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A Multi-Criteria Framework for Evaluating Strategic Innovation Management in Uzbekistan's Social Sector

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Abstract: The innovative development of the social sector is becoming a critical determinant of human capital formation, public-service quality, social stability, and sustainable economic growth. However, conventional assessment approaches frequently concentrate on financial inputs or the number of introduced technologies and therefore fail to capture the multidimensional nature of innovation in education, healthcare, social protection, and public administration. This study develops a multi-criteria framework for evaluating the effectiveness of strategic innovation management in Uzbekistan's social sector. The methodology integrates five analytical contours: target effectiveness, process effectiveness, resource effectiveness, innovation-output effectiveness, and social effectiveness. The empirical analysis uses official statistical and administrative indicators covering financial resources, educational and healthcare infrastructure, social protection, management digitalization, digital-platform implementation, and innovative output. The principal longitudinal dataset covers 2007–2025. The results indicate substantial resource and digital transformation. Innovative products and services in the social sector increased from UZS 11,547.2 billion in 2007 to UZS 68,321.5 billion in 2025. Digital-platform implementation increased from 31.7% to 68.7%, while government social expenditure expanded substantially. However, technological innovation activity within education, healthcare, and social services remains relatively limited. Consequently, process effectiveness is assessed as high, resource effectiveness as medium-to-high, target and social effectiveness as medium, and innovation-output effectiveness as low-to-medium. The study demonstrates that social-sector innovation should be evaluated through the entire transformation chain from resources and management processes to innovation outputs and social outcomes. The proposed framework can support results-based budgeting, regional benchmarking, strategic monitoring, and evidence-based public policy.

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1. Introduction

Innovation in the social sector has increasingly become a strategic component of national economic development. Education contributes to the accumulation of human capital; healthcare determines the quality and productive capacity of the labor force; social protection reduces vulnerability and supports social stability; and digital public services affect transaction costs, institutional efficiency, and citizens' access to public goods [1]–[4].

The role of the social sector is therefore considerably broader than the traditional interpretation of it as a mechanism of redistribution. In contemporary economies, it functions as an institutional environment in which human capabilities are reproduced and developed [1], [2], [5].

Global digital transformation has further changed the nature of social-service delivery. Public organizations increasingly rely on interoperable databases, digital identification, platform-based services, artificial intelligence, automated eligibility systems, and real-time administrative data. At the same time, demographic change, limited public resources, growing expectations regarding service quality, and regional inequalities increase the need for more effective strategic management.

Porter associates strategy with the creation of a coherent system of activities and choices [6], whereas Mintzberg emphasizes the multidimensional nature of strategy as a plan, pattern, position, and perspective [7]. Public-sector innovation literature extends these ideas by demonstrating that modern innovation increasingly depends on collaboration, inter-organizational coordination, data exchange, citizen participation, and institutional capacity [5], [8]–[10].

Recent research also shows that digital transformation in government cannot be reduced to the introduction of individual technologies. Sustainable transformation requires changes in organizational structures, decision-making processes, administrative routines, employee competencies, and the relationships between government institutions and citizens [10], [11].

For Uzbekistan, these issues are particularly relevant because education, healthcare, social protection, digital public administration, innovation, and human-capital development have become major components of long-term national development policy [1], [12]–[14].

Nevertheless, a methodological problem remains unresolved. Most conventional assessments separately measure public expenditure, digital services, institutional capacity, innovation activity, or social outcomes. Such fragmentation does not adequately explain how resources are transformed into processes, how processes generate innovations, and how innovations ultimately affect social welfare.

Research Gap

The existing literature provides substantial theoretical discussion of public-sector innovation, digital government, human capital, and strategic management. However, there is still insufficient integration of strategic target achievement, management-process transformation, resource availability, actual innovation outputs, and final social effects within a single assessment system applicable to the social sector of an emerging economy.

Research Questions

- RQ1. How can the effectiveness of strategic innovation management in the social sector be evaluated using a unified multi-criteria framework?
- RQ2. Which dimensions of innovation management demonstrate the strongest performance in Uzbekistan?
- RQ3. Does the expansion of financial and digital resources automatically translate into innovation outputs and final social effects?

Research Contribution

The contribution of the study is threefold. First, it develops a five-contour framework connecting strategic objectives, processes, resources, innovation outputs, and social outcomes. Second, it distinguishes between digitalization as infrastructure development and innovation as the effective transformation of services and institutions. Third, it provides a methodology that can be applied at national, regional, sectoral, and organizational levels.

2. Materials and Method

2.1. Research design

The study combines systemic analysis, institutional analysis, economic-statistical analysis, comparative analysis, indicator analysis, normalization procedures, weighted multi-criteria assessment, and strategic performance evaluation. The main quantitative

series cover 2007–2025, while sector-specific education, healthcare, and social-protection indicators are used for shorter periods according to data availability.

2.2. Conceptual structure of the assessment model

The proposed model contains five evaluation contours:

$$C = \{C_T, C_P, C_R, C_I, C_S\}$$

where C_T is target effectiveness; C_P is process effectiveness; C_R is resource effectiveness; C_I is innovation-output effectiveness; and C_S is social effectiveness.

Target effectiveness

Target effectiveness shows the degree to which actual results correspond to strategic targets. For indicator i :

$$K_Ti = A_i / T_i \quad (1)$$

where K_Ti is the target achievement coefficient, A_i is the actual value, and T_i is the target or normative value. $K_Ti = 1$ indicates complete target achievement; $K_Ti < 1$ indicates underachievement; and $K_Ti > 1$ indicates that actual performance exceeds the planned level.

2.3. Indicator normalization

Because indicators are expressed in different units, normalization is required before aggregation. For a positive indicator, where a higher value indicates better performance:

$$z_ijt = (x_ijt - x_j^{\min}) / (x_j^{\max} - x_j^{\min}) \quad (2)$$

where x_ijt is the actual value of indicator j for object i in period t ; $x_j^{\min}$ and $x_j^{\max}$ are the minimum and maximum observed values; and z_ijt is the normalized indicator.

For a negative indicator, where a lower value represents better performance:

$$z_ijt = (x_j^{\max} - x_ijt) / (x_j^{\max} - x_j^{\min}) \quad (3)$$

Consequently, $0 \leq z_ijt \leq 1$, and values approaching 1 represent stronger performance.

2.4. Calculation of an individual contour index

$$C_c = \sum_{j=1}^{m_c} \alpha_cj z_cj \quad (4)$$

$$\sum_{j=1}^{m_c} \alpha_cj = 1, \quad \alpha_cj \geq 0 \quad (5)$$

where C_c is the composite index of contour c ; m_c is the number of indicators included in contour c ; z_cj is the normalized value of indicator j ; and α_cj is the weight assigned to indicator j . Thus, $0 \leq C_c \leq 1$.

2.5. Overall Strategic Innovation Effectiveness Index

$$SIEI = W_T C_T + W_P C_P + W_R C_R + W_I C_I + W_S C_S \quad (6)$$

$$W_T + W_P + W_R + W_I + W_S = 1 \quad (7)$$

$$SIEI = \sum_{c=1}^5 W_c C_c \quad (8)$$

A single numerical national SIEI should be calculated only when reliable indicator-level weights are empirically justified. Therefore, this study does not fabricate an arbitrary national composite score. Instead, the five-contour system is used primarily as a strategic diagnostic framework.

2.6. Illustrative project-level validation

$$E_p = \sum_{i=1}^n K_i P_i \quad (9)$$

$$E_p = 0.31(0.353) + 0.29(0.445) + 0.17(0.853) + 0.15(0.366) + 0.08(0.828) \quad (10)$$

$$E_p \approx 0.5046 \approx 0.504 \quad (11)$$

Table 1. Strategic Innovation Effectiveness Assessment Framework and Interpretation Criteria

Integral value	Interpretation
0.00–0.30	Low effectiveness
0.31–0.60	Acceptable effectiveness
0.61–0.90	High effectiveness
0.91–1.00	Very high effectiveness

Accordingly, $E_p = 0.504$ corresponds to acceptable effectiveness.

3. Results

3.1. Financial expansion of the social sector

The empirical evidence demonstrates substantial growth in Uzbekistan's social-sector resource base. The volume of innovative products and services increased from UZS 11,547.2 billion in 2007 to UZS 68,321.5 billion in 2025.

$$G_Y = 68,321.5 / 11,547.2 \approx 5.92 \quad (13)$$

Thus, innovative output increased approximately 5.9 times over the period. Innovation financing increased from UZS 5,028.6 billion to approximately UZS 10,020.4 billion. Government expenditure on the social sector expanded considerably more rapidly, reflecting the increasing importance attached to education, healthcare, and social protection. However, resource expansion cannot itself be interpreted as proof of innovation-management efficiency.

3.2. Digital-platform development

The level of digital-platform implementation increased from 31.7% in 2007 to 68.7% in 2025 [12], [15].

$$\Delta DP = 68.7 - 31.7 = 37.0 \text{ percentage points} \quad (14)$$

$$g_{DP} = [(68.7 - 31.7) / 31.7] \times 100 \approx 116.7\% \quad (15)$$

Therefore, the penetration level of digital platforms more than doubled. At the same time, management digitalization followed a more volatile trajectory. This difference suggests that technological infrastructure has developed more rapidly than the organizational capacity required for its effective use.

3.3. Transformation of education

Between 2019/2020 and 2024/2025, general secondary-school enrollment increased, the number of schools increased, non-state education expanded rapidly, preschool infrastructure developed, and access to higher education increased. The number of non-government general secondary educational institutions increased from 91 to 500.

$$G_{private} = 500 / 91 \approx 5.49 \quad (16)$$

This indicates significant diversification in the institutional structure of educational-service provision. However, expansion in capacity does not automatically guarantee improvements in learning outcomes, teacher quality, digital competencies, or labor-market relevance.

3.4. Healthcare and social protection

Healthcare infrastructure also strengthened. The number of mid-level healthcare personnel rose from approximately 365.6 thousand in 2020 to 388.4 thousand in 2025. Hospital-bed capacity increased from 153.4 thousand to approximately 179.9 thousand. The number of recipients of pensions and social benefits increased from approximately 3.88 million to 4.95 million [4].

$$g_{SP} = [(4.9453 - 3.8784) / 3.8784] \times 100 \approx 27.5\% \quad (17)$$

This expansion creates increasing administrative pressure and reinforces the importance of automated targeting and digital social-protection systems.

3.5. Innovation-output gap

A significant result of the study is the asymmetry between digital transformation and formally recorded technological innovation. In 2021, among 1,098 organizations introducing technological innovations, only 17 were educational organizations, while only 4 were organizations in healthcare and social services. This indicates that the social sector is undergoing considerable organizational and digital transformation, while conventional technological-innovation statistics remain comparatively weak [8], [16].

3.6. Five-contour assessment

Table 2. Five-Contour Assessment of Strategic Innovation Effectiveness in the Social Sector

Assessment contour	Evaluation	Main evidence
Target effectiveness	Medium	Strategic modernization targets exist, but final outcomes remain incomplete
Process effectiveness	High	Digital services, automated procedures and platforms expanded
Resource effectiveness	Medium–High	Strong financial and infrastructural support
Innovation-output effectiveness	Low–Medium	Limited technological innovation in social-sector organizations
Social effectiveness	Medium	Accessibility and targeting improved, but long-term outcomes are still developing

The strongest performance is therefore observed in process and resource dimensions, while innovation-output effectiveness remains comparatively weaker. This implies that process and resource modernization are currently ahead of the ability of social-sector organizations to generate sustainable innovation outputs.

4. Discussion

The findings provide several important theoretical and policy implications. First, innovation in the social sector cannot be evaluated using the same measurement logic as industrial innovation. Industrial innovation is commonly reflected in patents, new products, R&D expenditure, and technological processes. Social-sector innovation is frequently expressed through digital service delivery, automated administrative processes, inter-agency information exchange, new financing models, citizen-centered service design, improved targeting, and organizational innovation. Consequently, technological-innovation statistics alone are likely to underestimate the real scale of transformation.

Second, the findings reveal a distinction between digital infrastructure and digital maturity. Digital platforms may be technically available, but their value depends on institutional interoperability, human capabilities, data quality, redesign of business processes, and the ability of managers to use digital information.

$$\text{Digital transformation} = f(\text{technology, institutions, skills, data, process redesign}) \quad (18)$$

Third, the analysis confirms that resource growth creates opportunities but does not automatically generate social innovation.

$$\text{Resources} \rightarrow \text{Processes} \rightarrow \text{Innovation Outputs} \rightarrow \text{Social Outcomes} \quad (19)$$

A weakness at any stage reduces overall effectiveness. For Uzbekistan, the main strategic challenge is increasingly located between the second and third stages: significant resources and digital processes have been created, but their transformation into sustainable sector-level innovation needs to accelerate.

4.1. Theoretical contribution

$$\text{SIEI} = f(T, P, R, I, S) \quad (20)$$

where T is target achievement, P is process transformation, R is resources, I is innovation outputs, and S is social outcomes. This provides a bridge between public-sector innovation literature and results-based strategic management.

4.2. Managerial and policy implications

1. Public expenditure should increasingly be evaluated by outcomes rather than by expenditure volumes.
2. Digital systems should move toward interoperability and integrated data exchange.
3. Sector-level incentives for innovation in education, healthcare, and social protection should be strengthened.
4. Public-private partnerships should be linked to measurable public-value indicators.
5. Regional benchmarking should be introduced to identify territorial differences in digital maturity, resource availability, and service outcomes.

4.3. Limitations and future research

The study has several limitations. First, the five-contour framework requires additional empirical validation using regional panel data. Second, the selection of weights may influence the value of an integral index. Future studies should therefore compare expert weighting, entropy weighting, principal-component weights, and equal-weight specifications. Third, some social innovations are organizational rather than technological and may remain underrepresented in official innovation statistics. Fourth, causal inference requires more detailed regional or organizational panel data.

$$\text{SIEI}_{it} = \alpha + \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (21)$$

Where *i* denotes regions and *t* denotes years. A regional panel model would make it possible to control for unobserved territorial heterogeneity and provide stronger causal evidence.

5. Conclusion

The study develops a five-contour framework for evaluating strategic innovation management in Uzbekistan's social sector. The analysis shows significant financial, institutional, and digital modernization during 2007–2025. Digital platforms, social-sector financing, education capacity, healthcare infrastructure, and social-protection coverage all expanded substantially.

Nevertheless, modernization remains asymmetric. Process and resource effectiveness are relatively strong, whereas innovation-output effectiveness remains less developed.

The key strategic task is therefore not simply to increase expenditure or introduce additional digital services. It is to improve the ability of the social sector to transform resources and digital infrastructure into sustainable innovation, higher service quality, improved accessibility, and measurable public value.

The proposed framework can be applied to strategic monitoring, regional benchmarking, results-based budgeting, public-program evaluation, and resource allocation.

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