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DIGITAL TRANSFORMATION OF PUBLIC SERVICES IN KAZAKHSTAN BASED ON DIGITAL PUBLIC INFRASTRUCTURE

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ABSTRACT. The article examines the digital transformation of public services in Kazakhstan through the lens of Digital Public Infrastructure (DPI) and citizen-centred project management. The purpose of the study is to develop a methodological justification for modernising the issuance and replacement of the national identity card as a priority case for moving from e-government to a proactive, secure and integrated digital state model. The methodology combines a review of international literature published in 2020-2026, analysis of regulatory and policy documents, a comparative review of Estonia's experience, service mapping, a service prioritisation matrix, and As-Is/To-Be process modelling. The originality of the study lies in integrating three analytical frameworks: a whole-of-government approach, the DPI/GovStack architecture, and a cost/benefit matrix for selecting a digital transformation quick win. The findings show that the national ID issuance and replacement service has high transformational potential, as it relies on existing DPI components in Kazakhstan, including eGov.kz, eGov Mobile, digital identity, e-signature, payment services and inter-agency data exchange. At the same time, sustainable impact requires legal and organisational safeguards: biometric data governance, algorithmic audit, transparent logs, independent cybersecurity monitoring, preservation of alternative offline

channels and systematic development of digital competencies among civil servants.

KEYWORDS: public services delivery, digitization, DPI, GovStack, citizen-centricity, digital transformation, state apparatus

ЦИФРОВАЯ ТРАНСФОРМАЦИЯ ГОСУДАРСТВЕННЫХ УСЛУГ КАЗАХСТАНА НА ОСНОВЕ ОБЩЕСТВЕННОЙ ПУБЛИЧНОЙ ИНФРАСТРУКТУРЫ

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АННОТАЦИЯ. В статье рассматривается цифровая трансформация государственных услуг Республики Казахстан через призму цифровой публичной инфраструктуры (Digital Public Infrastructure, DPI) и клиентоориентированного проектного управления. Цель исследования состоит в разработке научно-методического обоснования модернизации услуги выдачи и замены удостоверения личности как приоритетного кейса перехода от электронного правительства к проактивной, безопасной и интегрированной модели цифрового государства. Методология включает анализ международной литературы за 2020-2026 годы, обзор нормативных и программных документов, сравнительный анализ опыта Эстонии, сервисное картирование, матрицу приоритизации услуг, а также моделирование процессов As-Is/To-Be. Оригинальность исследования заключается в интеграции трех аналитических рамок: подхода whole-of-government, архитектуры DPI/GovStack и матрицы cost/benefit для выбора «быстрой победы» цифровой трансформации. Результаты показывают, что услуга выдачи и замены удостоверения личности обладает высоким трансформационным потенциалом: она опирается на уже функционирующие элементы DPI Казахстана, включая eGov.kz, eGov Mobile, цифровую идентификацию, электронную подпись, платежные сервисы и межведомственный обмен данными. Вместе с тем для устойчивого эффекта необходимы правовые и организационные гарантии: управление биометрическими данными, аудит алгоритмов, прозрачные журналы действий, независимый мониторинг кибербезопасности, сохранение альтернативных офлайн-каналов и развитие цифровых компетенций государственных служащих.

КЛЮЧЕВЫЕ СЛОВА: оказание государственных услуг, цифровизация, DPI, GovStack, клиентоориентированность, цифровая трансформация, государственный аппарат

ЦИФРЛЫҚ ҚОҒАМДЫҚ ИНФРАҚҰРЫЛЫМ НЕГІЗІНДЕ ҚАЗАҚСТАННЫҢ МЕМЛЕКЕТТІК ҚЫЗМЕТТЕРІН ЦИФРЛЫҚ ТРАНСФОРМАЦИЯЛАУ

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АҢДАТПА. Мақалада Қазақстан Республикасындағы мемлекеттік қызметтерді цифрлық қоғамдық инфрақұрылым (Digital Public Infrastructure, DPI) және азаматқа бағдарланған жобалық басқару тұрғысынан цифрлық трансформациялау мәселелері қарастырылады. Зерттеудің мақсаты - жеке куәлікті беру және ауыстыру қызметін электрондық үкіметтен проактивті, қауіпсіз және интеграцияланған цифрлық мемлекет моделіне өтудің басым кейсі ретінде ғылыми-әдістемелік негіздеу. Әдіснамасы 2020-2026 жылдардағы халықаралық әдебиеттерге шолуды, нормативтік және бағдарламалық құжаттарды талдауды, Эстония тәжірибесін салыстырмалы зерделеуді, қызметтерді карталауды, қызметтерді басымдыққа қою матрицасын және As-Is/To-Be процестерін модельдеуді қамтиды. Зерттеудің бірегейлігі үш талдамалық тәсілді біріктірумен айқындалады: whole-of-government қағидаты, DPI/GovStack архитектурасы және цифрлық трансформация үшін «жылдам нәтиже» беретін қызметті таңдауға арналған cost/benefit матрицасы. Нәтижелер жеке куәлікті беру және ауыстыру қызметінің трансформациялық әлеуеті жоғары екенін көрсетеді, өйткені ол Қазақстанда жұмыс істеп тұрған eGov.kz, eGov Mobile, цифрлық сәйкестендіру, электрондық қолтаңба, төлем сервистері және ведомствоаралық деректер алмасу сияқты DPI элементтеріне сүйенеді. Сонымен қатар тұрақты нәтиже үшін биометриялық деректерді басқару, алгоритмдерді аудиттеу, ашық журналдау, киберқауіпсіздікті тәуелсіз мониторингтеу, офлайн-арналарды сақтау және мемлекеттік қызметшілердің цифрлық құзыреттерін дамыту қажет.

ТҮЙІН СӨЗДЕР: мемлекеттік қызметтер көрсету, цифрландыру, DPI, GovStack, тұтынушыларға назар аудару, цифрлық трансформация, мемлекеттік аппараты

INTRODUCTION. The digital transformation of public administration is no longer limited to the digitalization of individual administrative procedures. The current stage is characterized by a shift from the "e-government" model, which emphasized portals and online forms, to a digital state model in which data, identification, payments, registries, user consent, and interdepartmental integration serve as common infrastructure components. Methodologically, this corresponds to the six dimensions of digital government identified by the OECD: digital by design, data-driven public sector, government as a platform, open by default, user-driven, and proactive [1].

This agenda is particularly relevant for Kazakhstan. The country boasts a developed e-government infrastructure, high levels of online public service penetration, and a robust institutional framework for digitalization. In 2024, Kazakhstan joined the group of countries with very high e-government development in the UN e-Government Development Index, ranking 24th in the global EGDI ranking [3]. However, a high ranking alone does not guarantee process maturity: the most challenging task is to ensure seamless, secure, personalized, and proactive public services while maintaining citizen trust.

International approaches to digital governance emphasize that digitalization must be accompanied by institutional coordination, change management, capacity development, transparent monitoring, and legal guarantees of data protection [2]. Therefore, in Kazakhstan's context, it is important to consider not only which services can be transferred online, but also which services should be prioritized to demonstrate public value, reduce administrative burdens, and strengthen trust in the state.

The research focuses on the public service delivery system in Kazakhstan, and the organizational and methodological conditions for the digital transformation of the ID card issuance and replacement service. This case study was chosen due to its social significance, widespread nature, connection to underlying registries, and the ability to leverage existing elements of the digital public infrastructure. The purpose of the article is to substantiate a model for modernizing this service based on DPI and GovStack, project management, and a customer-centric approach.

To achieve this goal, the following objectives were set: systematize modern scientific and institutional approaches to the digital transformation of public services; determine the role of digital public infrastructure in service modernization; assess the priority of the ID card issuance and replacement service using a cost-benefit matrix; describe the target To-Be model; identify risks and propose an implementation roadmap. The practical significance of this work lies in the ability to use the proposed recommendations in the design of public services, the development of eGov.kz and eGov Mobile, and the formation of a portfolio of digital transformation projects for government agencies.

The literature from 2020 to 2026 demonstrates a shift

in research focus: from studying e-services as separate channels of interaction to analyzing the digital state as an integrated ecosystem. In 2020, the OECD proposed considering digital maturity through the state's ability to design services "digital by default," use data as a strategic asset, function as a platform, open data and algorithms within acceptable limits, engage users, and move toward proactive services [1]. The subsequent guide for E-Leaders shifted the emphasis to the institutional side of transformation: interagency coordination, political support, regulatory levers, business cases, risk management, and performance monitoring [2].

UN e-government reports remain important as a comparative empirical basis. The 2024 Survey views digital government not only as a convenience tool but also as a mechanism for achieving the Sustainable Development Goals through effective, accountable, and inclusive institutions [3]. These findings are of direct relevance to Kazakhstan, as a high EGDI level requires a shift from quantitative expansion of online services to qualitative changes in their architecture: data integration, reduction of repeat requests, citizen life situations, and proactive support.

The World Bank develops a similar logic through its GovTech Maturity Index. The GTMI measures not only the availability of online services but also four interrelated dimensions: core government systems and overall digital infrastructure, digital service delivery, digital citizen engagement, and the institutional environment of GovTech – strategies, legislation, skills, and innovation programs [4]. Therefore, when designing a specific service, it is important to assess not only the user interface but also the maturity of the back office, data interoperability, service portfolio management, and the government's ability to support change.

In 2024–2025, the concept of Digital Public Infrastructure gained significant traction in international literature and policy documents. The World Bank defines DPI as a set of basic digital building blocks for public use that can be reused at scale by public and private service providers, including digital identification, electronic signatures, payments, and data exchange [5]. The OECD complements this definition with an emphasis on security, interoperability, inclusiveness, data protection, and the role of government in the design, management, and development of DPI [6].

GovStack's practice-oriented approach complements DPI logic through building block specifications and rules for their reuse. This is especially important for countries with established e-government portals: GovStack eliminates the need to create each service as a separate project, assembling it from compatible components – identification, consent, payments, notifications, registries, messaging, and workflows [7]. This approach reduces vendor dependency, facilitates scalability, and establishes an architectural discipline.

Recent academic research confirms that digital transformation of public services improves efficiency, citizen engagement, and accountability, but only if technological readiness, organizational adaptation, and consideration of the risks of digital inequality are met. J.J.P. Latupeirissa et al., based on a review and case studies, demonstrate that digitalization can improve service quality, but requires attention to accessibility, security, cost, and resource management [8]. F. Kitsios, M. Kamariotou, and A. Mavromatis, analyzing the practices of public sector managers, identify barriers to transformation: organizational, administrative, cultural, leadership, and macro-level limitations [9].

Case studies of legacy public organizations demonstrate that the implementation of digital technologies should not replace process change. Using the example of India Post, S. Sinha et al. emphasize the need to balance financial efficiency, social responsibility, and inclusiveness in the digitalization of services [10]. A. Shibambu and M. Ngoepe's study of digital transformation in the South African public sector demonstrates that the lack of a strategy and legal framework leads to fragmented implementation and reduces the impact on service quality [11].

A separate body of literature focuses on inclusiveness and trust. G.H. Djatmiko, O. Sinaga, and S. Pawirosumarto demonstrate that sustainable e-government requires long-term investments in digital literacy, accessibility, cybersecurity, public-private partnerships, and the protection of vulnerable groups [12]. S. Saeed, analyzing the perception of the security and privacy of e-government services, emphasizes that trust depends not only on the formal level of cybersecurity, but also on the usability, clarity, and perceived security of the interface [13].

Finally, the literature on digital maturity points to a methodological gap: many maturity models mention citizens, but do not always translate citizen-centricity into specific metrics, governance requirements, and participation procedures. A. Waara, having studied 18 digital government maturity models, shows that only a few systematically integrate citizen needs into maturity stages, metrics, constraints, and recommendations [14]. For Kazakhstan, this means linking eGov technological metrics to the quality of user experience, trust, accessibility, and citizens' life situations.

The development of artificial intelligence and automated decision-making strengthens the regulatory component. The European Union's 2024 Artificial Intelligence Regulation (AIIR) enshrined a risk-based approach and classified certain AI applications in publicly significant areas as high-risk [15]. For Kazakhstan, which declared 2026 the Year of Digitalization and Artificial Intelligence [16] and adopted a Digital Code [17], this experience is important as a benchmark for the development of national mechanisms for transparency, impact assessment, human oversight, and appeals.

MATERIAL AND METHODS OF RESEARCH. The article's empirical and analytical base includes: service mapping materials and a prioritization matrix for public services in Kazakhstan; methodological recommendations for the digital transformation of government agencies based on project management principles; a report examining Estonia's experience in GovStack, proactive services, and digital infrastructure; international documents from the OECD, UN, World Bank, and GovStack; regulatory sources, and official materials from eGov.kz.

The study utilized the following methods. First, document analysis allowed us to systematize international and national sources and identify key categories and requirements for digital transformation. Second, comparative analysis was used to compare the Kazakhstani case with Estonian principles: once-only, government-as-a-platform, digital identity, interoperability, proactive services, and life-situational services. Third, service mapping allowed us to identify process participants, channels, documents, regulatory frameworks, timelines, and problem areas.

Fourth, a prioritization matrix was used to select the most promising service. Each service was assessed across two sets of criteria: expected benefits and required costs/transformation complexity. The benefits set included reduced total cost of ownership, speed of delivery, coverage, interoperability, transparency, security, reduced data duplication, reduced errors, privacy protection, fewer physical visits, and a transition from a reactive to a proactive model. The costs set included changes in policy, processes, infrastructure, skills, cost, timeline, and imple-

mentation complexity.

Fifth, As-Is/To-Be modeling was applied. The As-Is model describes the current logic of service provision through physical contact at the PSC, document collection, verification, payment, waiting, and receiving the result. The To-Be model describes the target logic: digital application submission, automated data verification, biometric identification, online payment, digital assignment of the pickup location, notifications, and status monitoring. This approach allows us to link technological components with changes in the administrative process, rather than viewing digitalization as simply adding an online channel.

The study's limitations stem from the fact that the cost-benefit assessment is expert-analytical in nature and reflects preliminary prioritization rather than a financial and economic audit. Furthermore, individual indicators of user experience, accessibility for rural residents, and integration readiness require further empirical verification using surveys, interviews, and administrative data.

RESULTS AND THEIR DISCUSSION. 1. The Kazakhstan context: from an e-government portal to a DPI ecosystem. Kazakhstan's digital infrastructure creates favorable conditions for the transition to a DPI model. According to official data from eGov.kz, by 2026, the e-government portal had more than 15 million registered users, over 508 million services were provided through the system, over 111 million services were provided through eGov Mobile, and approximately 90% of more than 1,300 government services were available online [18]. These indicators confirm that the country has developed a mass digital channel for interaction between citizens and the government.

The maturity of the next stage is determined not by the number of online forms, but by the degree of reuse of common components. eGov Mobile already functions not only as a mobile interface but also as an access point to digital documents, eGov QR, services, notifications, and life situations. The official description of eGov Mobile indicates that a digital document is analogous to an original document and includes an identity card, driver's license, birth certificate, and other documents [20]. This forms the basis for the further transition from the "request" model to services that support citizens in specific life situations.

The service for issuing and replacing ID cards is a prime example, as it combines identification, biometrics, state registries, fee payment, electronic signature, consent to the processing of personal data, notifications, and the physical receipt of the document. Since 2025, eGov.kz has launched an online application for ID card replacement through the portal and eGov Mobile in a pilot format [19]. The service card indicates that online submission is available if the ID card has 30 or fewer calendar days remaining on its expiration date, or if the ID card is expired by no more than 10 calendar days [19].

Thus, the service in question already occupies a transitional position between traditional administrative procedures and a new-generation digital service. Its modernization could serve not only as an improvement to one service but also as a testing ground for scaling the DPI approach to other vital government services.

2. Prioritization of services and case selection. The service catalog examined four high-volume services: identity card issuance/replacement, vehicle registration, university admission and application for a state educational grant, and real estate ownership registration. All four services have high potential for digitalization, but differ in the complexity of integration, the number of institutional participants, and regulatory risks.

The matrix results showed that the identity card issuance and renewal service has a benefit score of 46, a cost score of 20, and the best cost-to-benefit ratio of 0.43. In comparison, real estate registration has a higher overall benefit potential (49), but requires greater interagency integration and exhibits a cost-to-benefit ratio of 0.55. University admission and vehicle registration also have high value but require more complex coordination with education, insurance, tax, banking, and registration systems.

The choice of the identity document as the first case study is methodologically sound for three reasons. First, the service has high public visibility: the document verifies identity and is required for numerous other public and private transactions. Second, its transformation builds on existing digital government components, meaning it can yield rapid results without having to rebuild the entire architecture. Third, a successful modernization will create a reusable model for other services that require secure identification, consent, payment, and interagency verification.

Table 1. Public Service Prioritization Matrix for Digital Transformation

№	Service	Benefit score	Cost score	Cost/Benefit ratio	Interpretation
1	Issuance/replacement of identity card	46	20	0,43	Fastest effect at moderate difficulty
2	Real estate registration	49	27	0,55	High benefits but complex interdepartmental integration
3	University admission and state grant	46	27	0,59	High social significance, requires integration of educational systems
4	Vehicle registration	43	26	0,60	Valuable service, but higher process complexity and risk control

3. As-Is/To-Be model and DPI architecture for the selected service. The current As-Is model typically involves several steps: a citizen contacts a public service center, submits an application and documents, undergoes a photograph/biometric capture, pays a state fee, waits for the data to be processed by the immigration police, and receives the completed document in person. This model creates administrative costs: queues, repeat visits, dependence on the physical availability of the public service center, potential errors during manual verification, and an uneven user experience across regions.

The To-Be target model should be built around the principle of "data moves, citizens don't run." Ideally, citizens receive proactive notification of their ID's approaching expiration date, confirm their intention to renew, undergo secure digital identification, complete a pre-filled application, pay the fee online, select a pickup location, and track the status. The state, in turn, automatically verifies the IIN, registration status, the relevance of personal data, the presence of restrictions, and the accuracy of the submitted information.

The DPI architecture of this service includes six key blocks: digital identification, electronic signature or alternative verification, interdepartmental data exchange, payments, consent to personal data processing, notifications, and status tracking. At the management level, each component must be assigned an owner, and indicators for availability, security, processing time, data quality, and

incident response mechanisms must be defined.

Biometric identification is of particular importance. According to the official description of online ID card replacement, the process involves checking the IIN and phone number through the mobile citizen database, an OTP code, and biometric identification. Biometric data is stored encrypted in the secure environment of JSC National Information Technologies [19]. However, even with technical measures in place, it is necessary to establish clear rules for the user: why the data is collected, how long it is stored, who has access, how to file a complaint, and what offline alternative is available if identification fails.

Table 2. DPI components of the identity card issuance and replacement service

DPI component	Function in the service	Management aspect	Risk of poor implementation
Digital identification	Applicant's identity verification, biometric verification	Who is responsible for the accuracy, security and audit of identification?	Identification errors, exclusion of some users, mistrust
Electronic signature/ confirmation	Legally significant confirmation of the application	What verification methods are equivalent and convenient?	Complexity for the user, dependence on NCALayer or device
Data exchange	Checking IIN, registration, and document status	Which registries are the sources of truth?	Data duplication, manual checks, delays
Payments	Payment of state duty and urgency	How are refunds, receipts and payment reconciliations ensured?	Payment errors, disputes, and repeated requests
Consent and data protection	Legitimization of the processing of personal and biometric data	How does a citizen manage consent and view access history?	Privacy violations, regulatory claims
Notifications and status	Proactive reminder, information about the progress of the service	What channels and SLAs are assigned?	Uncertainty for citizens, increase in calls to the Public Service Center

4. Lessons from Estonia and the applicability of the GovStack approach. The Estonian experience demonstrates that a digital state is built not around individual applications, but around legal, architectural, and cultural compatibility. Key principles include once-only implementation, interagency interoperability, security by default, digital identity, transparent access logs, life event services, and proactive service provisioning. For Kazakhstan, it's not the direct transfer of Estonian solutions that is particularly important, but rather the adaptation of the underlying logic: the creation of standards that enable various agencies to operate within a unified digital ecosystem.

The GovStack approach is useful as a methodological framework for moving from departmental automation to the assembly of services from standard components. In the Kazakhstan case, this means that the ID card replacement service should not be developed as an isolated module. Its components – identification, payments, notifications, consent, data verification, and logging –should be reusable across other services: driver's license renewal, vehicle registration, social benefits processing, and educational grant applications.

Proactivity is the most promising approach. The government already has information about the expiration date of an ID card, the citizen's contact information, registration status, and digital notification channels. Therefore, the service can begin not with a citizen's request, but with an automatic reminder: "The ID card expires in 30 days. Check the information and submit an application online." This model reduces the risk of document expiration, reduces the workload on the Public Service Center, and improves the perceived quality of government service.

However, proactivity should not degenerate into automatic intervention without consent and explanation. Citizens must understand what data is used for notification, have the option to opt out of certain notifications, choose a communication channel, receive an explanation of the decision, and, if necessary, switch to offline service. Therefore, technical proactivity must be complemented by legal accountability and service ethics.

5. Risks, limitations and legal guarantees. The digital transformation of identity documents is associated with increased risks, as it affects personal and biometric data, legally binding identification, and access to other government services. The main risks can be divided into five groups: technological, legal, organizational, social, and ethical.

Technological risks include biometric identification failures, portal unavailability, registry integration errors, cyberattacks, and poor data quality. Legal risks relate to the grounds for processing personal data, biometric storage periods, operator liability, and the citizen's right to appeal. Organizational risks include staff resistance, the lack of preparedness of public service centers for a hybrid service model, a lack of competence, and unclear division of responsibilities between agencies. Social risks manifest themselves in digital inequality, particularly for the elderly, rural residents, and those with low digital literacy. Ethical risks relate to potential discrimination during automated verification or biometric errors.

Kazakhstan's new legal environment creates a window of opportunity for institutionalizing such guarantees. The decree declaring 2026 the Year of Digitalization and Artificial Intelligence has cemented the political priority of further digitalization [16], and the Digital Code of the Republic of Kazakhstan is establishing a more systemic legal framework for the digital sphere [17]. As part of service modernization, this should be expressed not only in technical requirements but also in clear DPIA procedures, access logging, data ownership, incident response regulations, and user rights.

To mitigate these risks, the "digital by default, not digital by choice" principle is proposed. While the online channel should be the primary and convenient one, the Public Service Center (PSC) retains its support function for citizens who are unable to undergo biometric identification, lack access to a smartphone, experience difficulties with the digital interface, or prefer in-person service for objective reasons. This hybrid approach is consistent with the logic of inclusive digitalization described in contemporary literature [12].

6. Roadmap and performance indicators. A phased roadmap is proposed for practical implementation. The first stage involves completing a pilot online ID card replacement, collecting data on conversion rates, biometric failures, processing times, support requests, and user satisfaction. The second stage involves implementing proactive expiration notifications and automatic application pre-filling. In the third stage, the service should be integrated with an expanded consent and access log system,

allowing citizens to see what data was used during application processing. The fourth stage involves scaling the standard architecture to other documents and situations.

The KPI system should include not only technical and quantitative indicators but also trust and inclusiveness metrics. For example, the percentage of applications submitted online, the average time to complete an application, the percentage of successfully completed biometric verifications, the number of repeat applications, the percentage of applications without manual correction, user satisfaction, service availability, the number of security incidents, the percentage of users switching to an offline channel due to technical unavailability, and the number of complaints regarding personal data processing.

Table 3. Proposed roadmap for service modernization

Stage	Content	Expected result	KPI
1. Pilot and diagnostics	Evaluation of the current online process, feedback collection, failure analysis	Confirming service readiness and identifying bottlenecks	Online application conversion, processing time, and biometric failures
2. Proactivity	Notifications about the document validity period, pre-filling of the application	Reducing overdue payments and the burden on public service centers	The proportion of applications after notification, a reduction in in-person visits
3. Data management	Consent, access log, DPIA, incident protocol	Strengthening trust and legal accountability	Number of complaints, response time, log availability
4. Scaling	Reusing blocks for other documents and life situations	DPI effect and cost reduction for new services	Number of services on common components, satisfaction

CONCLUSION. The study showed that modernizing the ID card issuance and replacement service can be considered a priority for the digital transformation of Kazakhstan's public services. According to the prioritization matrix, this service has the best balance of expected benefits and required costs, placing it in the "quick win" category. Moreover, its importance extends beyond a single administrative process: an ID card is a fundamental document linked to a citizen's digital identity, access to other services, and trust in the government.

The scientific novelty of this article lies in its combination of three approaches: whole-of-government management, DPI/GovStack architecture, and a benefit/cost service matrix. This synthesis allows us to move beyond the departmental logic of digitalization and view services as part of a digital ecosystem, where data reuse, interdepartmental interoperability, security, user experience, and accountability are key.

Practical recommendations include: developing online ID card replacement through eGov.kz and eGov Mobile; implementing proactive notifications about document expiration dates; automatically pre-filling applications based on trusted registries; expanding consent mechanisms and access logs; conducting data protection impact assessments; securing ownership of DPI components; maintaining an offline alternative; developing digital competencies for PSC and government agency staff; and regularly publishing KPIs for service quality, availability, and security.

Further research should focus on empirical assessments of user experience, analysis of the digital divide between urban and rural users, financial assessment of TCO, biometric identification risk modeling, and comparative studies of proactive services in Kazakhstan, Estonia, and other countries. For sustainable digital transformation, it is important for Kazakhstan to shift from the logic of "how many services are available online" to "how connected, understandable, secure, proactive, and useful are services for citizens?"

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СТРАТЕГИЧЕСКИЕ ПРИОРИТЕТЫ И ЭКОНОМИЧЕСКИЕ МЕХАНИЗМЫ ДИВЕРСИФИКАЦИИ ЭКОНОМИКИ МАНГИСТАУСКОЙ ОБЛАСТИ В УСЛОВИЯХ СТРУКТУРНОЙ ТРАНСФОРМАЦИИ

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АННОТАЦИЯ. В статье предложен методический подход к определению стратегических приоритетов диверсификации экономики Мангистауской области. Исследование опирается на системный и институциональный подходы, анализ научной литературы, показатели отраслевой концентрации и многокритериальную процедуру отбора проектов. Выделены направления промышленной кооперации, логистики, туризма, ресурсосберегающих технологий и предпринимательства. Предлагаемая схема связывает диагностику отраслевой структуры с оценкой инфраструктурных ограничений, механизмами реализации и мониторингом качества экономического роста. Работа имеет концептуально-методический характер; количественные оценки эффективности политики требуют дальнейшей эмпирической проверки.

КЛЮЧЕВЫЕ СЛОВА: диверсификация экономики, Мангистауская область, структурная трансформация, региональная экономика, стратегические приоритеты, инвестиционная политика, экономические механизмы.

Құрылымдық трансформация жағдайында Маңғыстау облысының экономикасын әртараптандырудың стратегиялық басымдықтары мен экономикалық тетіктері

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АҢДАТПА. Мақалада Маңғыстау облысының экономикасын әртараптандырудың стратегиялық басымдықтарын айқындауға арналған әдістемелік тәсіл ұсынылған. Зерттеу жүйелік және институционалдық тәсілдерге, ғылыми әдебиеттерді талдауға, салалық шоғырлану көрсеткіштеріне және жобаларды іріктеудің көпкритерийлі рәсіміне негізделген. Өнеркәсіптік кооперацияны, логистиканы, туризмді, ресурс үнемдеуші технологияларды және кәсіпкерлікті дамыту бағыттары айқындалған. Ұсынылған әдістемелік схема салалық құрылымды диагностикалауды инфрақұрылымдық шектеулерді бағалаумен, іске асыру тетіктерімен және экономикалық өсудің сапалық көрсеткіштерін мониторингтеумен өзара байланыстырады. Зерттеу тұжырымдамалық-әдістемелік сипатқа ие; экономикалық саясаттың тиімділігін сандық бағалау алдағы уақытта эмпирикалық тексеруді қажет етеді.

ТҮЙІН СӨЗДЕР: экономиканы әртараптандыру, Маңғыстау облысы, құрылымдық трансформация, өңірлік экономика, стратегиялық басымдықтар, инвестициялық саясат, экономикалық тетіктер.

Strategic priorities and economic mechanisms for the diversification of the Mangystau region's economy in the context of structural transformation

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