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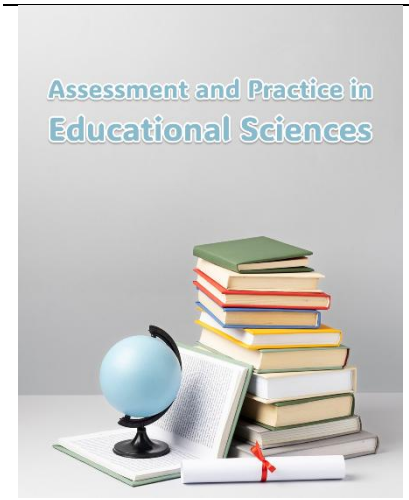

Modeling Modern Public Services with an Approach to Urban Social, Economic, and Environmental Sustainable Development in Mazandaran Municipalities

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ABSTRACT

This study, employing a mixed-methods approach, aims to model modern public services with a focus on urban social, economic, and environmental sustainable development in the municipalities of Mazandaran Province. The qualitative population included faculty members in the fields of public administration, urban management, urban planning, and city design at higher education institutions, as well as mayors, city council members, and senior managers of municipalities across the country. For the validation phase, the target population consisted of subject-matter experts and knowledgeable professionals in Mazandaran Province. In the quantitative phase, the population included senior and mid-level managers from municipalities in Mazandaran and eight affiliated municipal organizations: Fire Department, Transportation Organization, Cemetery Organization, Waste Management Organization, Construction Organization, Cultural–Social–Sports Organization, Urban Landscape and Beautification Organization, and the Fruit and Vegetable Markets Organization, across 62 municipalities with a total of 554 participants. In the qualitative phase, 19 experts were selected through snowball sampling. For the validation phase, 17 experts were selected using purposive sampling, and in the quantitative phase, 228 participants were selected through stratified random sampling. Data analysis in the qualitative phase was conducted using thematic analysis through initial coding, theme development, and theme refinement based on semi-structured interviews. In the validation phase, a three-round Delphi method was applied using an expert review checklist. In the quantitative phase, structural equation modeling (SEM) was used with a 96-item questionnaire. To assess validity and reliability in the qualitative phase, necessary measures such as credibility (expert review), confirmability (expert feedback), and intra-thematic agreement were employed. In the validation phase, the content of the expert checklist was confirmed by experts in terms of clarity and comprehensibility, and its reliability was confirmed through the test-retest method with a coefficient of 0.88. In the quantitative phase, the questionnaire's validity was confirmed through face validity, content validity (CVI between 0.80 and 1.00 and CVR between 0.50 and 0.90), and construct validity (convergent validity range between 0.563 and 0.730 and discriminant validity higher than inter-construct correlations). The questionnaire's reliability was confirmed through factor loadings (greater than 0.40), Cronbach's alpha (ranging from 0.710 to 0.830), and composite reliability (ranging from 0.794 to 0.890). According to the qualitative findings, the final model comprises six main themes: (1) Sustainable and Participatory Governance, (2) Social Justice and Inclusive Services, (3) Sustainable Resource and Environmental Management, (4) Technology and Innovation in Public Services, (5) Economic Sustainability and Financial Empowerment, and (6) Citizen Education and Cultural Development; along with 24 sub-themes and 96 indicators. The validation phase findings confirmed the research components by expert consensus. Finally, the results of the quantitative phase supported the validity and explanatory power of the proposed model in a real-world statistical population.

Keywords: Modern public services, social development, economic development, environmental development.

Introduction

In the face of escalating urban complexities, accelerating environmental degradation, and growing demands for inclusive governance, municipalities across the globe are under pressure to redesign their service delivery frameworks in a manner that aligns with principles of sustainable development. Nowhere is this more crucial than in rapidly urbanizing regions such as Iran's Mazandaran Province, where urban expansion intersects with environmental fragility, socio-economic inequality, and institutional inefficiency. The emergence of "New Public Services" (NPS) as a paradigmatic shift away from the traditional New Public Management (NPM) model has sparked a growing interest in models that prioritize sustainability, citizen engagement, and technological innovation as core pillars of urban governance (1, 2).

The transition to new models of public service delivery—ones that emphasize equity, accountability, transparency, and environmental stewardship—has been highlighted in global policy frameworks, notably in the United Nations' World Cities Report which emphasizes "emerging futures" grounded in sustainability and participation (3). In urban contexts like Mazandaran, characterized by natural diversity and socio-spatial disparities, the necessity for such models is acute. Scholars argue that modern urban policy must be capable of addressing multiple and intersecting challenges, including informal settlements, resource mismanagement, and spatial inequality (4-6).

As urban areas become primary engines of economic activity and demographic concentration, the complexity of managing public services also intensifies. To respond effectively, urban managers and policymakers must integrate multidisciplinary insights and governance tools to ensure sustainability across three major axes: social inclusivity, environmental responsibility, and economic viability (7, 8). Social sustainability requires mechanisms for citizen empowerment, equity in service access, and the institutionalization of participatory governance. Economic sustainability, on the other hand, emphasizes financial resilience, diversified revenue sources, and support for local enterprises (9). Environmental sustainability mandates innovative approaches to resource conservation, green infrastructure, and pollution reduction, as emphasized in global and regional case studies (10, 11).

In this context, the conceptualization of new public services must be situated within a governance framework that transcends managerial efficiency and encompasses normative goals such as justice, collaboration, and resilience (12). According to Bozorginezhad and colleagues, the policy-making cycle in Iranian urban governance can be redesigned through a neuro-fuzzy approach that integrates stakeholder perspectives, adaptive learning, and outcome-based strategies (12). Furthermore, Gheitasi Vand et al. argue for network governance models that enhance coordination among public agencies and civil society, particularly in areas such as transportation and waste management (13).

Technological innovation has emerged as a key enabler of these transformations. Smart cities, digital platforms, and data-driven planning provide municipalities with tools to manage urban systems more efficiently and inclusively. Studies underscore the potential of technology not only for operational optimization but also for democratizing access to services and enhancing transparency (14, 15). In Mazandaran, these tools can bridge gaps in service delivery across geographically diverse municipalities, strengthen disaster preparedness, and support eco-friendly urban infrastructure.

However, realizing this vision requires navigating institutional inertia, political resistance, and structural limitations. A critical enabler in this process is the adoption of strategic foresight and future-oriented planning mechanisms. Aba't et al. advocate for infrastructure-based urban foresight models that anticipate demographic trends, ecological risks, and technological shifts, particularly in secondary cities that often lack comprehensive planning systems (16). Similarly, Ghazi Nouri et al. stress the need for integrated policy instruments and goal alignment across science, technology, and urban development agendas (17).

Social equity and justice also stand at the center of sustainable public service delivery. Urban services must not only be available but equitably accessible to all segments of the population, including vulnerable groups such as women, the elderly, and low-income households. The work of Baratalipour highlights the post-revolutionary discourse in Iran surrounding social justice policy and its implications for public service design (18). Furthermore, Karimzadeh's spatial analysis of service access in Tabriz reveals deep-rooted inequalities that must be addressed through targeted municipal fee policies and spatial justice frameworks (19).

Beyond structural and procedural reforms, attention must be directed toward cultural and cognitive dimensions of governance. Public administrators and citizens alike must internalize values such as accountability, environmental ethics, and civic responsibility. Abouei Ardakan and colleagues emphasize the role of strategic thinking in cultural organizations, which can be extended to municipalities as they seek to foster inclusive and forward-looking leadership (20). This requires capacity building, training programs, and organizational learning to realign institutional behaviors with sustainability principles.

The importance of stakeholder collaboration and multi-sector partnerships cannot be overstated. Irwandi et al. document successful public-private partnerships in Indonesia that have advanced sustainable development in urban settings through integrated planning and financial innovation (21). These insights are especially relevant for Mazandaran's municipalities, which must mobilize diverse actors—governmental, private, and civic—toward co-creating public value. Ugoani emphasizes that such governance models enhance long-term sustainability by distributing responsibility and fostering resilience in service ecosystems (2).

The unique context of Mazandaran—with its combination of coastal and mountainous terrains, tourism influxes, and ecological sensitivity—requires an adaptive, evidence-based, and context-specific model of public services. Prior studies in Tehran and other Iranian cities provide empirical foundations and methodological tools that can be refined and localized for the province's needs (1, 11). These models emphasize iterative feedback loops, stakeholder feedback integration, and flexible policy frameworks capable of responding to uncertainty and complexity.

Given this background, the present study aims to model new public services for the municipalities of Mazandaran based on a multidimensional framework of sustainable urban development.

Methods and Materials

This study employed a mixed-methods research design (qualitative–quantitative). In the qualitative section, an interpretive approach was adopted using thematic analysis. In the validation phase, a group decision-making approach was applied using the Delphi technique. In the quantitative section, the study used the Inferential Analysis (IA) method with the Structural Equation Modeling (SEM) technique.

In the qualitative phase, experts and specialists were consulted to ensure the credibility of interviews. Participants in the qualitative phase included: (1) academic experts (faculty members in public administration, urban management, urban design, and urban planning), (2) organizational experts (mayors, city council members, and senior municipal managers), and (3) scholars and professionals in the fields of modern public services and urban sustainable development.

The criteria for expert selection included: (1) academic qualifications in public administration, (2) academic qualifications in urban management, (3) authorship of books, articles, or research projects related to the topic, and (4) relevant executive experience in municipalities.

A snowball sampling method was used to recruit a spectrum of key informants in the qualitative section. Sampling continued until theoretical saturation was achieved—i.e., when no new concepts emerged from the final interviews. A total of 19 experts were interviewed. Their characteristics are presented in Table 1.

Table 1. Information of Interviewees

No.	Gender	Academic Field	Academic Degree	Years of Experience	Organizational Position	Survey Code
1	Female	Public Administration – Policy and Decision-Making	PhD Candidate	21	Senior Municipal Manager	N1
2	Male	Urban Design – Urbanism	PhD Candidate	22	Mid-level Municipal Manager	N2
3	Male	Urban Affairs Management	PhD	11	Faculty Member, Islamic Azad University	N3
4	Male	Public Administration – Comparative Management and Development	MA	19	Mid-level Municipal Manager	N4
5	Female	Public Administration – Policy and Decision-Making	PhD Candidate	22	Senior Municipal Manager	N5
6	Female	Public Administration – Human Resource Management	PhD	23	Faculty Member, Ministry of Science	N6
7	Male	Urban Design – Urbanism	PhD Candidate	27	Senior Municipal Manager	N7
8	Female	Public Administration – Human Resource Management	PhD Candidate	25	Faculty Member, Payame Noor University	N8
9	Male	Urban Design – Urban Planning	MA	13	Mid-level Municipal Manager	N9
10	Male	Urban Planning	PhD	19	Faculty Member, Ministry of Science	N10
11	Male	Public Administration – Comparative Management and Development	PhD	7	Faculty Member, Ministry of Science	N11
12	Male	Urban Design – Urban Planning	PhD Candidate	24	Faculty Member, Islamic Azad University	N12
13	Male	Public Administration – Comparative Management and Development	PhD	27	Faculty Member, Islamic Azad University	N13
14	Female	Urban Affairs Management	PhD	9	Faculty Member, Islamic Azad University	N14
15	Male	Public Administration – Policy and Decision-Making	PhD	19	Faculty Member, Ministry of Science	N15
16	Male	Urban Design – Urban Planning	PhD	18	Senior Municipal Manager	N16
17	Male	Urban Planning	PhD Candidate	21	Faculty Member, Islamic Azad University	N17
18	Male	Geography and Urban Planning	MA	17	Deputy Director of Urban Development	N18
19	Female	Urban Design – Urbanism	PhD	9	Faculty Member, Ministry of Science	N19

The target population in the validation phase consisted of senior municipal managers and faculty members in public administration, urban management, urban design, and urban planning at universities in Mazandaran Province. A purposive non-probability sampling method was applied, and 17 experts and professionals were selected. Semi-structured interviews were used for qualitative data collection, while the expert validation checklist was used in the validation phase.

To ensure the validity and reliability of tools in the qualitative phase, expert feedback was sought to establish credibility (expert review) and confirmability (rechecking by experts). The transcripts and initial codes of five interviews were shared with the interviewees for validation. Any discrepancies or corrections were incorporated to ensure accurate interpretation. For reliability, the finalized categories were returned to several initial participants for feedback, and adjustments were made based on their suggestions.

For data validity in the validation phase, the checklist was reviewed by several academic and organizational experts for clarity and expressiveness. Its reliability was assessed via the test-retest method, where the checklist was distributed twice, two weeks apart, among 10 participants. The correlation coefficient calculated using SPSS was 0.88, confirming reliability.

The qualitative phase employed thematic analysis—a method for identifying, analyzing, and interpreting patterns (themes) within data. Thematic analysis organizes data and describes it in detail, often interpreting multiple aspects of the research subject. Themes represent the most abstract level of data and are influenced heavily by the research structure. This method is

especially useful when little is known about the phenomenon or when there is no comprehensive theoretical framework on the topic. The goal of using thematic analysis was to identify initial and in-depth ideas for developing theoretical models for future empirical research.

Anderson (2007) proposed a 15-step process for thematic analysis. Additionally, Clarke and Braun (2006, 2013) developed a six-phase process, which was adopted in this study.

In the validation phase, the identified components from the qualitative phase were validated by determining their importance in model development using expert surveys and the Delphi technique. Descriptive statistics were calculated using SPSS across three Delphi rounds. The Delphi method is a qualitative technique used to reach consensus in group decision-making. It involves a series of iterative surveys or rounds with controlled feedback aiming to build agreement among experts.

In this study, the Delphi method was conducted in three rounds. The researcher provided a five-point Likert checklist to experts, evaluating the sub-themes under six main themes: (1) Sustainable and Participatory Governance, (2) Social Justice and Inclusive Services, (3) Sustainable Resource and Environmental Management, (4) Technology and Innovation in Public Services, (5) Economic Sustainability and Financial Empowerment, and (6) Citizen Education and Cultural Development. Each round was spaced one week apart.

In the quantitative phase, the target population consisted of all senior and mid-level managers of municipalities in Mazandaran Province and eight affiliated organizations: Fire Department, Transportation Organization, Cemetery Organization, Waste Management Organization, Construction Organization, Cultural–Social–Sports Organization, Urban Landscape and Beautification Organization, and the Fruit and Vegetable Markets Organization, totaling 554 individuals across 62 municipalities.

A proportional stratified sampling method was used. Municipalities were divided into three strata based on their classification (ranked 1–5 in the first stratum, 6–8 in the second, and 9–11 in the third) according to the Ministry of Interior's classification. Random distribution of questionnaires within each stratum was conducted based on its population. The sample size, determined using Cochran's formula, was 228 participants.

The quantitative data collection tool was a 96-item questionnaire, developed from the conceptual model derived from the qualitative phase. Thus, the model variables were transformed from qualitative to quantitative format.

The validity of the questionnaire was confirmed using three methods: face validity, content validity (CVI between 0.80 and 1.00; CVR between 0.50 and 0.90), and construct validity (convergent validity range from 0.563 to 0.730; discriminant validity higher than inter-construct correlations).

The reliability of the questionnaire was confirmed through factor loadings (greater than 0.40), Cronbach's alpha (ranging from 0.710 to 0.830), and composite reliability (ranging from 0.794 to 0.890).

To analyze the data obtained from the questionnaire in the quantitative phase, both descriptive and inferential statistical methods were employed. For model testing, Structural Equation Modeling (SEM) was applied. SEM is a statistical model that examines relationships between latent variables (unobserved) and observed variables. It integrates confirmatory factor analysis (measurement model) and regression/path analysis (structural model) into a single statistical test. Path analysis, best visualized through path diagrams, illustrates probable causal links among variables.

In this study, SEM and path analysis were used for testing the model, and data were analyzed using SPSS and Smart PLS software.

Findings and Results

Out of 19 experts, 13 were male (81.25%) and 6 were female (18.75%). Therefore, the majority of participants were male. A total of 10 individuals held a master's degree or were Ph.D. candidates (52.6%), 6 individuals held a Ph.D. with the rank of assistant professor (31.6%), 2 were associate professors (10.5%), and 1 was a full professor (5.3%). Thus, most participants held a master's degree or were pursuing a Ph.D.

In terms of work experience, 3 individuals had 10 years or less of experience (15.8%), 7 had between 11 to 20 years (36.8%), and 9 had over 20 years (47.4%). Hence, the majority of participants had more than 20 years of work experience. Regarding institutional affiliation, 5 individuals (26.3%) were from the Ministry of Science, Research, and Technology, 1 (5.3%) from Payame Noor University, 5 (26.3%) from Islamic Azad University, and 8 individuals (42.1%) were municipal managers from across the country. Therefore, the largest group of participants consisted of municipal managers.

In the qualitative section, the central focus of the study was to explore and identify the influential factors related to the main themes, sub-themes, and criteria of the "Model of Modern Public Services with an Approach to Urban Social, Economic, and Environmental Sustainable Development" as the core concept. The six-phase approach of Clarke and Braun (2006) was used for analyzing the semi-structured interviews.

Step 1: Familiarization with the Data

This involved immersion in the data, including repeated reading and active engagement with the texts (i.e., searching for meaning and patterns). Before beginning the initial coding, each interview was reviewed at the sentence and phrase level to ensure deep immersion in the data through multiple readings and interpretive reading.

Step 2: Generating Initial Codes

This step involved reading and familiarizing the researcher with the data to extract initial codes. Ultimately, 317 initial conceptual codes were identified.

Step 3: Searching for Selective Codes

This stage entailed categorizing different codes into broader selective codes and organizing all coded data segments. After reviewing and cross-checking the codes, 221 duplicate codes out of the initial 317 were removed, resulting in a final count of 96 codes.

Step 4: Forming Sub-Themes

This step focused on developing a set of themes and reviewing them. Table 2 presents the results of identifying the sub-themes (subcategories). The aim was to establish relationships between the generated criteria. From the 317 initial codes identified during the first coding phase, and after removing duplicates, 221 codes were excluded. In the second phase of coding (theme construction), the final 96 initial codes were used to define and structure the sub-themes (subcategories).

Table 2. Results of Sub-Theme Identification (Subcategories) in Second-Level Coding (Theme Construction)

Sub-Theme	Criteria	No.
Green Technologies	Development of electric transportation [N2-18] – 3 repetitions; Water consumption optimization using modern technologies [N18-2] – 3 repetitions; Use of sustainable construction materials [N4-5] – 3 repetitions; Reduction of carbon footprint through application and enhancement of modern technologies [N14-10] – 4 repetitions	1
Transparency and Accountability	Establishment of budget and expenditure transparency system [N1-1] – 4 repetitions; Publication of municipal performance reports [N4-18] – 4 repetitions; Responding to citizen requests within a specified deadline [N6-11] – 2 repetitions; Independent oversight of municipal performance [N17-17] – 4 repetitions	2
Support for Local Businesses	Creation of local marketplaces [N11-11] – 3 repetitions; Cooperation with banks in granting loans to micro-enterprises [N10-12] – 3 repetitions; Tax reductions for small businesses [N19-7] – 4 repetitions; Support for local product manufacturing [N4-11] – 3 repetitions	3
Urban Financial Management	Transparency in urban budgeting [N7-17] – 4 repetitions; Resource allocation based on prioritization [N10-4] – 4 repetitions; Municipal debt management through optimization of current expenditures [N8-7] – 4 repetitions; Increased efficiency in public spending [N16-13] – 2 repetitions	4
Rule of Law	Equity in granting public licenses [N7-6] – 4 repetitions; Legal action against urban violations [N18-8] – 4 repetitions; Guarantee of civil rights in local regulations [N12-9] – 3 repetitions; Drafting transparent urban service regulations [N6-7] – 3 repetitions	5

Universal Accessibility	Facilities for people with disabilities [N3-14] – 3 repetitions; Barrier-free urban design for better accessibility [N11-14] – 3 repetitions; Enhancing online services for easier access [N17-2] – 4 repetitions; Improvement of public transportation infrastructure [N2-10] – 4 repetitions	6
Smart City	Intelligent traffic management system [N2-17] – 4 repetitions; Online citizen services [N4-4] – 2 repetitions; Installation of smart sensors across urban areas [N14-9] – 3 repetitions; Establishment of intelligent monitoring systems [N18-1] – 4 repetitions	7
Inter-Sectoral Collaboration	Interagency cooperation with governmental and non-governmental organizations [N11-5] – 2 repetitions; Formation of joint working groups for urban projects [N3-11] – 4 repetitions; Information sharing among departments [N12-8] – 2 repetitions; Cross-sectoral coordination in urban crises [N5-1] – 3 repetitions	8
Green Space Preservation	Protection of forests and urban parks [N1-10] – 3 repetitions; Expansion of local parks [N19-12] – 4 repetitions; Tree planting in urban streets to enhance greenery [N12-16] – 3 repetitions; Prevention of green space destruction in construction [N8-6] – 4 repetitions	9
Enhancement of Social Interaction	Creation of public spaces for engagement [N3-8] – 3 repetitions; Support for NGOs and volunteer activities [N10-14] – 3 repetitions; Strengthening local social networks [N11-9] – 2 repetitions; Hosting social events throughout the city [N17-15] – 4 repetitions	10
Economic Empowerment	Vocational training for citizens with support from Technical and Vocational Organization [N4-12] – 4 repetitions; Employment promotion in underprivileged areas [N1-20] – 4 repetitions; Creation of entrepreneurial opportunities using national funding [N13-6] – 4 repetitions; Strengthening local cooperatives [N12-12] – 4 repetitions	11
Waste Management	Waste sorting at source by waste management personnel [N16-5] – 4 repetitions; Implementation of municipal recycling programs [N1-9] – 4 repetitions; Establishment of waste collection stations [N4-6] – 2 repetitions; Reduction of waste production through public education [N13-4] – 4 repetitions	12
Promotion of Civic Culture	Organization of public cultural campaigns [N13-11] – 3 repetitions; Citizenship education in schools through cooperation with the Ministry of Education [N2-1] – 4 repetitions; Awareness programs via media and local networks [N5-17] – 3 repetitions; Production of cultural content in media [N12-13] – 3 repetitions	13
Equity in Service Distribution	Balanced distribution of urban amenities across districts [N2-9] – 3 repetitions; Equal access to public transportation [N18-9] – 4 repetitions; Equal provision of educational services [N1-5] – 2 repetitions; Elimination of welfare service discrimination among regions [N5-3] – 3 repetitions	14
Public Participation	Establishment of online citizen participation platforms [N12-7] – 4 repetitions; Hosting neighborhood consultation meetings with local leaders [N4-17] – 4 repetitions; Formation of local participatory councils [N8-3] – 4 repetitions; Feedback collection from urban projects [N16-8] – 4 repetitions	15
Strengthening Local Identity	Hosting local festivals to foster identity [N9-15] – 4 repetitions; Preservation and revival of cultural symbols [N3-7] – 3 repetitions; Implementation of cultural tourism development programs [N5-21] – 3 repetitions; Enhancement of neighborhood belongingness [N11-8] – 3 repetitions	16
Support for Vulnerable Groups	Housing assistance programs for low-income groups [N3-15] – 4 repetitions; Development of software and hardware services for elderly and children [N7-8] – 3 repetitions; Expansion of welfare services in underserved neighborhoods [N2-11] – 2 repetitions; Educational programs for vulnerable populations [N1-7] – 3 repetitions	17
Gender Justice	Promotion of women's participation in urban management [N2-12] – 2 repetitions; Enhancing urban safety for women [N6-1] – 3 repetitions; Equal employment opportunities [N7-11] – 3 repetitions; Practical support for women-led businesses [N19-3] – 4 repetitions	18
Revenue Diversification	Creation of sustainable non-tax revenues [N11-10] – 4 repetitions; Support for investment projects [N1-18] – 1 repetition; Attraction of regional and interregional investors [N18-12] – 3 repetitions; Development of cultural and tourism industries [N4-10] – 2 repetitions	19
Sustainable Energy	Development of renewable energy (solar and wind) [N1-12] – 3 repetitions; Energy efficiency in urban buildings and enforcement on contractors [N6-4] – 4 repetitions; Use of low-consumption technologies [N4-3] – 3 repetitions; Financial incentives for clean energy [N14-4] – 4 repetitions	20
Pollution Reduction	Air and noise pollution monitoring via hardware/software upgrades [N6-3] – 3 repetitions; Restriction on polluting vehicles [N9-5] – 3 repetitions; Promotion of clean transportation [N4-2] – 3 repetitions; Strict regulation on polluting industries [N8-11] – 2 repetitions	21
Educational Programs	Public and urban health education via media and local networks [N17-9] – 4 repetitions; Crisis management training courses [N3-6] – 3 repetitions; Online education in civic culture [N9-14] – 4 repetitions; Training for responsible behavior in public spaces [N16-11] – 4 repetitions	22
Technological Specialization in Public Services	Training specialists in technology [N9-4] – 4 repetitions; Recruitment of tech-savvy managers in municipalities [N5-14] – 3 repetitions; Engagement of technology consultants in public services [N14-13] – 3 repetitions; Development of R&D teams [N15-5] – 4 repetitions	23
Innovation in Services	Provision of integrated services via platforms [N15-4] – 3 repetitions; Development of inclusive urban applications [N9-12] – 3 repetitions; Offering personalized services to citizens [N1-15] – 3 repetitions; Development of AI-based solutions [N19-15] – 4 repetitions	24

Step 5: Definition and Naming of Main Themes:

This step aimed to develop a coherent and satisfactory thematic structure in the third phase of coding (theme refinement). The 96 final codes, which had been grouped into 24 sub-themes (subcategories), were subsequently organized under 6 main themes (primary categories).

Step 6: Report Writing – Final Analysis and Documentation:

The final results of the qualitative analysis are presented in Table 3 as follows:

Table 3. Classification of Main Themes, Sub-Themes, and Indicators in the Final Research Model

No.	Main Theme	Sub-Theme	Number of Sub-Themes	Number of Indicators
1	Sustainable and Participatory Governance	Transparency and Accountability	4	16
		Public Participation		
		Intersectoral Collaboration		
		Rule of Law		
2	Social Justice and Inclusive Services	Equity in Service Distribution	4	16
		Universal Accessibility		
		Support for Vulnerable Groups		
		Gender Justice		
3	Sustainable Resource and Environmental Management	Waste Management	4	16
		Green Space Preservation		
		Pollution Reduction		
		Sustainable Energy		
4	Technology and Innovation in Public Services	Smart City	4	16
		Green Technologies		
		Service Innovation		
		Technological Specialization		
5	Economic Sustainability and Financial Empowerment	Urban Financial Management	4	16
		Revenue Diversification		
		Support for Local Businesses		
		Economic Empowerment		
6	Citizen Education and Culture Building	Civic Culture Promotion	4	16
		Educational Programs		
		Strengthening Local Identity		
		Enhancement of Social Interaction		

In the first round of Delphi, the sub-theme with the highest importance was *Public Participation* with a mean of 3.96 and a standard deviation of 0.58, while *Intersectoral Collaboration* received the lowest importance with a mean of 3.88 and a standard deviation of 0.66. In the second round, *Rule of Law* ranked highest (M = 3.83, SD = 0.87), and *Transparency and Accountability* the lowest (M = 3.75, SD = 0.82). In the third round, *Rule of Law* remained the highest (M = 3.87, SD = 0.70), while *Intersectoral Collaboration* remained the lowest (M = 3.76, SD = 0.55). The Kendall's coefficient of concordance for the third round responses was 0.802, reflecting only an 8.52% increase from round two (0.739), indicating a modest growth in consensus. Overall, the sub-themes—(1) Transparency and Accountability, (2) Public Participation, (3) Intersectoral Collaboration, and (4) Rule of Law—were considered valid and acceptable by experts.

In Delphi round one, *Universal Accessibility* had the highest mean (M = 3.76, SD = 0.92), while *Gender Justice* had the lowest (M = 3.69, SD = 0.85). In round two, *Equity in Service Distribution* ranked highest (M = 3.69, SD = 0.63), and *Universal Accessibility* lowest (M = 3.60, SD = 0.74). In round three, *Equity in Service Distribution* again scored highest (M = 3.93, SD = 0.97), and *Gender Justice* the lowest (M = 3.83, SD = 0.78). Kendall's coefficient for round three was 0.903, with only a 6.86% increase from round two (0.845), indicating limited additional consensus. The four sub-themes—(1) Equity in Service Distribution, (2) Universal Accessibility, (3) Support for Vulnerable Groups, and (4) Gender Justice—were deemed valid and appropriate by expert opinion.

In the first Delphi round, *Sustainable Energy* had the highest mean (M = 3.84, SD = 0.90), while *Pollution Reduction* scored lowest (M = 3.76, SD = 0.88). In round two, *Sustainable Energy* remained highest (M = 3.93, SD = 0.57), while *Waste*

Management was lowest (M = 3.74, SD = 0.79). In round three, *Sustainable Energy* still ranked highest (M = 3.85, SD = 0.90), and *Green Space Preservation* was lowest (M = 3.71, SD = 0.89). Kendall's coefficient for round three was 0.879, only a 9.32% increase from round two (0.804), reflecting minimal additional consensus. Experts validated the four sub-themes: (1) Waste Management, (2) Green Space Preservation, (3) Pollution Reduction, and (4) Sustainable Energy.

In the first Delphi round, *Smart City* scored the highest (M = 3.92, SD = 0.83), while *Technological Specialization in Public Services* had the lowest score (M = 3.72, SD = 0.91). In round two, *Service Innovation* ranked highest (M = 3.93, SD = 0.62), while *Green Technologies* ranked lowest (M = 3.76, SD = 0.59). In round three, *Smart City* regained the top position (M = 3.89, SD = 0.74), with *Green Technologies* again the lowest (M = 3.80, SD = 0.65). The Kendall's coefficient for round three was 0.766, up only 8.03% from round two (0.709), indicating moderate consensus improvement. The sub-themes—(1) Smart City, (2) Green Technologies, (3) Service Innovation, and (4) Technological Specialization—were validated as relevant by the experts.

In the first Delphi round, *Urban Financial Management* was ranked highest (M = 3.96, SD = 0.79), while *Revenue Diversification* was lowest (M = 3.83, SD = 0.66). In round two, *Economic Empowerment* scored the highest (M = 3.79, SD = 0.55), and *Support for Local Businesses* scored lowest (M = 3.68, SD = 0.63). In the third round, *Urban Financial Management* again ranked highest (M = 3.85, SD = 0.69), and *Revenue Diversification* was the lowest (M = 3.74, SD = 0.82). Kendall's coefficient for the third round was 0.841, an increase of only 9.50% from the second round (0.768), indicating limited growth in consensus. Experts confirmed the validity of the four sub-themes: (1) Urban Financial Management, (2) Revenue Diversification, (3) Support for Local Businesses, and (4) Economic Empowerment.

In the first Delphi round, *Enhancement of Social Interaction* had the highest mean (M = 3.89, SD = 0.63), and *Strengthening Local Identity* the lowest (M = 3.71, SD = 0.85). In round two, *Civic Culture Promotion* scored highest (M = 3.94, SD = 0.79), and *Strengthening Local Identity* again scored lowest (M = 3.81, SD = 0.73). In round three, *Civic Culture Promotion* maintained the top spot (M = 3.96, SD = 0.83), while *Strengthening Local Identity* remained lowest (M = 3.79, SD = 0.61). The Kendall's coefficient for round three was 0.796, showing only a 9.49% increase from round two (0.727). The final four validated sub-themes were: (1) Civic Culture Promotion, (2) Educational Programs, (3) Strengthening Local Identity, and (4) Enhancement of Social Interaction.

The detailed results from the third round of the Delphi technique from the perspective of experts are presented in Table 4.

Table 4. Respondents' Views on the Components Explaining Modern Public Services with an Urban Social, Economic, and Environmental Sustainability Approach in Municipalities – Third Round of Delphi

Component	Number of Responses	Minimum	Maximum	Mean	Standard Deviation	Importance Rank
Sustainable and Participatory Governance						
Transparency and Accountability	17	1.00	5.00	3.85	0.79	2
Public Participation	17	2.00	5.00	3.80	0.68	3
Intersectoral Collaboration	17	2.00	5.00	3.76	0.55	4
Rule of Law	17	1.00	5.00	3.87	0.70	1
Social Justice and Inclusive Services						
Equity in Service Distribution	17	2.00	5.00	3.93	0.97	1
Universal Accessibility	17	1.00	5.00	3.86	0.76	3
Support for Vulnerable Groups	17	1.00	5.00	3.90	0.62	2
Gender Justice	17	1.00	5.00	3.83	0.78	4
Sustainable Resource and Environmental Management						
Waste Management	17	1.00	5.00	3.74	0.75	3
Green Space Preservation	17	2.00	5.00	3.71	0.89	4
Pollution Reduction	17	2.00	5.00	3.81	0.77	2
Sustainable Energy	17	1.00	5.00	3.85	0.90	1

Technology and Innovation in Public Services						
Smart City	17	2.00	5.00	3.89	0.74	1
Green Technologies	17	2.00	5.00	3.80	0.65	4
Service Innovation	17	2.00	5.00	3.81	0.78	3
Technological Specialization in Public Services	17	1.00	5.00	3.84	0.83	2
Economic Sustainability and Financial Empowerment						
Urban Financial Management	17	2.00	5.00	3.85	0.69	1
Revenue Diversification	17	1.00	5.00	3.74	0.82	4
Support for Local Businesses	17	2.00	5.00	3.76	0.71	3
Economic Empowerment	17	2.00	5.00	3.82	0.58	2
Citizen Education and Culture Building						
Civic Culture Promotion	17	1.00	5.00	3.96	0.83	1
Educational Programs	17	1.00	5.00	3.81	0.77	3
Strengthening Local Identity	17	1.00	5.00	3.79	0.61	4
Enhancement of Social Interaction	17	1.00	5.00	3.86	0.91	2

Among the research participants, 169 were male (74.12%) and 59 were female (25.88%). A total of 52 participants were single (22.81%), while 176 were married (77.19%). In terms of age: 34 individuals were 30 years old or younger (14.91%), 64 were between 31 and 40 years old (28.07%), 77 were between 41 and 50 years old (33.77%), and 53 participants were over 50 years old (23.25%).

In terms of education: 53 had a bachelor's degree or less (23.25%), 118 had a master's degree (51.75%), 37 were Ph.D. candidates (16.23%), and 20 held a Ph.D. (8.77%). Regarding work experience: 22 participants had 5 years or less (9.65%), 42 had between 6 to 10 years (18.42%), 57 had 11 to 15 years (25%), 53 had between 16 to 20 years (23.25%), and 54 had more than 20 years of experience (23.68%).

To assess the model, the researcher-developed questionnaire—derived from the qualitative phase and validated through multiple stages—was distributed among 228 participants. Data were analyzed using exploratory and confirmatory factor analysis with SPSS and Smart PLS software.

To determine the adequacy of the sample size and the appropriateness of inter-variable correlations for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett’s Test of Sphericity were used. The KMO values for the six dimensions were as follows:

1. Sustainable and Participatory Governance – 0.863
2. Social Justice and Inclusive Services – 0.846
3. Sustainable Resource and Environmental Management – 0.819
4. Technology and Innovation in Public Services – 0.804
5. Economic Sustainability and Financial Empowerment – 0.865
6. Citizen Education and Culture Building – 0.791

The significance level for Bartlett's Test was $p = 0.0009$, confirming that both sampling adequacy and the matrix correlation structure were suitable for conducting factor analysis.

According to the results, the extracted factors and the explained variance percentages for each component are as follows:

- For Sustainable and Participatory Governance, four components with eigenvalues greater than 1 explained approximately 58% of total variance. After Varimax rotation, Component 1 accounted for 16.74%, Component 2 for 16.13%, Component 3 for 13.48%, and Component 4 for 12.05%.

- For Social Justice and Inclusive Services, four components with eigenvalues greater than 1 explained approximately 56% of total variance. After rotation, Component 1 explained 15.79%, Component 2 explained 15.37%, Component 3 had an eigenvalue of 13.54%, and Component 4 explained 11.52%.
- For Sustainable Resource and Environmental Management, four components with eigenvalues above 1 explained approximately 56% of total variance. After rotation, Component 1 explained 16.78%, Component 2 accounted for 14.96%, Component 3 for 12.31%, and Component 4 for 12.22%.
- For Technology and Innovation in Public Services, four factors explained approximately 54% of variance. Component 1 contributed 15.07%, Component 2 accounted for 15.01%, Component 3 for 13.93%, and Component 4 for 12.75%.
- For Economic Sustainability and Financial Empowerment, four factors explained approximately 56% of variance. Component 1 explained 16.86%, Component 2 for 15.48%, Component 3 for 12.50%, and Component 4 for 11.13%.
- For Citizen Education and Culture Building, four components explained approximately 54% of variance. After Varimax rotation, Component 1 explained 15.61%, Component 2 for 12.96%, Component 3 for 12.92%, and Component 4 for 12.53%.

To evaluate the research model, second-order confirmatory factor analysis (CFA) was used. The results of this analysis are presented in Table 5.

Table 5. Path Coefficients and Significance Levels of the Research Model

Path Between Variables	Path Coefficient	t-Statistic	p-Value	Result
Sustainable and Participatory Governance → Intersectoral Collaboration	0.782	23.829	0.0009	Significant
Sustainable and Participatory Governance → Rule of Law	0.727	17.842	0.0009	Significant
Sustainable and Participatory Governance → Transparency and Accountability	0.735	18.470	0.0009	Significant
Sustainable and Participatory Governance → Public Participation	0.752	24.121	0.0009	Significant
Social Justice and Inclusive Services → Equity in Service Distribution	0.755	21.678	0.0009	Significant
Social Justice and Inclusive Services → Support for Vulnerable Groups	0.807	30.804	0.0004	Significant
Social Justice and Inclusive Services → Universal Accessibility	0.563	9.327	0.0009	Significant
Social Justice and Inclusive Services → Gender Justice	0.723	17.945	0.0009	Significant
Sustainable Resource and Environmental Management → Sustainable Energy	0.610	9.811	0.0009	Significant
Sustainable Resource and Environmental Management → Green Space Preservation	0.857	46.017	0.0009	Significant
Sustainable Resource and Environmental Management → Waste Management	0.288	2.774	0.006	Significant
Sustainable Resource and Environmental Management → Pollution Reduction	0.809	30.721	0.0009	Significant
Technology and Innovation in Public Services → Technological Specialization	0.608	9.668	0.0009	Significant
Technology and Innovation in Public Services → Smart City	0.661	12.240	0.0009	Significant
Technology and Innovation in Public Services → Green Technologies	0.712	14.968	0.0009	Significant
Technology and Innovation in Public Services → Service Innovation	0.765	19.796	0.0009	Significant
Economic Sustainability and Financial Empowerment → Revenue Diversification	0.791	28.093	0.0009	Significant
Economic Sustainability and Financial Empowerment → Economic Empowerment	0.845	39.823	0.0009	Significant
Economic Sustainability and Financial Empowerment → Support for Local Businesses	0.595	9.685	0.0009	Significant
Economic Sustainability and Financial Empowerment → Urban Financial Management	0.654	14.373	0.0009	Significant
Citizen Education and Culture Building → Enhancement of Social Interaction	0.327	3.013	0.003	Significant
Citizen Education and Culture Building → Educational Programs	0.721	15.624	0.0009	Significant
Citizen Education and Culture Building → Civic Culture Promotion	0.730	18.437	0.0009	Significant
Citizen Education and Culture Building → Strengthening Local Identity	0.835	34.686	0.0009	Significant

According to the participants, the results indicate that the model of Modern Public Services with an Urban Social, Economic, and Environmental Sustainability Approach in Mazandaran municipalities consists of 24 components. Figure 1 displays the research model with standardized and significance coefficients.

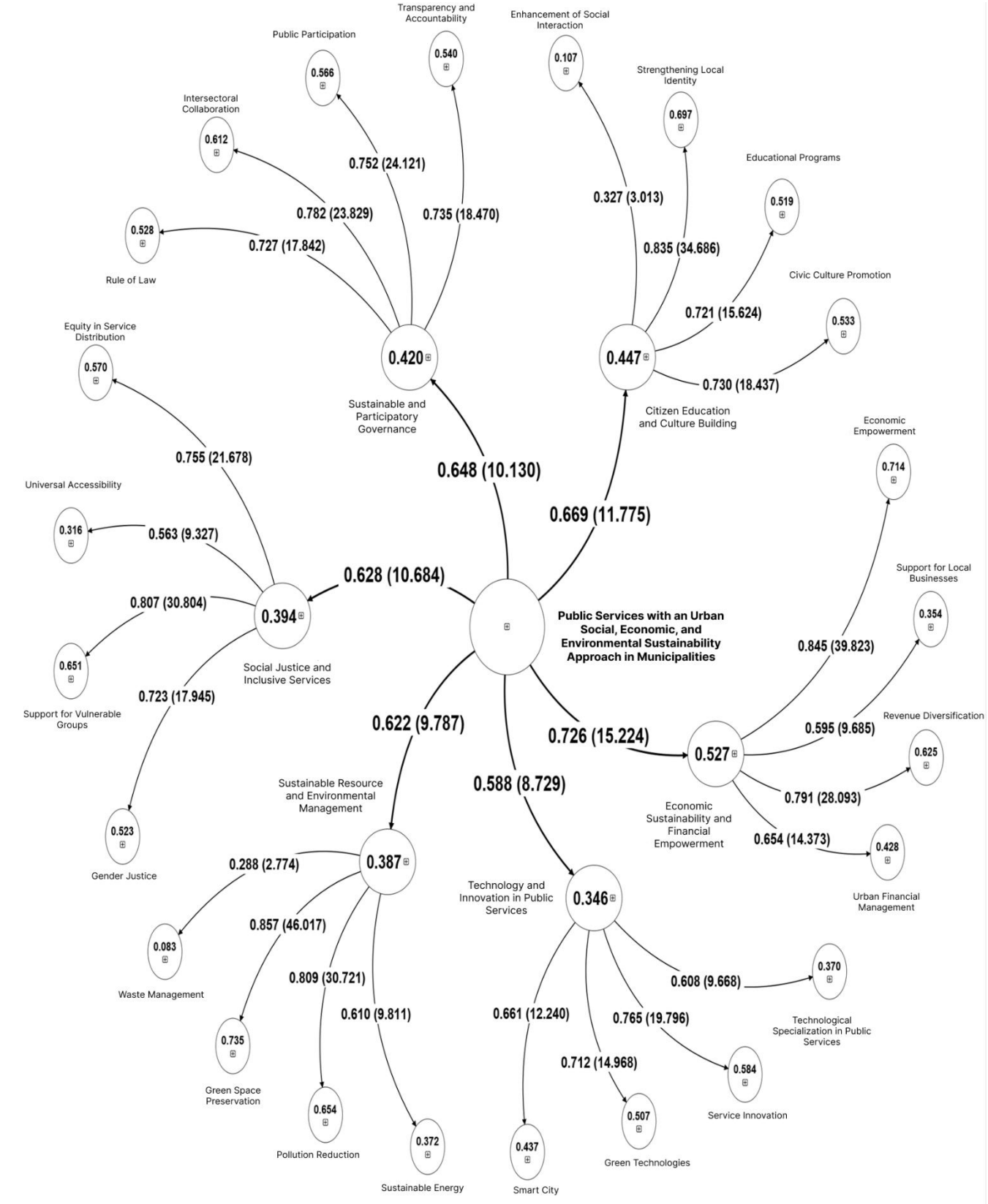

Figure 1. Final Research Model with Standardized Path and Significance Coefficients

The data collected through fieldwork were analyzed using SMART-PLS, and the following results were obtained:

Table 6. Main Path Coefficients and Significance of the Research Model

Paths	Standardized Coefficients	t-Values	p-Value	Result
Modern Public Services with Urban Sustainability Approach → Sustainable and Participatory Governance	0.648	10.130	0.0009	Significant
Modern Public Services with Urban Sustainability Approach → Social Justice and Inclusive Services	0.628	10.684	0.0009	Significant
Modern Public Services with Urban Sustainability Approach → Citizen Education and Culture Building	0.669	11.775	0.0009	Significant
Modern Public Services with Urban Sustainability Approach → Technology and Innovation in Public Services	0.588	8.729	0.0009	Significant
Modern Public Services with Urban Sustainability Approach → Sustainable Resource and Environmental Management	0.622	9.787	0.0009	Significant
Modern Public Services with Urban Sustainability Approach → Economic Sustainability and Financial Empowerment	0.726	15.224	0.0009	Significant

Based on the Friedman test, the prioritization of dimensions and components using the mean rank values is as follows:

1. Citizen Education and Culture Building ranked first with a mean rank of 3.640.
2. Sustainable Resource and Environmental Management ranked second with a mean rank of 3.614.
3. Technology and Innovation in Public Services ranked third with a mean rank of 3.605.
4. Economic Sustainability and Financial Empowerment ranked fourth with 3.443.
5. Sustainable and Participatory Governance ranked fifth with 3.351.
6. Social Justice and Inclusive Services ranked sixth with 3.346, indicating the lowest priority.

This prioritization highlights the relatively greater importance of Citizen Education and Culture Building and Sustainable Resource and Environmental Management in achieving the study's objectives, while Social Justice and Inclusive Services had the least impact among the examined dimensions.

Friedman Test – Prioritization of Model Components:

- In Sustainable and Participatory Governance, *Rule of Law* ranked first (mean rank = 2.693), while *Transparency and Accountability* ranked last (mean rank = 2.298).
- In Social Justice and Inclusive Services, *Support for Vulnerable Groups* ranked highest (mean = 2.618), while *Gender Justice* ranked fourth (mean = 2.406).
- In Sustainable Resource and Environmental Management, *Waste Management* had the highest priority (mean = 2.546), and *Green Space Preservation* the lowest (mean = 2.439).
- In Technology and Innovation in Public Services, *Technological Specialization in Public Services* ranked highest (mean = 2.533), and *Green Technologies* the lowest (mean = 2.452).
- In Economic Sustainability and Financial Empowerment, *Revenue Diversification* had the highest priority (mean = 2.590), and *Economic Empowerment* the lowest (mean = 2.390).
- In Citizen Education and Culture Building, *Strengthening Local Identity* ranked highest (mean = 2.654), while *Enhancement of Social Interaction* had the lowest priority (mean = 2.379).

Given the sample size (central limit theorem), the one-sample t-test was used.

- *Sustainable and Participatory Governance*: Mean = 2.96, SD = 0.54, t = -1.19 → Moderate level.
- *Social Justice and Inclusive Services*: Mean = 2.95, SD = 0.54, t = -1.49 → Moderate level.
- *Sustainable Resource and Environmental Management*: Mean = 3.00, SD = 0.50, t = -0.02 → Moderate level.
- *Technology and Innovation in Public Services*: Mean = 3.00, SD = 0.50, t = -0.50 → Moderate level.
- *Economic Sustainability and Financial Empowerment*: Mean = 2.98, SD = 0.51, t = -0.71 → Moderate level.
- *Citizen Education and Culture Building*: Mean = 3.01, SD = 0.48, t = 0.23 → Moderate level.

Overall, the final model components, when assessed based on the current situation, were found to be at a moderate level across most dimensions.

Discussion and Conclusion

The findings of the present study underscore the structural and functional significance of New Public Services (NPS) in supporting sustainable urban development in the municipalities of Mazandaran. The results of the path analysis clearly demonstrated that the model of NPS—when approached through the lens of sustainability—establishes meaningful and strong causal relationships with six core components: participatory and sustainable governance, social justice and inclusive services, sustainable environmental and resource management, innovation and technology in public services, financial empowerment and economic sustainability, and civic education and cultural development. All of these dimensions showed statistically significant path coefficients, confirming the robustness and internal validity of the proposed model. This outcome not only confirms the multidimensional nature of sustainable public services but also aligns with the theoretical propositions of scholars who have argued for integrated and citizen-centered models of urban service delivery (2, 12).

First, the strong and significant relationship between NPS and sustainable participatory governance ($\beta = 0.648$; $p < 0.01$) highlights the foundational role of collaborative and transparent governance structures in realizing sustainable urban development. Governance dimensions such as intersectoral coordination, rule of law, transparency, and public participation are key enablers of effective service delivery. These findings are in line with the arguments presented by Irwandi et al., who identified public-private cooperation and civic inclusion as essential to the governance of sustainable cities in Indonesia (21). Similarly, the work of Ugoani emphasized that reforms in public administration, anchored in transparency and accountability, are prerequisites for sustainable governance in the Global South (2).

Second, the component of social justice and inclusive services exhibited a significant path coefficient ($\beta = 0.628$; $p < 0.01$), reinforcing the role of equity in urban policy. Within this dimension, components such as gender equity, comprehensive accessibility, and support for vulnerable groups emerged as high-priority subfactors. This supports prior studies that argue social sustainability is not just a normative goal but a practical requirement for effective urban governance. Ghafeli et al. emphasized the necessity of integrating smart technologies to provide justice-based services, especially for marginalized populations in urban areas (9). Similarly, Baratalipour argued for a coherent justice policy model in post-revolutionary Iran to correct ontological and normative disjunctions in service provision (18).

The results also show that environmental and resource sustainability has a statistically significant path coefficient ($\beta = 0.622$; $p < 0.01$). This dimension includes sustainable energy, pollution reduction, green space preservation, and waste management. Notably, waste management and pollution reduction received the highest weight within this dimension. These findings mirror global concerns and academic warnings about ecological degradation in urban areas (4, 10). Melore and Nel, for example, showed how informal settlements in Ethiopia and South Africa exhibit high vulnerability to environmental shocks due to the absence of integrated environmental management systems (10). Similarly, Gheitasi Vand et al. pointed out that lack of environmental foresight and policy fragmentation in Tehran undermines sustainability efforts in urban service systems (11).

Another significant finding was the strong association between the NPS model and technology and innovation in public services ($\beta = 0.588$; $p < 0.01$). Subdimensions such as smart city development, green technologies, and technological specialization within public services all showed high path coefficients. This supports the growing body of literature advocating for digital transformation as a catalyst for enhancing public service quality, responsiveness, and citizen satisfaction (14). In particular, Guo's exploration of urban development in the digital era underscores that data-based decision-making and the use of artificial intelligence in service delivery can bridge gaps in underserved urban areas (14). Likewise, Hofmann's review of

smart urban monitoring systems illustrates the critical role of remote sensing and real-time feedback loops in ensuring equitable service distribution (15).

Economic sustainability and financial empowerment demonstrated the highest path coefficient in the model ($\beta = 0.726$; $p < 0.01$), indicating that fiscal resilience and income diversification are central to sustainable public service models. The emphasis on supporting local businesses and developing financial strategies for urban resilience aligns with the research of Ra'is Ghanavati et al., who examined the critical drivers of sustainable development in port cities and found that financial empowerment and local investment incentives play a decisive role (8). Similarly, Karimzadeh and Naseri's spatial analysis of service access in Tabriz highlighted how misaligned municipal fee structures undermine local economic sustainability and service equity (19).

The final dimension—civic education and cultural development—also displayed significant relationships with the core NPS model ($\beta = 0.669$; $p < 0.01$). This dimension includes promoting civic identity, enhancing social interaction, and delivering educational programs to boost public awareness. These results are supported by the findings of Abouei Ardakan et al., who emphasized the need for strategic thinking and organizational learning in cultural institutions to foster long-term public engagement (20). Furthermore, the research of Bozorginezhad et al. suggests that values-based education within municipal contexts leads to more effective, participatory governance structures (12).

The Friedman test results also provided valuable insight into the prioritization of dimensions within the proposed model. Among all dimensions, civic education and cultural development received the highest mean rank, followed closely by environmental sustainability and technological innovation. In contrast, social justice and inclusive services were ranked the lowest in terms of implementation priority. This suggests that while municipalities recognize the importance of justice and equity, their implementation remains constrained by structural, cultural, or fiscal limitations. This aligns with the conclusions of Galego et al., who identified institutional inertia and policy incoherence as common barriers to implementing inclusive urban development models (7).

Moreover, the single-sample t-test results revealed that most components of the model are currently at a moderate level of development in Mazandaran municipalities. This finding further reinforces the need for integrated reforms across governance, environmental management, technological infrastructure, and public education. Studies such as that of Aba't et al., who examined foresight models for urban infrastructure development in Ardabil, underline the importance of long-term planning in elevating municipal performance beyond a moderate status (16).

In sum, the empirical evidence of this study not only validates the structural model of NPS for sustainable urban development but also demonstrates its applicability to the context of Iranian municipalities. The consistency of these findings with international experiences—from Lagos to Nairobi, Delhi to Konso—indicates that despite cultural and political differences, the principles of participatory governance, equitable service access, technological innovation, and environmental responsibility have global resonance and operational relevance (5, 6, 22).

Despite the comprehensiveness of the proposed model, this study faced several limitations. First, the research sample was limited to municipalities in Mazandaran Province, which, while representative of certain urban characteristics in northern Iran, cannot be generalized to all Iranian cities or international contexts. Second, the study relied heavily on self-reported data from municipal managers and officials, which may introduce biases related to social desirability or organizational alignment. Third, although structural equation modeling provided a robust statistical approach, the complexity of interdependent relationships among sustainability dimensions may require more advanced system dynamics modeling in future research. Additionally, the exclusion of citizen perspectives limits the model's capacity to fully reflect bottom-up dynamics in service delivery and urban development.

Future research should expand the geographical scope to include other provinces and diverse urban settings, including megacities like Tehran and smaller towns with unique socio-ecological challenges. Comparative studies between regions can also uncover structural variables that influence the success or failure of NPS implementation. Furthermore, longitudinal research is recommended to monitor how municipal performance evolves over time in response to policy interventions based on this model. Incorporating citizen surveys and participatory action research methods would provide deeper insights into the lived experiences of service recipients, thereby enriching the model's applicability and responsiveness. Lastly, integrating qualitative scenario analysis with quantitative modeling can enhance the model's capacity to anticipate future disruptions such as climate change, digital transformation, and demographic shifts.

For practical implementation, municipalities should prioritize capacity-building programs that train public managers in systems thinking, technological literacy, and collaborative governance. Investment in data infrastructure and real-time monitoring tools is essential to operationalize smart and equitable service delivery. Local governments must also engage communities through inclusive planning platforms that enhance civic participation and accountability. Financial sustainability should be reinforced through diversified revenue streams and performance-based budgeting. Finally, embedding sustainability education into public communication strategies and school curricula can foster long-term behavioral change, supporting the cultural foundations of sustainable urban governance.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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