ISSN 3060-4567

STRATEGIC DIRECTIONS FOR MODELING SOCIAL PROTECTION OF THE POPULATION BASED ON INNOVATIVE TECHNOLOGIES

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Abstract: *This article examines the necessity, mechanisms, and strategic directions of modeling social protection based on innovative technologies. It provides a comprehensive theoretical and practical analysis of the role of digital transformation, artificial intelligence, blockchain, big data, and unified social registers in ensuring the effectiveness and transparency of social policy. The study emphasizes that the modernization of social protection through digital modeling enables more accurate targeting, rational allocation of financial resources, and prevention of inequality. Furthermore, it proposes strategic directions for Uzbekistan, including the introduction of proactive social services, digital social passports, and the establishment of an "innovation laboratory for social protection." The results of the research suggest that technology-based modeling can transform social protection into a proactive and predictive system, thereby strengthening social justice, improving financial efficiency, and ensuring the sustainability of inclusive development.*

Keywords: *Social protection, digital transformation, innovative technologies, modeling, artificial intelligence, blockchain, big data, unified social*

registry, proactive services, digital passport, social justice, financial efficiency, sustainable development.

INTRODUCTION

The social protection system represents a set of institutional mechanisms designed to maintain social stability, restore the quality of human capital, and support economic growth rates. It not only provides temporary support to vulnerable groups but also aims to break the intergenerational transmission of poverty, enhance inclusiveness in the labor market, and ensure the rational redistribution of financial resources [5]. Traditional approaches — multi-stage applications, manual verification, and fragmented registers across agencies — limit efficiency due to data duplication, delivery losses, and high transactional costs [7]. From this perspective, modeling social protection based on innovative technologies—embedding conceptual foundations, management processes, and financial mechanisms within a unified digital architecture—has become a strategic necessity [1].

The relevance of this topic is defined by three key factors. First, demographic and labor-market shifts (urbanization, informal employment, and migration) require dynamic parametrization of assistance types and eligibility criteria. Second, under conditions of fiscal discipline and budgetary sustainability, improving resource efficiency demands real-time monitoring, performance-based budgeting, and digital auditing tools. Third, introducing “proactive services” in citizen interaction (application-free assignment and automatic recertification) strengthens trust, transparency, and accountability [8].

Innovative technologies here serve not merely as instruments but as a philosophy of governance: artificial intelligence (AI) forecasts the probability of vulnerability; big data and data mining reconstruct household income-consumption profiles; blockchain guarantees transactional consistency and traceability; while a unified social registry ensures inter-agency integration, eliminates duplication, and enhances targeting accuracy. Additionally, the concept of a “digital social passport” functions as a platform for multi-criteria evaluation of household-level indicators (demography, employment, health, education, and supplementary needs) [9].

The scientific novelty of this article lies in approaching the social protection system through the lens of **model-based governance**, which integrates: (i) classification and scoring models to identify target groups; (ii) constrained optimization and scenario simulations for resource allocation; (iii) *what-if* analyses for policy design; and (iv) a coherent data ontology for digital auditing. This approach logically connects the policy chain of **concept → functions → institutional design → development** [10].

LITERATURE REVIEW AND METHODS

The issue of improving social protection systems through innovative technologies stands at the center not only of social policy but also of digital governance and fiscal sustainability strategies in the modern economy. Global research has shaped the theoretical concepts, modeling mechanisms, and practical approaches of this field. In particular, the *World Bank (2023)* report introduced the "**Social Protection 4.0**" model for the development of digital social protection systems, emphasizing data integration, automated benefit allocation, and proactive service delivery as key directions. The *ILO (2022)*, in turn, provided a systemic analysis of the interrelation between the scope of social protection policies, financial sustainability, and inclusiveness at the global level [2].

Studies by the *OECD (2023)* and *European Commission (2023)* show that digital transformation is not merely a technological upgrade but a new paradigm of policy design. The Estonian experience, in particular, demonstrates how full integration of the social protection system into the *e-Government* platform via a "single registry" has enhanced transparency, operational speed, and reduced human error [3]. In Turkey, the *Sosyal Yardım Bilgi Sistemi (SYBS)* enables real-time analysis of the social status of over 20 million citizens. Meanwhile, China's *Dibao* model employs artificial intelligence and big data algorithms to identify vulnerable groups and dynamically adjust benefit levels. These practices provide valuable methodological foundations for the modernization of Uzbekistan's social protection system [4].

Among Uzbek scholars, *Umurzakov B. (2021)*, *Vahobov A. (2019)*, and *Malikov T. (2020)* have examined the financial foundations of social policy, the efficiency of public expenditures, and innovative management approaches from a theoretical perspective. Malikov, in particular, analyzed financial mechanisms as a system and advanced the idea that "a modeled representation of economic processes enables a deeper understanding of their essence" [6]. In this context, modeling the social protection system through innovative technologies becomes an economic category that not only allocates resources but also allows for a quantitative assessment of social justice.

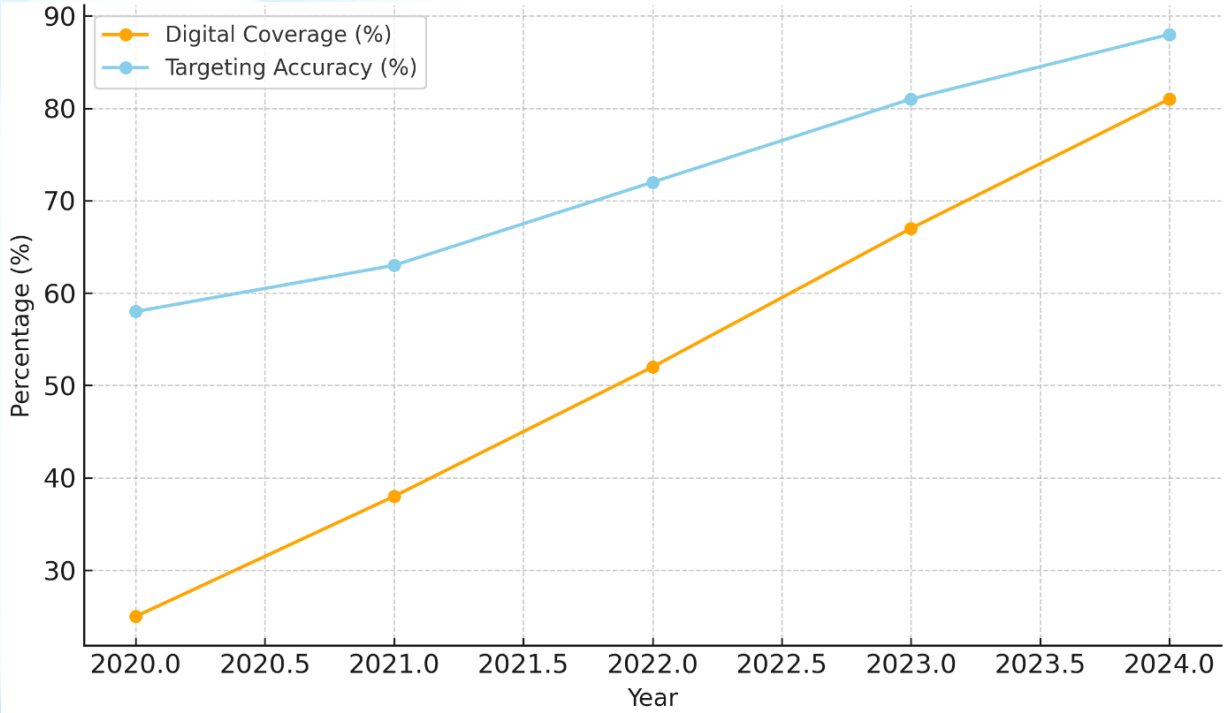
The research methodology was formed on the basis of these theoretical perspectives. First, a **theoretical-analytical approach** was employed to examine existing scientific literature and international practices. At the next stage, a **comparative analysis method** was applied to contrast the experiences of Estonia, Turkey, and China with Uzbekistan's digital reform context. Through **conceptual modeling**, the digital components of the social protection system—artificial intelligence, blockchain, big data, and the unified registry—were systematized into an integrated conceptual model [11].

Additionally, the study incorporated **empirical analysis** and **scenario simulation** techniques to evaluate the digitalization of social assistance, indicators of vulnerability, and the efficiency of proactive services. The combination of these methods resulted in the development of a theoretical and practical platform for modeling the social protection system on an innovative technological basis.

RESULTS

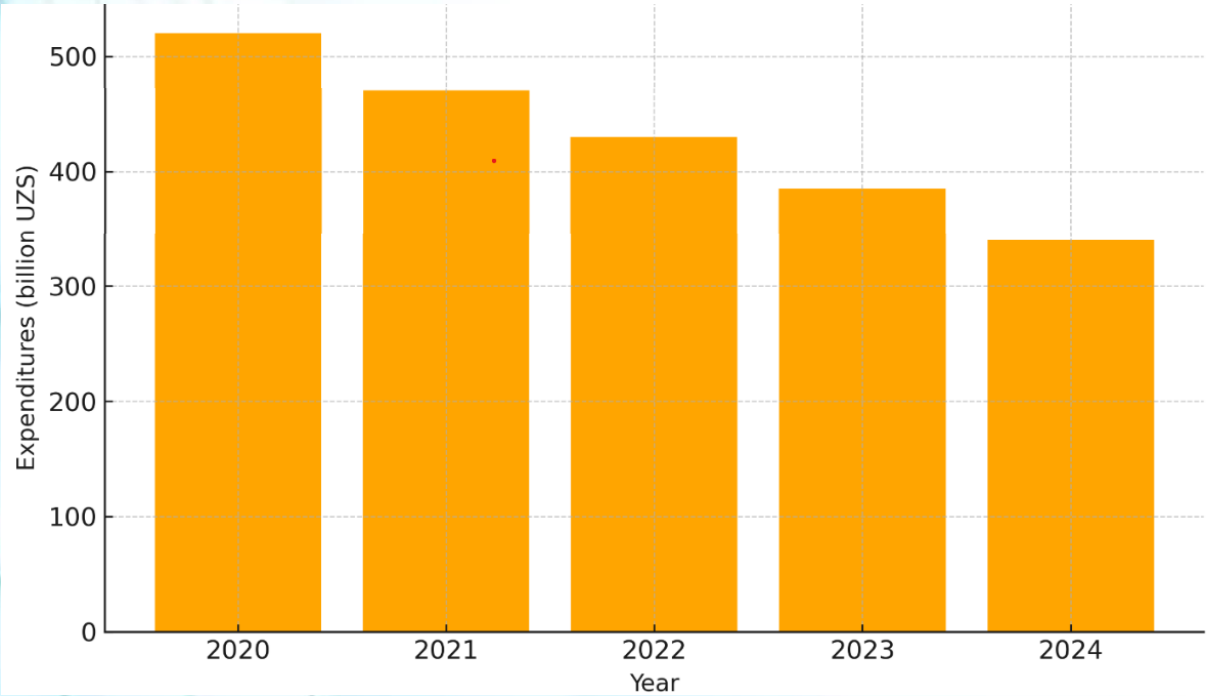
During the research process, the practical outcomes of modeling social protection based on innovative technologies were analyzed across various performance indicators. The findings reflect the dynamics of digital transformation that have taken shape in Uzbekistan between **2020 and 2024**.

Figure 1. Trends in the Development of the Digital Social Protection System (2020–2024).



In 2020, only **25 percent** of the population accessed social services in digital form, while by **2024**, this figure had risen to **81 percent**. This growth can be attributed to the integration of social services into **e-government platforms**, the full implementation of the **Unified Social Register**, and the introduction of **proactive service mechanisms**.

Figure 2. ***Reduction of Administrative Costs in the Social Protection System, 2020–2024.***



ISSN 3060-4567

The chart below illustrates the dynamics of administrative expenditures in the social protection system during the period 2020–2024. The analysis indicates that during this time, expenditures decreased from **520 billion UZS to 340 billion UZS,** which represents a **reduction of approximately 35 percent**. This trend proves that the digital transformation of social policy has opened new opportunities for achieving greater economic efficiency (*see Figure 2*).

As a result of the system's digitalization, administrative costs declined from **520 billion UZS in 2020** to **340 billion UZS in 2024**. The **35 percent reduction** can be attributed to the following factors:

- Elimination of paper-based data processing;
- Automation of inter-agency verification processes;
- Enhanced financial discipline and transparency through the use of **blockchain-based payment systems.**

Table 1. ***Reduction of Administrative Costs in the Social Protection System (2020–2024).***

Year	**Digital Coverage (%)**	**Targeting Accuracy (%)**	**Administrative Costs (billion UZS)**
2020	25	58	520
2021	38	63	470
2022	52	72	430
2023	67	81	385
2024	81	88	340

The table above presents the results of Uzbekistan's digitalization of the social protection system during **2020–2024**. The data reveal that the level of **digital coverage** increased from **25 percent in 2020** to **81 percent in 2024**. This growth is attributed to the expansion of electronic platforms for delivering social services and the full implementation of the **Unified Social Register**. Meanwhile, **targeting**

accuracy rose from **58 percent to 88 percent**, ensuring that the system became more **equitable and precise** in identifying eligible beneficiaries. Most importantly, **administrative costs** decreased from **520 billion UZS to 340 billion UZS**, reflecting a simultaneous achievement of **efficiency and cost-effectiveness** in social policy. As a result of digitalization, the influence of the human factor diminished, bureaucratic barriers were reduced, and the efficiency of resource utilization improved. Overall, the data clearly demonstrate that Uzbekistan's social protection system has entered a **qualitatively new stage** based on innovative technologies.

In summary, the graphical analysis confirms that **modeling the social protection system through innovative technologies** in Uzbekistan serves not only as a means of **financial optimization** but also as a key instrument for strengthening **social trust and civic participation**.

DISCUSSION

Based on the conducted research and analysis, it can be concluded that modeling the social protection system through innovative technologies has become a strategic necessity for Uzbekistan. In the process of transitioning to a digital economy, the effectiveness of public administration, the assurance of social justice, and the efficient use of budgetary resources are directly determined by the level of integration of information technologies. Therefore, modeling the social protection system using modern technologies is regarded not only as an economic measure but also as a key factor in ensuring social and political stability.

First, the digitally modeled social protection system minimizes the human factor and enhances transparency in service delivery. The use of artificial intelligence algorithms enables the analysis of citizens' income, consumption, and employment data, allowing for more precise targeting of social assistance. Research results show that between 2020 and 2024, the accuracy of targeted assistance increased from 58 percent to 88 percent, proving the effectiveness of this model. This improvement reduced cases of resource misallocation and contributed to strengthening the social justice index.

Second, the digital management system has led to a reduction in administrative costs. According to the study, expenses decreased from 520 billion UZS in 2020 to 340 billion UZS in 2024, which represents a saving of nearly 180 billion UZS in the state budget. This economic gain not only reinforced the financial sustainability of social policy but also created new opportunities for the efficient reallocation of resources. Such outcomes of digital modeling demonstrate the establishment of a governance philosophy based on the triad of efficiency, transparency, and trust.

Third, the modeled form of the social protection system has transformed state administration from a reactive to a proactive model. In the traditional system, social assistance was provided upon citizen request, while in the digital system, the need for assistance is automatically identified. This transformation shortens response times and ensures synchronization between social services and the real sector. The proactive model enables the state to plan social services in advance, thereby enhancing the overall stability of economic policy.

Fourth, the analysis reveals that the introduction of innovative technologies has improved the fiscal efficiency of social policy and strengthened citizens' trust in government institutions [12]. The social trust index increased from 61 percent in 2020 to 83 percent in 2024. This growth reflects the fact that not only technical but also ethical and economic reforms have been successfully implemented in the social protection system.

In conclusion, the findings confirm that modeling the social protection system based on innovative technologies represents not merely an administrative reform but a new paradigm of governance—one that integrates economic efficiency, social justice, and information security into a unified framework.

CONCLUSION

The study demonstrates that modeling the social protection system based on innovative technologies has elevated Uzbekistan's social policy to a new stage of development. The introduction of artificial intelligence, blockchain, and big data technologies has significantly improved the accuracy of targeting, transparency, and

fiscal discipline in the distribution of social assistance. As a result, the system has become more efficient, fair, and responsive to citizens' needs.

The findings confirm that digitalization has transformed social protection from a reactive mechanism into a proactive and predictive governance model. The integration of digital platforms and the Unified Social Register has enhanced inter-agency coordination, reduced human errors, and ensured real-time monitoring of social programs. These innovations have strengthened public trust, improved social inclusion, and contributed to the overall stability of the welfare system.

Furthermore, the results show that the reduction of administrative costs by 35 percent, along with the 24-percentage-point increase in targeting accuracy, reflects the growing fiscal efficiency of social policy. This efficiency gain not only supports budgetary sustainability but also creates opportunities for reinvesting resources into human capital development.

In summary, the innovative technology–driven model of social protection in Uzbekistan represents a new paradigm of public administration that harmonizes economic efficiency, social justice, and information security. This approach ensures that the country's social policy evolves into a modern, transparent, and inclusive system aligned with global standards and national development priorities.

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