ragnedda, 2017; Holmes, 2022; Heeks, 2021; Spulber et al., 2022; Lechman, 2022), as well as Kazakhstani studies of digital transformation (Kurgan and Dunaev, 2021; Insebayeva, 2023; Jamanbalayeva et al., 2025).

### ***Methods of analysis***

A set of complementary methods was used to achieve these goals.:

Bibliographic analysis: systematization and critical interpretation of international and domestic publications on the topic of digital inequality, digital capital, the phenomenon of new poverty and AI-divide. This made it possible to identify key areas of scientific discussion and identify theoretical gaps.

Statistical data analysis: comparison of international indexes with national data of Kazakhstan. This stage included work with quantitative indicators (Internet coverage, use of digital services, differences in income, gender, region), their visualization and interpretation.

Overview of empirical studies and reports: the study of scientific research conducted in Kazakhstan and their comparison with global data. Special attention was paid to the results of research conducted during the COVID-19 pandemic, which revealed new forms of digital vulnerability.

SWOT analysis: was used to assess the strengths and weaknesses of Kazakhstan's digital policy, as well as the opportunities and threats associated with digital transformation.

### ***Research hypotheses***

Based on the collected materials, the following hypotheses were tested:

1. International digital development indexes underestimate the humanitarian dimension of digitalization, which leads to a distorted perception of its real social consequences.

2. Digital inequality persists in all strata of society and reproduces traditional social stratification lines.

3. The new poverty manifests itself not only in low income, but also in digital exclusion, which restricts access to social benefits and labor markets.

4. Expert assessments of digitalization in Kazakhstan are contradictory: Along with the recognition of infrastructural progress, there is an increase in social risks.

5. In the context of catch-up modernization, Kazakhstan is facing a special form of digital stratification, where technological advances are juxtaposed with social asymmetries.

The rationale for research design

The choice of a mixed strategy is explained by the need to combine quantitative and qualitative data. The bibliographic analysis revealed the main theoretical framework, statistical analysis allowed us to record social differences, reconstruct institutional and

cultural interpretations of digitalization. In our opinion, it is this combination of methods that provides a holistic understanding of the phenomenon of “new poverty” and allows us to go beyond the technocratic discourse, forming a broader sociological paradigm of digital society.

## Results

### 1. Bibliographic analysis

An analysis of the literature and empirical works presented in the database makes it possible to identify several stable research areas related to digital inequality, the phenomenon of new poverty and the formation of a digital society paradigm. Below, we have systematized the main conclusions on key topics and their relationship to our research.

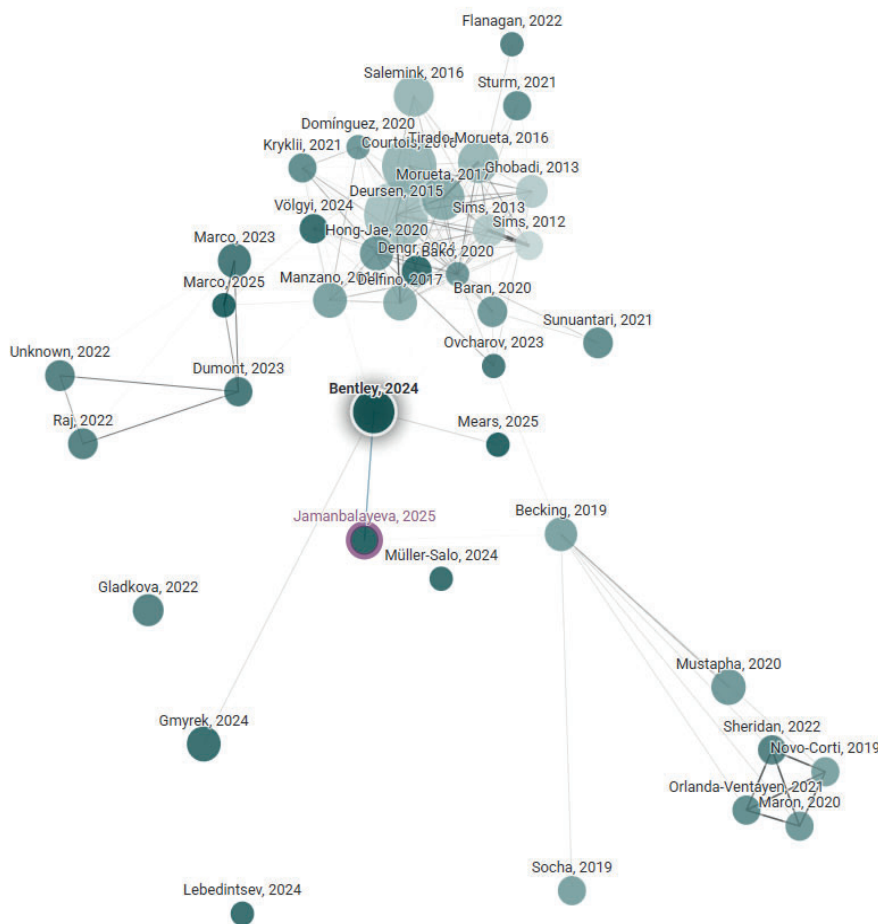


Figure 1. Bibliographic map of co-authorship and citation on the digital divide and the new poverty (2020-2025)

### *1.1. Research on the digital divide*

by Van Dijk and their followers has provided a theoretical framework for analyzing the multilevel nature of digital inequality. Current research (Van Deursen & Van Dijk, 2015; Bentley et al., 2024) develops these approaches, showing that the digital divide extends beyond access to devices and the Internet to include skills, quality of use, and the ability to convert digital resources into social benefits.

Special attention is paid to age and cultural aspects: studies by Lee & Kyung (2020) and Tirado-Morueta et al. (2016) show that older citizens have difficulty adapting to new technologies, which reduces their subjective well-being [35; 36]. These results are important for Kazakhstan, where the demographic structure also generates different levels of digital vulnerability.

We build on this body of work, expanding it in relation to transitional societies. For Kazakhstan, the key challenge is precisely institutional and regional differentiation, which reinforces the classic digital divide.

### *1.2. Digital inequality and social stratification*

A number of studies (Robinson et al., 2020; Dumont et al., 2023) demonstrate that digital exclusion reproduces traditional forms of stratification by class, gender, education, and ethnicity [37; 38]. Moreover, it forms new exclusion lines related to algorithmic practices and access to platforms.

Dumont et al. (2023) showed that digital inequality is directly related to job opportunities: low-skilled workers face discrimination in online labor markets [38]. This aspect is especially relevant for Kazakhstan, where the platform employment market is growing rapidly, but remains poorly protected legally.

We would like to emphasize that digitalization in the context of catching-up modernization not only reproduces traditional barriers (city-village, rich-poor), but also introduces new “algorithmic inequalities”, which have not yet been sufficiently studied in the literature.

### *1.3. The New poverty in the digital Age*

The works of Holmes (2022) and Ragnedda (2022) clearly record a shift in the understanding of poverty: it is determined not only by low income, but also by lack of access to digital services, skills and socially significant opportunities [16; 18].

Empirical studies in the UK and the EU (Holmes, 2022; Good Things Foundation, 2024) show that digital exclusion increases marginalization even in high-income countries [16;39]. The examples of the COVID-19 pandemic have confirmed that digital poverty can perpetuate generational gaps, especially in education.

Data on Kazakhstan and neighboring countries show the same trends: rural regions and low-income groups remain at risk. Unlike in developed countries, where it is more about skills and “quality of use,” the basic barrier remains - the lack of infrastructure.

### *1.4. Artificial intelligence and “AI-divide”*

New research (Bentley et al., 2024) identifies a separate layer of AI-divide digital inequality [22]. It is expressed in the fact that groups with different levels of income, education and digital skills perceive and use artificial intelligence technologies in different ways.

The risks are that AI reinforces existing social differences, creating new barriers to employment and access to services. In Kazakhstan, this aspect has hardly been studied yet, although the introduction of AI into government services and businesses is accelerating.

Ignoring the AI divide in transition economies can perpetuate the “new poverty” at the generational level, as vulnerable groups will be excluded not only from the digital economy, but also from the algorithmic economy.

#### *1.5. Formation of the digital society paradigm and research perspectives*

A review of the literature allows us to identify three lines in the study of the digital society. The technocratic tradition focuses on infrastructure and technological development. The socio-humanitarian line analyzes the social consequences, cultural differences and inequality (Ragnedda, Robinson, Holmes) [30;20;16]. The integrative approach seeks to connect these dimensions by forming multidimensional models of a digital society (Jamanbalayeva et al., 2025) [40]. In transition economies, these areas are inextricably linked: digitalization is both a driver of modernization and a source of new risks.

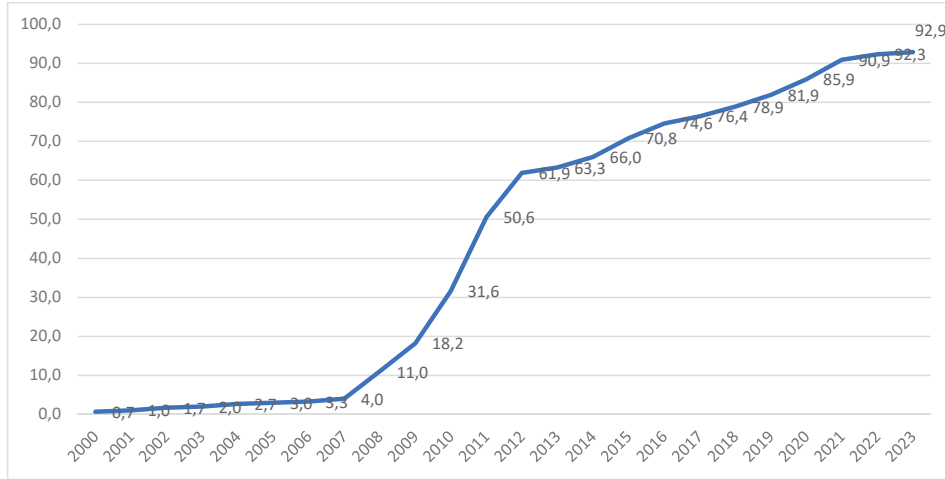
However, significant research gaps have been identified. Most of the work focuses on developed countries and the basic levels of the digital divide, while the contexts of Central Asia, the Caucasus, and Eastern Europe remain poorly understood. Socio-cultural factors (language, values, trust in institutions), as well as the impact of AI and the platform economy under weak institutional conditions, are underestimated. Little attention has been paid to the intergenerational effects of digital poverty. Our research fills in some of these gaps by analyzing the Kazakh context, where digitalization is developing rapidly, but is accompanied by persistent social asymmetries.

The synthesis of the analysis confirms:

1. Digitalization increases inequality in the absence of compensatory mechanisms.
2. The “new poverty” is becoming a global phenomenon, especially acute in transitional societies.
3. AI and the platform economy open up new perspectives, but at the same time carry the risks of perpetuating digital marginalization.
4. For Kazakhstan, the strategic task is to integrate technocratic and socio-humanitarian lines so that digital transformation turns from an infrastructure project into a socially oriented development model.

Thus, the results of the analysis confirm the relevance of research on digital inequality and the new poverty. While the classical digital divide and its evolution to AI-divide have been sufficiently studied on a global scale, the specifics of transition economies remain on the periphery of academic discussions. Our research fills this gap by offering the Kazakhstan case as an example of catch-up modernization. This allows us to contribute to the formation of a new sociological paradigm of the digital society, which takes into account the technological, social, cultural and institutional dimensions of digital transformation.

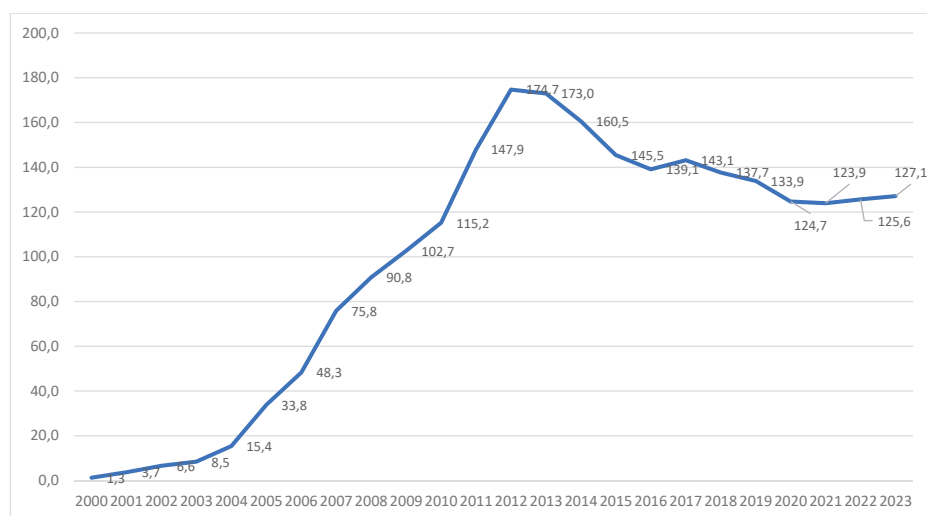
## 2. Results of statistical data analysis



**Figure 2.** Dynamics of Internet users in Kazakhstan (per 100 people), 2000-2023 (according to the World Bank/FRED) [41].

Figure 2 shows the growth dynamics of the number of Internet users in Kazakhstan in the period 2000-2023 according to the World Bank. The Internet penetration rate increased from less than 1 user per 100 people in the early 2000s to 92.9 in 2023, reflecting the country's rapid digitalization process. A particularly sharp increase was observed in the period from 2007 to 2012, when the indicator increased by more than 15 times, which coincides with the stage of active development of the national telecommunications infrastructure and digital modernization programs. In the following years, growth continued, albeit at a slower pace, reaching almost full digital saturation by the 2020s.

This dynamic indicates the formation of a new socio-economic reality, where the Internet has become not only a communication tool, but also a basic prerequisite for participation in a digital society. However, a high degree of coverage alone does not eliminate social inequality: the data indicate quantitative progress, but do not reveal qualitative differences in Internet use between different social groups. It is at this point that the risk of "new poverty" arises, when the majority have formal access, but the skills, resources and opportunities for the full use of digital services remain limited for certain categories of the population. This trend is particularly critical for Kazakhstan: digitalization expands infrastructural boundaries, but at the same time strengthens social stratification, which requires a shift in the focus of public policy from simply expanding coverage to ensuring inclusive and equal digital participation.



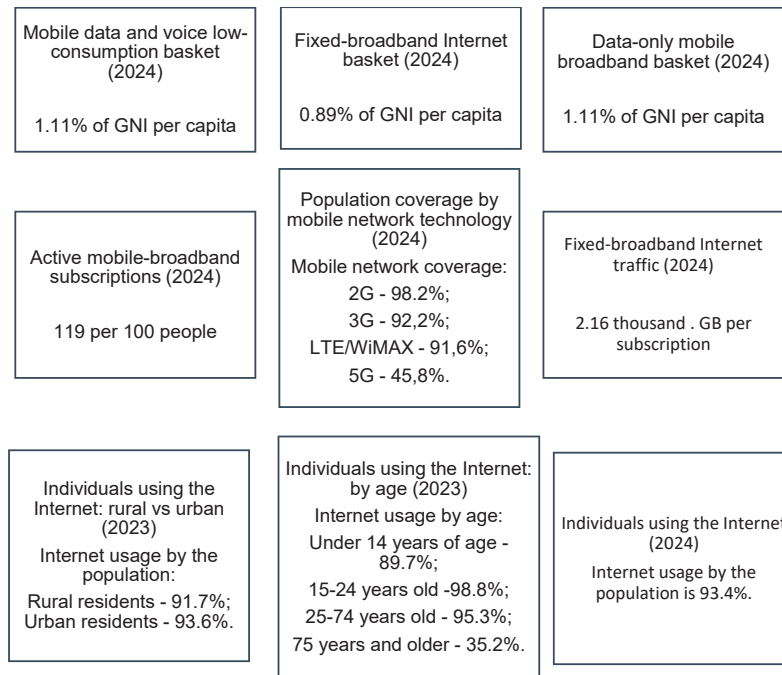
**Figure 3.** Dynamics of the number of mobile cellular subscribers in Kazakhstan (per 100 people), 2000-2023 (according to ITU data) [42].

Figure 3 shows the dynamics of the number of mobile cellular subscribers in Kazakhstan in the period 2000-2023 according to the International Telecommunication Union (ITU). The indicator grew from single values in the early 2000s to a peak of 174 subscribers per 100 people in 2012, due to the widespread practice of using multiple SIM cards by one user and the rapid development of telecom operators. After 2013, there has been a gradual decrease in the penetration rate to 124-127 subscribers per 100 people, reflecting market saturation, optimization of the number of active connections and the transition of the population to more sustainable models of using digital services.

This dynamic clearly demonstrates the inconsistency of digital modernization: quantitative subscriber growth does not always mean a real reduction in digital inequality. The peak of the “mobile boom” in Kazakhstan was accompanied by the fact that access to mobile communications became widespread, but the uneven quality of services, Internet speed and cost of tariffs consolidated social differences between urban and rural areas, rich and low-income households. Moreover, the subsequent decrease in the indicator indicates a transition from an extensive to an intensive stage of digitalization, where the key is not the number of SIM cards, but the ability of the population to fully integrate into the digital economy. In this context, it is the “new poverty” that manifests itself most clearly: the majority have formal access to mobile communications, but differences in digital skills, trust in services and their use opportunities turn mobile digitalization into a stratification factor rather than an inclusion tool. For Kazakhstan, this means the need to shift the focus in government policy from expanding coverage to reducing socio-cultural and regional barriers that hinder real digital inclusion.

A comparative analysis of the dynamics of Internet users (Figure 2) and mobile subscribers (Figure 3) shows the difference in the trajectories of digitalization in

Kazakhstan. If mobile communications reached saturation by 2012 and then showed a decline, reflecting the transition to a more mature usage model, then Internet penetration continued to grow steadily, reaching 92.9 users per 100 people by 2023. This indicates a shift in digital inequality: the key is not access to basic communication channels, but the quality and completeness of integration into the digital economy, where the Internet plays a crucial role. Thus, mobile communications have become the basis of mass coverage, while the Internet defines new lines of social differentiation and the formation of the phenomenon of “new poverty”.



**Figure 4.** Key indicators of digital access, accessibility and Internet usage in Kazakhstan (according to ITU data, 2023-2024) [43].

The presented indicators demonstrate the dual logic of Kazakhstan’s digitalization: on the one hand, high levels of Internet penetration (93.4% of the population) and active mobile subscriptions (119 per 100 people) indicate a steady expansion of digital infrastructure, while the low cost of services (0.89–1.11% of GNI per capita) makes digital services accessible by international standards. On the other hand, structural differences are noticeable – by age (only 35.2% among 75+), by place of residence (the gap between urban and rural remains), as well as by coverage of new generation networks (LTE is available to 91.6%, but 5G is available to only 45.8% of the population). These data confirm that digitalization in Kazakhstan is developing inclusively, but unevenly: the key challenge is not only to expand infrastructure, but also to remove social barriers so that digital development does not reproduce the “new poverty”, but becomes a driver of real social integration.

### **3. Secondary analysis and review of the research results on the topic of the article**

#### **3.1. Digital exclusion and the “new poverty”: institutional and social factors**

Analysis of the results by Amirova et al. It directly confirms the framework of our research on the “new poverty” as a consequence of digital exclusion [44]. First, access: the speed and stability of the Internet, as well as the availability of a school rather than a home PC, are key predictors of teacher participation in synchronous learning. This is important conceptually: institutionally provided resources narrow the gap more than household appliances, therefore, the lack of infrastructure in organizations (schools) is an independent mechanism for reproducing digital vulnerability. Secondly, space: the urban/rural factor is statistically significant in itself (urban teachers use video services more often), although the interaction of “locality/ speed” is insignificant, this indicates that the territorial affiliation and the quality of the Internet act as parallel rather than multiplicative barriers. Thirdly, competencies: age is negatively related to the use of synchronous instruments, while professional category, length of service and workload are positively related.; Thus, the skill base is formed not so much by formal education (its effect is insignificant) as by career socialization and practice. Collectively, this builds a profile of the greatest digital vulnerability: young and less qualified rural teachers without access to school equipment and with low network speeds, this is where the “new poverty” manifests itself as a loss of access to key educational functions (the “access– skill–result” relationship).

From the point of view of politics and our Kazakhstan case, the conclusions are translated into three priorities, which directly fit into the research hypothesis about the duality of digitalization. (1) “Hardware and channel” - prioritize providing school jobs (computers, licenses, stable channel) in rural locations; home appliances do not replace institutional access and do not eliminate the outcome gap. (2) “Skills at the place of practice” - targeted PD programs for younger teachers and beginners with an emphasis on synchronous didactics (Zoom/Teams) rather than general “ICT literacy”; this is what converts access to results. (3) “Third-level metrics” - monitoring should move away from simply accounting for connection to usage indicators and learning outcomes (proportion of lessons in synchronous format, regularity, quality of interaction). For our article, this means: firstly, empirical support for the thesis that digital infrastructure in organizations is the decisive antidote to the “new poverty”; secondly, the need to consider digital inequality as a composition of independent barriers (territory and quality of communication), and not as a single gradient.; Third, the shift in focus from “access to the web” to institutional inclusion and professional practices that determine whether digitalization will be a modernization tool or a stratification mechanism.

#### **3.2. Social determinants of well-being and digital inequality in the context of the crisis**

The results of the Durrani and Makhmetova study allow us to take a fresh look at the social determinants that shape not only the well-being of school leaders in Kazakhstan, but also, more broadly, the vulnerability of women and families in crisis [45]. Gender turned out to be a key factor: female school leaders, combining professional duties and family care, faced higher levels of stress and a deterioration in well-being.

This conclusion directly overlaps with our topic: socio-economic inequality and the distribution of roles within the family increase the burden on women, which affects both reproductive health and educational strategies. Difficulties in interacting with parents, emotional burnout and lack of resources indicate that the crisis has affected not only the school management system, but has also become an additional risk factor for women in the field of work and health.

Contextual constraints, low school autonomy, lack of digital infrastructure, and weak Internet coverage have added to the pressure on school leaders. It is important that limited access to digital resources has hit managers and families alike, widening the gap between urban and rural areas and perpetuating forms of “new digital poverty.” The study highlights that supporting female leaders requires institutional changes, including policies for equal resource allocation, gender-sensitive programs, and the development of school autonomy. For our article, this means that crisis factors, from overload to digital inequality, are becoming systemic barriers affecting both women’s professional well-being and their ability to implement reproductive strategies and manage family health in an unstable environment.

### *3.3. Digital vulnerability of schoolchildren: online learning as a factor of new poverty*

Analysis of the results by Nurgaliyeva et al. It complements our framework of the “new poverty” as a consequence of digital exclusion [46]. The negative relationship between satisfaction with online learning and its difficulty and the high need for face-to-face interaction (especially among rural and girls) indicate uneven access to “high-quality” digital experiences. The contrast of “rural people are more satisfied with learning in general, but less online” captures parallel barriers: infrastructural (communication/devices) and pedagogical (lack of interaction and support). An increase in the proportion of students who reported a drop in results and motivation is an indicator of the third-level outcome gap.

For our research, this means: (1) institutional access (school devices, licensed platforms, guaranteed bandwidth) is more critical than “home appliances”; (2) metrics should take into account not only connectivity, but also the intensity/quality of synchronous interaction; (3) Vulnerable rural groups, girls, high school students, and large families experience an accumulated risk of “digital poverty.” Hybrid models with the priority of live feedback, targeted subsidies for connectivity, and targeted teacher training for synchronous didactics are politically relevant.

## **4. SWOT analysis**

Kazakhstan’s digital policy has a solid infrastructural foundation and a managerial contour, but it risks reproducing the “new poverty” while the focus is shifted to coverage and connectivity. The key to inclusivity: institutional access (schools/FAPs/PSC), on-the-job skills, ethics and security of AI/data, and measuring outcomes, not just infrastructure. This reconfiguration transforms digitalization from a technocratic project into a social strategy compatible with the goals of reducing inequality and the risks of intergenerational marginalization.

STRENGTHS	WEAKNESSES
<p>1. Infrastructural progress and affordability: high Internet penetration, massive mobile connectivity, relative availability of basic data packages → low barrier of entry for most households.</p> <p>2. Developed e-gov and platform-based public services: standardized registries, electronic services, implementation of basic algorithms in administration → reduction of transaction costs, increased transparency.</p> <p>3. The political and organizational inertia of Digital Kazakhstan: fixed roadmaps, KPIs, interagency coordination → the ability to scale pilots quickly.</p> <p>4. Human resource islands of competencies: ICT cores in large cities, university and industry centers, corporate EdTech/FinTech teams → implementation locomotives.</p> <p>5. Post-COVID institutional lessons: gained experience in remote administration and hybrid forms of learning/work → a base for next-gen solutions.</p>	<p>1. Structural unevenness of access: persistent urban-rural gap, age and gender disparities; 5G/high-speed fixed access are unevenly distributed → the risk of perpetuation of «new poverty».</p> <p>2. The predominance of «quantitative» logic: an emphasis on coverage and connectivity instead of metrics of quality of use and outcomes (educational, labor, health effects).</p> <p>3. Institutional dependence: the school/social infrastructure is insufficiently equipped with hardware and a channel; home devices do not compensate for the lack of institutional access.</p> <p>4. Lack of practice-oriented skills: PD and digital literacy are often formal; weak didactics of synchronous learning; fragmented soft and safety skills (privacy, cyber hygiene, source verification).</p> <p>5. Centralized management and low autonomy: «upper» regulations slow down local adaptations; weak feedback from schools/clinics/akimats.</p> <p>6. Incomplete readiness for AI/data: gaps in data governance, lack of data personnel in government agencies and regions, methodological risks of using algorithms in socially sensitive areas.</p>
OPPORTUNITIES	THREATS
<p>1. Change of focus: from «connectivity» to «outcomes»: introduce outcome metrics (school learning, employment, SME income, access to health services) as targets of digital policy.</p> <p>2. The point of growth is institutional access: prioritize equipping schools, FAPs, PSCs (devices, licenses, sustainable channels) in rural and vulnerable locations → rapid gap reduction effect.</p> <p>3. AI for inclusion: localization of AI services (Kazakh/Russian, offline modes, small models), assistive technologies for the elderly/people with disabilities, smart proactive public services.</p> <p>4. Hybrid models: combined learning with a mandatory share of synchronous interaction; «digital classrooms» in rural schools and coworking spaces at akimats.</p> <p>5. Targeted subsidies and vouchers: targeted support for connections and devices for large families/novice teachers/high school students → reduction of the accumulated risk of «digital poverty».</p> <p>6. Data-driven management: unified data standards, secure sandboxes for researchers, municipal dashboards of inequality → more accurate goal setting and evaluation of effects.</p>	<p>1. «AI-divide» and algorithmic stratification: automation in labor markets, predictive decisions in education/social support without equity audit → increased invisible discrimination.</p> <p>2. Infrastructure vulnerability: network overload, mono-channel, vendor dependency → risks of failures and price increases in a crisis.</p> <p>3. Low digital confidence: psychological barriers among the elderly, women in care, rural users → underuse of services with formal access.</p> <p>4. Cyber risks and privacy: data leaks, phishing, social payment fraud → erosion of trust in e-gov, «rollback offline».</p> <p>5. Political and administrative risks: «showcase» indicators, weak feedback, broken pilots → permanent «project» mode without sustainable practices.</p> <p>6. Intergenerational fixation of inequality: learning losses and «subtle» skills (communication, self-organization) in schoolchildren in vulnerable groups → deferred adult poverty.</p>

**Figure 5.** SWOT analysis of Kazakhstan’s digital policy and transformation through the lens of social inequality and the “new poverty”

### Strategic conclusions

#### 1. Reconfiguring goals: from the KPI of connectivity to the KPI of outcomes.

– Education: the proportion of lessons actually conducted in a synchronous format; academic performance/dropout rate in rural schools; the proportion of schools with “institutional access”.

– Labor market: the share of “digital” employment outside large cities; the growth of SME income from online channels.

– Healthcare: completed telemedicine consultations; proactive services coverage.

#### 2. Institutional access as an antidote to the “new poverty”:

– School-as-a-platform kits (PCs/tablets, licenses, LTE routers with traffic prioritization, technical support); service levels for rural institutions; backup channels.

#### 3. “on-the-job” skills:

– PD for teachers/social workers/paramedics - not “ICT-general”, but scenario training (conducting a synchronous lesson; digital navigation of benefits; working with vulnerable users).

– Digital confidence programs for the elderly and female caregivers (mentoring, “peer educates peer”).

#### 4. Ethics and Data Security/AI:

– Mandatory algorithmic audit in education, social support, employment; registration of datasets; DPIA assessments; data Ombudsman.

#### 5. Targeted support:

– Connection vouchers/devices for large families, high school students, and college students; tax benefits for operators for covering “expensive” villages.

#### 6. Local “digital spaces”:

– Village co-working spaces/”digital living rooms” at schools and akimats (Wi-Fi, PCs, tutors) anchors for education, public services, and employment.

#### Monitoring indicators (a short set for the Policy Assessment Methodology section)

– Institutional access: to rural schools/FAPs with guaranteed bandwidth and licenses; median network downtime.

– Usage and quality: proportion of synchronous lessons; average duration of video sessions; parent/student participation.

– Skills and confidence: digital confidence index for target groups (female carers, 60+, rural).

– Outcome metrics: educational outcomes in rural/urban schools; percentage of people employed through digital channels in small towns; completed telemedicine cases.

– Safety/ethics: the number of incidents, the audit coverage of AI modules, the proportion of services with DPIA.

#### “Red flags” (which is especially important to keep track of)

– Fast launch of AI services in education/social support without equity tests.

– The focus on 5G is on display, with fixed access stagnating in rural areas.

– The growth of cyberbullying → users’ refusal from e-gov.

– Substitution of institutional access with “home-made” solutions, the “pseudo-access” effect.

### **Conclusion**

The analysis shows that in Kazakhstan, digitalization has ceased to be a neutral technological trajectory and has become an independent mechanism of stratification. The “new poverty” is formed not by a lack of connectivity per se, but by a lack of institutional access, practice-oriented skills, and the ability to convert digital resources into educational, labor, and health outcomes. Empirical data on schools, students, and supervisors confirm the three-tier exclusion logic of “access → skill → outcome,” with increased vulnerability in rural areas, women, and households with high caregiving burdens.

Strategic inference for policy, goal reconfiguration: from coverage metrics to outcome metrics and reduction of “pseudo-access”. The priorities are: (1) institutionalization of access in schools, FAP and PSC (devices, licenses, guaranteed bandwidth, technical support); (2) mass trainings “at the place of practice” (synchronous didactics, digital navigation of benefits, cyber hygiene) and digital confidence development programs for target groups; (3) Data ethics and algorithm equity auditing as a standard for education, social support, and employment to prevent “AI-divide.”

The scientific agenda requires a shift towards causal assessment and longitudinal monitoring: measuring institutional access, quality of use, and performance at the school, family, and municipal levels; embedding experimental and quasi-experimental designs into national programs; and developing digital confidence and algorithmic equity indexes. This combination of policy and research solutions transforms digitalization from a technocratic project into a socially oriented strategy for reducing inequality and intergenerational vulnerability.

### **Discussion**

The main results of the study confirm the dual nature of digitalization: on the one hand, Kazakhstan has made significant progress in the field of digital infrastructure and Internet penetration, on the other hand, structural differences persist that form the phenomenon of “new poverty”. This paradox indicates that digitalization in a transitional economy cannot be reduced to a technocratic project: its consequences must be considered in the logic of social stratification. Our data demonstrate that high levels of Internet and mobile coverage do not bridge gaps in the quality of digital participation, but rather can perpetuate existing social differences.

A comparison with international studies shows that the Kazakh case has specific features. In developed countries, digital inequality is more often associated with skills and “quality of use” (Robinson et al., Holmes, 2022), whereas for Kazakhstan, basic access and institutional infrastructure remain crucial [20;16]. The poor equipment of schools, clinics and rural institutions with technology and a stable Internet channel creates a stable risk zone where digital poverty is reproduced in an intergenerational perspective. These results confirm the thesis that the key antidote to digital exclusion is institutional access, not just home devices or individual literacy.

Special attention should be paid to the fact that the phenomenon of “new poverty” in Kazakhstan should be considered in combination with socio-cultural and gender factors. Research conducted during the pandemic revealed that women, rural families,

and students from large households were the most vulnerable. Here, digital inequality is intertwined with traditional barriers: economic, educational, and cultural. This result requires a rethink of the state digital policy: while maintaining the focus on infrastructure projects, it is necessary to strengthen the socio-humanitarian dimension of teacher support, training for synchronous learning, and the development of digital confidence among vulnerable groups.

Our analysis also captures promising, but still poorly understood challenges associated with the introduction of artificial intelligence. The risk of “AI-divide” has been identified in the literature (Bentley et al., 2024), and in Kazakhstan it may become a factor in deepening stratification: groups already in the zone of digital vulnerability risk being excluded from the algorithmic economy. This opens up an important area for future research: the study of the social perception of AI, the willingness of various social groups to use it, and the impact on the labor market.

The limitations of this study are related to the fact that the focus was on macro-level data and comparison with international indexes. Micro-level digital usage practices (for example, differences in educational strategies or professional integration) require a separate empirical analysis. Nevertheless, the results suggest that without a shift in emphasis from “connectivity” to “effectiveness,” the digital transformation in Kazakhstan risks perpetuating social inequality.

Thus, the discussion confirms the need to develop a new sociological paradigm of a digital society for transition economies. It should take into account not only technological advances, but also the institutional, cultural, and gender dimensions of digitalization. For Kazakhstan, the key task is to form a socially oriented digital policy that will not only expand infrastructure coverage, but also reduce the risks of digital poverty, creating conditions for inclusion and social sustainability.

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