THE ECONOMIC BENEFITS OF DIGITAL TRANSFORMATION AND ARTIFICIAL INTELLIGENCE IN PUBLIC GOVERNANCE

Kamoliddin Ne'matov Ulug'bek o'g'li
Candidate for Master of Science
Graduate School of Business and Entrepreneurship under the Cabinet of Ministers of the Republic of Uzbekistan
Kamoliddin.Nematov@uztbm.uz

Abstract. This article examines how digital transformation and artificial intelligence (AI) generate measurable economic benefits in public governance, and under what conditions those benefits survive contact with reality. Using a comparative case-study design based on secondary sources updated to November 2026, it analyses Estonia, Denmark, India, Ukraine and Singapore, and contrasts them with the failures of Australia's Robodebt scheme and the Dutch childcare-benefits scandal. The findings show that benefits arise through three channels: lower transaction costs, reduced fiscal leakage and private-sector spillovers. They also show that poorly governed algorithms can erase these gains, at a cost that continues to grow years after the event. The article concludes with recommendations for governments at an early stage of digitalization, with particular reference to Uzbekistan.

Keywords: digital government, artificial intelligence, public governance, transaction costs, e-government, economic efficiency.

Public administration is the largest single organization in most national economies, and a considerable share of its budget is consumed not by services themselves but by the friction surrounding them: verifying documents, transferring data between agencies, storing paper files and queuing for approvals. This friction has a precise economic meaning. Coase explained that organizations exist because using markets and hierarchies involves transaction costs;[2] consequently, digital technologies, which lower the cost of searching, verifying and exchanging information, attack precisely these costs. Building on this logic, Dunleavy and colleagues argued that governments were moving beyond new public management toward "digital-era governance," in which the reintegration of functions, holistic service delivery and the digitalization of processes become organizing principles of the state.[3] Vial, in turn, describes digital

[2]Ronald H. Coase, "The Nature of the Firm," Economica 4, no. 16 (1937): 386–405.
[3]Patrick Dunleavy et al., "New Public Management Is Dead-Long Live Digital-Era Governance," Journal of Public Administration Research and Theory 16, no. 3 (2006): 467–494.

transformation as a process that triggers significant changes in an entity through combinations of information, computing, communication and connectivity technologies.[4]

Over the last decade, artificial intelligence has added a further layer to this picture. Machine learning, natural language processing and predictive analytics allow governments not only to automate routine tasks but also to anticipate risks and personalize services.[5] The pace of adoption has since accelerated: an OECD review of 200 government use cases across 11 core functions found that AI is already embedded in service delivery, justice and civic participation, although many initiatives remain at the pilot stage.[6] Yet the discussion of economic returns remains fragmented. Much of it celebrates showcase projects, whereas less attention is paid to the full cost of ownership and to failures. This gap in the literature motivates the present article.

The aim of this article is therefore to systematize the economic benefits of digital transformation and AI in public governance and to identify the conditions under which they materialize. Three questions guide the analysis. First, through which channels do digital and AI-based solutions create economic value? Second, which empirical examples illustrate these channels? Third, what risks may offset the gains? The answers are then translated into practical lessons for governments that are still building their digital foundations.

To answer these questions, the study follows a qualitative comparative case-study design.[7] Cases were selected purposively to reflect different income levels, institutional traditions and technological emphasis: Estonia and Denmark as digital-by-default administrations, India as an example of digital public infrastructure for social transfers, Ukraine as a case of e-procurement and mobile government, and Singapore as an example of AI-enabled public services. Australia and the Netherlands were added as negative cases in order to avoid survivorship bias.

Data were drawn from peer-reviewed articles, reports of international organizations (the OECD and the United Nations),[8] official government sources, as well as from a royal commission and a parliamentary inquiry. Because governments often publish their own performance figures, such figures are treated here as official claims rather than independently verified measurements, and, wherever available, they are

[4]Gregory Vial, "Understanding Digital Transformation: A Review and a Research Agenda," Journal of Strategic Information Systems 28, no. 2 (2019): 118-144.
[5]Bernd W. Wirtz, Jan C. Weyerer and Carolin Geyer, "Artificial Intelligence and the Public Sector-Applications and Challenges," International Journal of Public Administration 42, no. 7 (2019): 596–615.
[6]OECD, Governing with Artificial Intelligence: The State of Play and Way Forward in Core Government Functions (Paris: OECD Publishing, 2025), https://doi.org/10.1787/795de142-en. The report analyses 200 use cases across 11 government functions.
[7]Robert K. Yin, Case Study Research and Applications: Design and Methods, 6th ed. (Thousand Oaks, CA: SAGE, 2018).
[8]United Nations, E-Government Survey 2024: Accelerating Digital Transformation for Sustainable Development (New York: UN DESA, 2024). The next edition is scheduled for 2026; at the time of writing (November 2026) the 2024 rankings were the latest verified.

set against independent evaluations. The analytical framework rests on transaction-cost logic and distinguishes three channels of benefit: direct administrative savings, reduction of fiscal leakage, and spillovers to the private sector. The main limitation is the reliance on secondary data and non-standardized metrics, which prevents statistical generalization.

Estonia is the most frequently cited example of the first channel. Its national digital identity, the X-Road data-exchange layer and the "once-only" principle, under which the state may not ask citizens for data it already holds, allow nearly all public services to be used online. The Estonian government claims that the collective use of digital signatures saves at least 2% of GDP annually;[9] since this figure originates with the implementing government, it should be read as an official estimate. Its institutional credibility is nevertheless supported by the independent UN E-Government Survey, in which Denmark and Estonia ranked first and second in 2024.[10]

Denmark offers a complementary lesson, namely that legislation can be as important as technology. Having consistently led the UN rankings, it made digital communication with public authorities compulsory: Digital Post became obligatory for businesses in November 2013 and for residents in November 2014.[11] As a result, the state saves on printing, postage and manual processing, while users gain a single entry point instead of dozens of agency-specific channels. At the same time, the Danish National Audit Office's review of the projected savings of roughly DKK 1 billion a year is instructive, because it found that some authorities expected considerably lower savings than the central estimate.[12] In other words, even in the best-performing states, projected savings should be verified ex post.

While administrative savings are valuable, the largest effects appear where digitalization touches public money. In India, biometric identification, instant digital payments and direct benefit transfers reduced intermediaries in social programs. The strongest evidence comes from a large randomized evaluation of biometric smartcards in the employment guarantee scheme of Andhra Pradesh, which covered about 19 million people. Muralidharan and colleagues found that payments became faster and more predictable and that leakage declined, while the monetary value of the time

[9]e-Estonia, e-Estonia Guide (Tallinn: e-Estonia Briefing Centre, 2024), which states that at least 2% of GDP is saved through the collective use of digital signatures. The estimate has circulated since at least 2016 in statements by Estonian officials and the e-Governance Academy and has not, to my knowledge, been independently audited.

[10]United Nations, E-Government Survey 2024: Denmark scored 0.9847 and Estonia 0.9727 on the E-Government Development Index.

[11]Danish Agency for Digital Government, "Current Legislation about Digital Post," https://en.digst.dk/systems/digital-post/current-legislation-about-digital-post. Digital Post became obligatory for businesses on 1 November 2013 and for residents on 1 November 2014.

[12]Rigsrevisionen (Danish National Audit Office), Report to the Public Accounts Committee on the Savings Potential of Approx. DKK 1 Billion Annually Associated with the Transition to the Mandatory Public Digital Mailbox Digital Post (Copenhagen, January 2016). The audit examined the Agency for Digitisation's estimate and noted that some authorities expected considerably lower savings.

saved by beneficiaries alone was equal to the cost of the intervention.[13] Beneficiaries' weekly earnings from the scheme rose by roughly 24 percent, even though government spending on it did not change significantly.[14] At national scale, an assessment disseminated by the Ministry of Finance in 2025 estimates cumulative savings of ₹3.48 lakh crore between 2009 and 2024; however, because this estimate was produced by a foundation and promoted by the government, it is better treated as an indicative claim than as an audited result.[15]

Ukraine illustrates the same channel from the procurement side. The ProZorro electronic platform opened tenders to public scrutiny, and an independent policy brief of the Kyiv School of Economics estimated that competitive tenders delivered savings of more than 5 percent, and the ProZorro Market e-catalogue more than 10 percent, relative to comparable purchases made outside the system.[16] Official data point in the same direction: in January 2025 alone, public buyers saved almost UAH 2 billion through the e-catalogue.[17] This is consistent with the economic logic that transparency raises competition and lowers contract prices. Notably, the Kyiv School of Economics also warned that purchases moved outside the system after the full-scale invasion in 2022 should be returned to it, which shows that these gains depend on continuing institutional discipline.

Having considered the channels that digitalization opens, it is useful to ask what AI adds. In the literature, AI creates value at three levels: service, analytics and prediction.[18] At the service level, Singapore's "Ask Jamie" virtual assistant answered citizens' questions across multiple agency websites, reducing the burden on contact centers and the need for citizens to know which agency is responsible.[19] Singapore has since moved from public-facing chatbots to equipping the civil service itself:

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[13]Karthik Muralidharan, Paul Niehaus and Sandip Sukhtankar, "Building State Capacity: Evidence from Biometric Smartcards in India," American Economic Review 106, no. 10 (2016): 2895-2929, https://doi.org/10.1257/aer.20141346. The experiment randomized the rollout across 157 subdistricts and about 19 million people.

[14]Abdul Latif Jameel Poverty Action Lab (J-PAL), "Improving Governance through Biometric Authentication and Secure Payments in India," evaluation summary; NREGS participants with Smartcards reported weekly earnings about 24 percent higher.

[15]Press Information Bureau, Government of India, "India's DBT: Boosting Welfare Efficiency," 21 April 2025, summarising an assessment by the BlueKraft Digital Foundation. The report estimates cumulative savings of ₹3.48 lakh crore for 2009–2024; it is not an independent audit of the Ministry's own programs.

[16]Kyiv School of Economics (KSE Institute), The Prozorro Impact: What Real Savings an Electronic System Delivers, Policy Brief (Kyiv, 30 December 2022). Tender procedures delivered savings of more than 5 percent and the Prozorro Market e-catalogue more than 10 percent relative to purchases made outside the system.

[17]Ministry of Economy of Ukraine, "Prozorro Market Helped the State Save UAH 2 Billion in January," 7 February 2025, https://www.kmu.gov.ua/en/news/za-sichen-derzhava-zaoshchadyla-2-miliardy-hryven-zavdiaky-prozorro-market. Official figures are reported as claims of the implementing government.

[18]Wirtz, Weyerer and Geyer, "Artificial Intelligence and the Public Sector," 596-615; OECD, Governing with Artificial Intelligence (2025).

[19]Government Technology Agency of Singapore (GovTech), "Ask Jamie Virtual Assistant," https://www.tech.gov.sg/products-and-services/ask-jamie; on the transition of agency chatbots to the VICA platform see GovInsider, "Is It Time to Say Goodbye to 'Ask Jamie'?," https://govinsider.asia/intl-en/article/is-it-time-to-say-goodbye-to-ask-jamie-inside-govtechs-refresh-of-government

according to GovTech, more than half of its 150,000 public officers now use the Pair assistant regularly, and a registry of AI agents is being developed for wider deployment in 2026, although the reported time savings are self-assessed.[20]

At the analytics level, tax and customs authorities use machine learning to rank declarations by risk, so that inspections target likely violations rather than the compliant majority. At the prediction level, predictive maintenance of bridges, water networks and power grids makes it possible to repair assets before failure, which is typically far cheaper than emergency repair. In all three cases AI mainly reallocates public servants' time from data entry to tasks requiring judgment and empathy. It should be added, however, that the evidence base is still thin: the OECD notes that most documented applications rely on rules-based or classical machine-learning methods, that generative AI is less common, and that scaling beyond pilots remains the main challenge.[21]

Beyond the budget itself, gains outside it are often larger than direct savings. Online company registration shortens market entry, e-procurement opens contracts to small firms that previously could not afford tender support, and transparent digital procedures reduce the corruption premium and thereby the cost of capital. Estonia is again illustrative: with a population of about 1.36 million, it has produced around ten unicorns and, according to the government's own 2026 research, ranks second in the world in unicorns per capita; entrepreneurs frequently cite the reliable digital environment as a key factor.[22] Although such figures are correlational and cannot prove that e-government caused the start-up boom, they are consistent with the idea that the state acts as a platform: when identification, signature and payment are provided cheaply and securely, private firms build products on top of them.

Despite these successes, two failures demonstrate that expected savings can turn into liabilities. In Australia, the Robodebt scheme automatically raised welfare debts by averaging income data. The Royal Commission concluded in 2023 that the scheme was unlawful and had caused serious harm, calling it "a crude and cruel

[20]"Singapore to Create a Registry of AI Agents for 150,000 Public Officers amid AI Push," The Star (Malaysia), 2 June 2026, https://www.thestar.com.my/aseanplus/aseanplus-news/2026/06/02/singapore-to-create-a-registry-of-ai-agents-for-150000-public-officers-amid-ai-push. GovTech reports that more than half of the officers regularly use the Pair assistant; the productivity effect is self-reported.

[21]OECD, Governing with Artificial Intelligence (2025). The report finds that most documented use cases rely on rules-based or classical machine-learning techniques, that generative AI remains less common, and that many initiatives are still at the pilot stage.

[22]Estonia's population stood at 1,360,745 at the start of 2026 (Statistics Estonia, as reported by Silicon Canals); government research published in July 2026 ranked Estonia second in the world for unicorns per capita after Liechtenstein (see Fintech Baltic, "Estonia Ranks Second Worldwide in Unicorns per Capita," 14 July 2026, https://fintech-baltic.com/11724/fintechestonia/estonia-ranks-second-worldwide-in-unicorns-per-capita/). The count of ten unicorns and the per-capita ratios are drawn from Estonian government and Invest in Estonia sources and are correlational, not causal, evidence.

mechanism."[23] The financial consequences have proved long-lasting: the government first agreed to a package of about A$1.8 billion in 2020–2021, and in June 2026 the Federal Court approved a further settlement of A$548.5 million, which includes A$475 million in compensation.[24]

The Dutch case is similar in kind and larger in scale. Risk-scoring algorithms used in childcare-benefit enforcement wrongly flagged thousands of families, leading to financial ruin for many, to years of compensation costs and, in January 2021, to the resignation of the government.[25] The Ministry of Finance's estimate of the cost of the recovery operation was reported in 2025 at about €11.5 billion, a figure far above any plausible savings from the original enforcement policy, and children of affected parents are now suing the state for damages.[26] Taken together, the two cases show that the cost of an automated error is not limited to the year in which it is made.

The cases confirm that the economic value of digital government is rooted in the reduction of transaction costs, but they also show that the size of the effect depends on institutional conditions rather than on technology alone. This conclusion is consistent with the OECD's framework, which treats digital government as a set of interdependent policy dimensions rather than a technology project.[27] Three conditions stand out.

First, foundational infrastructure, namely secure digital identity, interoperable data exchange and legally valid electronic signatures, yields the highest return per unit of investment. Estonia and India both began with these building blocks rather than with user-facing portals. Second, digitalization must be accompanied by process redesign. Moving an inefficient procedure online merely accelerates inefficiency; therefore, the first question should be whether a certificate or approval is needed at all.

Third, and most importantly, algorithmic decision-making requires governance. The Australian and Dutch cases show that the absence of transparency, human

[23]Royal Commission into the Robodebt Scheme, Report (Canberra: Commonwealth of Australia, 7 July 2023), which called the scheme "a crude and cruel mechanism, neither fair nor legal." The Commission found that about A$1.7 billion in debts had been wrongly raised against some 433,000 people.

[24]Services Australia, "Robodebt Class Action and Settlement Payments," https://www.servicesaustralia.gov.au/individuals/subjects/information-about-refunds-income-compliance-program/class-action-notices. The 2020-2021 settlement was worth about A$1.8 billion; in an appeal settlement approved by the Federal Court on 23 June 2026 (Prygodicz v Commonwealth of Australia), the Commonwealth agreed to pay a further A$548.5 million, including A$475 million in compensation.

[25]Dutch Parliamentary Inquiry Committee on Childcare Benefits, Ongekend onrecht [Unprecedented Injustice] (The Hague: House of Representatives, 2020). The cabinet of Prime Minister Mark Rutte resigned on 15 January 2021.

[26]NL Times, "Children in Benefits Scandal Sue Dutch State for Compensation," 29 May 2025, https://nltimes.nl/2025/05/29/children-benefits-scandal-sue-dutch-state-compensation , citing the Ministry of Finance's estimate of about €11.5 billion for the recovery operation; the final cost remains uncertain.

[27]OECD, The OECD Digital Government Policy Framework: Six Dimensions of a Digital Government, OECD Public Governance Policy Papers, No. 02 (Paris: OECD Publishing, 2020), https://doi.org/10.1787/f64fae0c-en.

oversight and a right of appeal converts apparent savings into deferred costs. A "human-in-the-loop" principle, in which the algorithm proposes and a responsible official decides, and in which citizens can learn how a decision was reached and contest it, does not slow efficiency but insures against expensive errors. This principle is now becoming law: the EU's Artificial Intelligence Act classifies systems that public authorities use to assess eligibility for essential public benefits as high-risk, and, following the Digital Omnibus adopted in July 2026, the corresponding obligations apply from 2 December 2027.[28] The economic assessment should also use total cost of ownership, including cybersecurity, maintenance of legacy systems, vendor dependency, staff training and offline channels for people at risk of digital exclusion.

For governments at an early stage of digitalization, the evidence suggests a clear sequence. They should build identity and data-exchange foundations; define measurable indicators such as cost per transaction, time to service, share of online services and contact-center load; introduce AI first in low-risk service functions; and expand to higher-stakes decisions only with safeguards. Uzbekistan's experience shows how quickly the first steps can pay off: it rose from 87th place in the UN E-Government Development Index in 2020 to 63rd in 2024 and entered the "very high" group for the first time.[29] The adoption in October 2024 of the Strategy for the Development of Artificial Intelligence Technologies until 2030 added a policy framework for the next stage.[30]

The same experience points to the risks discussed above. The number of services on the my.gov.uz portal grew from 525 in 2024 to 905 by August 2026, and a presidential decree of July 2026 targets a unified integrated digital platform and a reduction of at least 30 percent in spending on state information systems.[31] Such targets are welcome precisely because they are measurable; accordingly, they should be matched by independent ex-post evaluation and, before AI is used in decisions on benefits, taxes or licenses, by explicit rules on transparency, human review and appeal. Future research should develop standardized metrics and independent evaluations, since many available figures originate from the implementing governments themselves.

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[28]Regulation (EU) 2024/1689 (Artificial Intelligence Act), Annex III, point 5; as amended by Regulation (EU) 2026/1744 (Digital Omnibus on AI), in force since 27 July 2026, which postponed the application of stand-alone high-risk obligations from 2 August 2026 to 2 December 2027. AI systems used by public authorities to assess eligibility for essential public benefits are classified as high-risk.

[29]UN DESA, UN E-Government Knowledgebase, "Uzbekistan," https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/186-Uzbekistan : EGDI 0.7999, rank 63 of 193 in 2024 (69th in 2022; 87th in 2020).

[30]President of the Republic of Uzbekistan, Resolution No. PP-358 "On the Approval of the Strategy for the Development of Artificial Intelligence Technologies until 2030," 14 October 2024, https://lex.uz/docs/7159258; Digital Government Portal of Uzbekistan, https://dgov.uz/en/

[31]"Uzbekistan Research Centre Opens in China's Hangzhou," UzDaily.uz, August 2026, https://www.uzdaily.uz/en/uzbekistan-research-centre-opens-in-chinas-hangzhou / (public services on my.gov.uz rose from 525 in 2024 to 905 in August 2026)

In sum, digital transformation and AI can turn public administration from a cost center into a source of economic growth by lowering transaction costs, limiting fiscal leakage and creating a platform for private innovation. Estonia, Denmark, India, Ukraine and Singapore illustrate different routes to these benefits, while Australia and the Netherlands demonstrate that poorly governed automation can destroy trust and generate large costs for years afterwards. The successful digital state is therefore not the one that adopts algorithms fastest, but the one whose systems are transparent, accountable and designed around people. Such a state can convert the hidden tax of paperwork into a digital dividend.

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