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## ORIGINAL RESEARCH PAPER

### Identification and validation of factors affecting smart governance for the future Tehran in the horizon of 2050

Vahid Araei<sup>1</sup>, Pantea Ghaffari<sup>2\*</sup>

<sup>1</sup> Assistant Professor, Department of Public Administration and Public Policy, Islamic Azad University, Central Tehran Branch, Tehran, Iran

<sup>2\*</sup> Ph.D. in futures studies, kish International Campus, University of Tehran, Tehran, Iran

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#### ABSTRACT

Smart governance has emerged as a critical framework for addressing the complex urban challenges of metropolises like Tehran, which faces severe issues including traffic congestion, environmental degradation, inefficient resource management, inadequate service delivery, and limited citizen engagement. This research aims to identify and validate the factors affecting smart governance for future Tehran in the horizon of 2050, providing a comprehensive framework to guide urban transformation. This study employed a mixed-methods approach combining qualitative document analysis with a quantitative Delphi technique. Through purposive sampling, 22 experts with advanced degrees in management and minimum 5-10 years of relevant experience participated in semi-structured interviews until theoretical saturation was reached at 16 interviews. Subsequently, a two-round Delphi survey was conducted to validate the identified factors, with Kendall's coefficient used to measure expert consensus. Results revealed three primary dimensions of smart governance: political vision (8 main themes, 38 sub-themes including legal considerations, smart planning, and political governance integration), economic vision (8 main themes, 51 sub-themes covering optimal capacity building, revenue integration, and smart cost management), and socio-cultural vision (7 main themes, 39 sub-themes focusing on citizen participation, electronic education, and accountability). A Kendall's coefficient of 0.507 confirmed strong expert consensus on these dimensions. The highest rated factors included leadership at the head of urban affairs (8.91), improvement of urban spaces (8.94), and smart budgeting for economic planning (8.68). The findings provide a comprehensive framework that can guide Tehran's transformation toward smart urban governance by 2050, emphasizing that successful implementation requires integration of technological systems with governance structures and human factors. The study demonstrates that smart governance must address political, economic, and socio-cultural dimensions simultaneously to be effective in Tehran's context. Future research should examine implementation challenges across different urban contexts in Iran and develop quantitative metrics to measure smart governance effectiveness in developing metropolises.

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\*Corresponding Author:

Email: [pantea.ghaffari@ut.ac.ir](mailto:pantea.ghaffari@ut.ac.ir)

Phone: +989122332075

ORCID: <https://orcid.org/0000-0002-5166-2616>

## INTRODUCTION

### *Background and Context*

Future visualization is fundamental for effective policymaking, enabling decision-makers to merge complex data and anticipate developments through automation, simulation, and advanced visualization techniques (Hagen, 2019; Rojas-Padilla, 2022). With the information technology revolution, ICT emerged as the main axis of global development (Law, 2019). Urbanization is projected to increase energy consumption to 80% by 2050, making smart governance approaches essential for sustainable urban management.

### *Statement of the Problem*

Tehran, as one of the largest metropolises in Iran and the Middle East, faces significant governance challenges requiring comprehensive smart governance solutions by 2050. Key challenges include severe traffic congestion due to inadequate transportation systems (Alizadeh & Sharifi, 2023), air pollution from PM10 and PM2.5 causing serious health risks (Delavar et al., 2019), inefficient resource management, inadequate urban services, and limited citizen engagement in decision-making processes (Pazhuhani, 2023). The city also suffers from spatial inequality with uneven access to urban services (Rabiei-Dastjerdi, 2021; Hajar, 2022), environmental degradation reducing disaster resilience (Faridi, 2019; Ghorbani, 2021), and cultural heritage preservation issues affecting social cohesion (Yousefi, 2019). These challenges necessitate moving from centralized structures toward new urban management methods (Safarsabzevar, 2024).

### *Significance of the Study*

Smart governance can enhance transparency, citizen engagement, and service delivery through Information and Communication Technology (ICT) utilization (Caputo, 2023; Haltofová, 2018). In rapidly urbanizing cities like Tehran, collaborative approaches allow governments to respond to citizen needs and build urban resilience (Caputo, 2023). As urbanization

contributes to declining quality of life and social inequality (Hassanzadehkermanshahi, 2022), comprehensive urban planning and policy responses are essential for improving sustainability and urban equity

### *Research Objectives and Questions*

Based on identified challenges and research gaps, this study addresses three primary research questions:

RQ1: What characteristics define the political vision of smart governance for the future of Tehran in the 2050 horizon?

RQ2: What characteristics define the economic vision of smart governance for the future of Tehran in the 2050 horizon?

RQ3: What characteristics define the socio-cultural vision of smart governance for the future of Tehran in the 2050 horizon?

### *Structure of the Paper*

This study visualizes the future of smart urban governance in Tehran to review current policies and provide stakeholders with frameworks for implementing smart governance solutions. Smart governance principles applied through urban planning and materials regulation can achieve significant energy savings, as 40% of urban energy consumption occurs in the building sector in developing countries (Tarkalam et al., 2023). By identifying and validating critical factors influencing smart governance implementation, this research provides Tehran with context-specific strategies to transform urban management capabilities and address pressing governance challenges toward 2050. This study was carried out in Tehran, Iran during 2023-2024.

### *THEORETICAL FRAMEWORK*

Smart Governance represents an innovative approach that leverages modern technologies, big data analytics, and artificial intelligence to enhance government quality and efficiency. It employs the Internet of Things (IoT), electronic accounting, and smart cities systems, among other modern improvements, to better urban management (Pereira, 2018; Tomor et al., 2019).

In practical applications, smart governance enables cities to optimize traffic management through real-time data analysis. Its primary objectives include promoting transparency, reducing corruption, enhancing citizen communication, and improving public service delivery (Lopes, 2017; Gao, 2024). Smart governance principles aim to address the needs of all community members, particularly important as population growth and various crises push leaders across societal domains toward modernization (Herawati et al., 2025). Unlike traditional governance models where data availability was limited, contemporary governance operates in an information-rich environment that requires effective utilization and research (Triyandra et al., 2024). Efficient governance structures and bidirectional communication channels are essential for developing smart urban governance. By establishing knowledge ecosystems based on long-term relationships, governments can build coordination with counterbalancing forces: individuals, industries, and local governing entities (Cezar et al., 2024).

The implementation of smart cities and bottom-up approaches in public policymaking encourages greater engagement from citizens, entrepreneurs, and other stakeholders throughout the governance process (Kaur et al., 2024). This collaborative approach not only improves services directly but also strengthens community ties and resilience (Hardi et al., 2025).

“Digital governance” encompasses newer forms of electronic governance that emphasize citizens’ equitable rights to participate in decision-making. Engagement enables citizens to shape governance practices to enhance their quality of life. Smart governance seeks to simplify and improve governance through technology that benefits governments, citizens, and businesses, thereby promoting public inclusivity (Ghaffari et al., 2024a; 2024b; Ghaffari et al., 2023; Berawi et al., 2024; Guret et al., 2024).

Smart governance commonly describes actions that comprise new technology initiatives and/or strategic approaches to enable agile and

flexible governance structures for public infrastructure and investment (Rasoulzadeh Aghdam et al., 2025). The benefits of smart governance for governments include political stability, accountability, transparency, efficient public services, and the rule of law, which together work to promote equity and reduce corruption (Saputri et al., 2024; Malik et al., 2025).

Smart governance is increasingly seen as a way of moving the governance structure to be more agile and flexible through the application of new and emerging technologies, and new styles of governance. It emphasizes the purposeful utilization of Information and Communication Technology (ICT) to improve public administration and the actions of citizens (Cezar et al., 2024; Kaur et al., 2024). The concept is still not clearly delineated as a concept with a universal meaning, though, which will require greater scientific study toward providing elements of outcomes, tools, and observable dimensions. Attention to smart governance has been of interest to technology consulting firms yet has not produced academic scholarship to the same level of engagement (Evellinda, 2024). Smart governance calls for the active engagement of citizens, the optimal deployment of public services, and the thoughtful consideration of the e-governance process that uses modern forms of communication (Hardi et al., 2025). Smart governance seeks to apply to the emergent urban challenges that confront cities today, and also to aim to foster inclusive and sustainable governance within the spirit of the practices (Idrus et al., 2025).

Tehran and other large cities in Iran face multiple urban issues that significantly affect the quality of life for their residents. The decline in quality of life is one of the most critical urban issues, as quick urbanization results in a lower quality of life compounded by growing urban poverty and increasing social divisions (Ghaffari et al., 2024a). There are also stark uneven spatial results related to physical spaces within the city, as urban services, a hollowed-out community of care, and amenities within the city are not evenly distributed producing a gulf between

the available services and amenities in highly serviced neighbourhoods, with increasing thresholds of deprivation in spaces that have little service provisions (Rabiei-Dastjerdi et al., 2021). Environmental issues are also urgent including severe air pollution, little green space, and ongoing environmental degradation, which together diminish natural disaster resilience for the yet growing urban population (Ghorbani, 2023). Cultural heritage preservation is felt in the neglect of preserving local and cultural heritage spaces, which can be seen as contributing to an overall identity crisis and subsequent breaking down of social cohesion within local communities. Ghaffari et al.'s (2023) recent publication suggests that collective action will produce a collective approach to resolving these connected issues, and further services (Ghaffari et al. 2024a; 2024b), proposed new frameworks that will produce sustainable urban development approaches that resolve these connected issues. All of these urban issues persist and need full planning strategies and applicable policy to hope to produce or enhance the sustainability of Tehran, which can include equity and livability (Ghaffari et al. 2024a; 2024b).

In order to build smart cities, governance will demand improved transparency, engagement of citizens, and political mechanisms. Government should have visibility of their citizens' perspectives, needs and feedback on policies that provide multiple channels of communication to increase citizen involvement in governance or development efforts (Ugochukwu et al., 2024; Berawi, 2024). Centralized governance also includes a diversity of the public and private workforce--formal and informal organizations, families, and communities-with a variety of tools and mechanisms, such as norms and regulations (Rasoulzadeh Aghdam et al., 2025). For collaboration of diverse stakeholders, centralized governance is crucial to provide inclusive urban contexts and successful urban policies that reflect their diversity, and promote more resilient urban contexts (Patel et al., 2024; Chouraiik, 2024).

### *Smart Urban Governance Models*

Smart urban governance, often implemented through smart city initiatives, represents a departure from traditional technocratic administration methods. Researchers have proposed a framework based on three intertwined components:

1. Spatial components: Addressing urban challenges related to social justice, economic development, and environmental sustainability
2. Institutional components: Encompassing governance methods across government, market, and civil society sectors
3. Technological components: Leveraging functional intelligence through information dissemination, communication, analysis, and design

As urban challenges manifest differently across varying contexts, governance approaches must be adapted accordingly, particularly regarding information and communication technologies (ICTs) deployment. Research indicates that major urban issues provide significant guidance for determining appropriate governance modes and developing context-specific technology applications. The smart urban governance (SUG) model considers urban challenges, evaluates relevant governance modes, and proposes solutions responsive to socio-spatial contexts through appropriate technology utilization (Jiang et al., 2020).

Smart urban governance is closely associated with 'smart government,' representing the ability to leverage digital technology and smart initiatives to access, share, and process information for decision-making, transferring power to stakeholders and incentivizing meaningful participation (Toan & Nu, 2020).

Smart economy is turning into one of the pillars of smart cities as economic movements in the information world represent a serious key in the improvement of a city. A smart economy should be able to engage people from inside and outside the city in social matters and also attract companies and investors to accelerate

development. A smart economy is a creative and innovative practice for governing cities like Tehran. Various dimensions can be offered for a sustainable smart city, and to determine the smart sustainable city concept, it is necessary to define which dimensions of a specific city are smart and sustainable. For Tehran's future governance, considering these dimensions is essential to address the city's growing challenges in energy consumption, environmental issues, and service delivery (Hamzehkolaei et al., 2021). It is important to address the quality of life in the city and then collaboration, citizen participation, and evidence-based decision-making are indicators of smart urban governance.

#### *Elements of Smart Governance*

*Smart governance comprises several key elements:*

1. **Smart Administration:** Public investment in ICT to enhance accountability and transparency among public institutions at national and local levels, typically associated with public management reform and government modernization programs.
2. **Smart Service Delivery:** Public investment in ICT to improve transparency and efficiency in public service provision across sectors, implemented alongside public management reforms, access to justice initiatives, and local governance enhancements.
3. **Smart Participation:** Public investment in ICT to strengthen interaction between public institutions and citizens, improving policy-making, service delivery, and public activities (Ghiravani et al., 2023).
4. **Good Smart Governance:** Characterized by transparent government policies, accountable executive agencies, active citizen participation in political and social affairs, and equality before the law. Key principles include:
  - **Participation:** Enabling citizen involvement through legal institutions and freedom of expression
  - **Rule of Law:** Establishing fair legal frameworks that protect individual rights

- **Transparency:** Ensuring free information flow and accessibility
- **Responsiveness:** Holding institutions accountable to members and clients
- **Consensus Formation:** Providing platforms for diverse opinions within national consensus frameworks
- **Equal Rights:** Recognizing equal rights and opportunities for all citizens
- **Effectiveness and Efficiency:** Regulating institutional activities for efficient resource use
- **Responsibility:** Ensuring accountability across government, private, and civil institutions (Jalali, 2017).

#### *Smart City Development*

The smart city concept has gained considerable traction in scientific and political discourse over the past two decades, referring to intelligent solutions enabling modern cities to improve production qualitatively and quantitatively. Smart cities require tools for efficient management and service coordination. Implementation should be based on local government knowledge while enabling information sharing with third-party services to enhance quality of life (Farrokhi, 2023).

A smart city represents a cohesive, innovative, and sustainable approach where new technologies serve as tools for improving citizens' quality of life, achieving social justice, accelerating economic growth, and enhancing environmental conditions. Through ICT utilization, smart cities work toward operational efficiency, improved government services, and higher welfare levels for residents (Al-Sharif & Pokharel, 2022).

Table 1 provides various definitions of smart governance from the literature, demonstrating the concept's evolution and multifaceted nature.

#### *LITERATURE REVIEW*

Previous research on smart governance and smart cities provides valuable insights for understanding the challenges and opportunities in implementing these concepts in urban contexts like Tehran. Table 2 summarizes key studies and their findings.

Table 1: Definitions of Smart Governance

Source	Definition
Pereira et al. (2018)	The capacity to use intelligent and adaptive activities and actions to care for and make decisions about a problem.
Alawadhi et al. (2012)	Better governance with smart city planning management
Salari (2013)	Widespread Use of Smart Technology to Perform Governance Tasks
Scholl & Scholl (2014)	A set of elements including openness and decision-making, use and sharing of open information, participation and collaboration with improved government services and operations, all using smart technologies to act as facilitators of innovation, competitiveness, sustainability and liveability.
Gil-Garcia et al. (2013)	The citizenship dimension measured by the performance of local smart governance.
Gil-Garcia et al. (2013)	Facilitating local economies to create new businesses through policy
Adiani (2018)	Integrated governance management through mobile legislation, which is created by smart law, smart rule of law, smart elections, smart participation and smart referendums.
Key & We (2009)	A set of factors, principles and capacities that make a form of governance capable of accompanying and coping with the conditions, events and requirements of the knowledge society.
Sharma (2015)	Smart governance is the use of the Internet based on information technology to provide the information and services needed by users to create desirable, efficient and effective governance.
Bingham et al. (2005)	The implementation and creation of activities based on the shared goals of citizens and organizations that may or may not have legal authority or political power.
Scholl & Scholl (2012)	Interoperability, Internet governance, information exchange, organizational interactions, and other models that are still developing.
Anthopoulos & Reddick (2016)	Smart governance is not synonymous with smart city; and smart city has a dimension of smart governance and smart governance uses smart city as a practical area.
Batagan (2011)	The use of information and communication technologies by citizens, as well as cooperation between agencies and communities, to improve economic growth and citizen-centeredness of services and activities
Pereira et al. (2018)	This concept plays a central role in the growing discourse on smart cities and as part of the broader models of smart governance institutions, financial institutions, religious leaders and political parties play a central role in smart government.
Gabriela et al. (2018)	The intelligent use of information and communication technologies to improve decision-making through better collaboration between multiple stakeholders, openness of the political space and the importance of a role in smart city initiatives.
Azcona (2012)	Including active political participation, citizen services and intelligent use of e-government, which is often linked to the use of new communication channels, such as e-government democracy.
Bolivar & Meijer (2016)	The use of a smart technology, organizational processes, smart collaboration and participation, smart internal management, smart management and decision-making and smart desired outcomes.
Tomor et al. (2018)	Government organizations, citizen participation and consequently the cooperation of the government and citizens in the use of technology.

Several common themes emerge from the literature:

1. Integrated Governance Approaches: Ghaffari et al. (2023) identified integration of political governance and urban revenues as critical themes for smart governance in Tehran, emphasizing the need for comprehensive approaches.
2. Human Resource Development: Gheiravani et al. (2023) validated components of smart governance in the public sector, focusing on human resource development and training as essential elements.

3. Contextual Factors: Najafi Rostaqi & Abdolhosseinzadeh (2023) highlighted the importance of considering contextual factors, IT infrastructure enhancement, and structural redesign in governance models.
4. Multi-dimensional Frameworks: Karimi et al. (2023) proposed a smart network governance model comprising seven dimensions, including behavioral, structural, and mechanism factors, demonstrating the complexity of smart governance implementation.
5. Stakeholder Participation: Multiple studies (Mohammadi Shafi et al., 2022; Willis & Nold, 2022; Masik et al., 2021) emphasized the importance of stakeholder participation, collaborative processes, and citizen engagement in smart governance initiatives.
6. Technology Integration: Deghati et al. (2023) identified information and communication technology factors, high-speed internet, and technological infrastructure as critical for network governance establishment.

7. Future-oriented Planning: Firouzpour et al. (2020) discussed the importance of future thinking and scenario-based approaches for improving urban management and planning processes, particularly relevant for long-term horizons like 2050.

The literature review reveals several research gaps. First, while numerous studies examine smart governance components, few provide comprehensive frameworks integrating political, economic, and socio-cultural dimensions. Second, there is limited research specifically addressing the future vision of smart governance for Tehran. Third, many studies focus on current challenges without projecting long-term scenarios toward 2050. This study aims to address these gaps by developing a holistic model of smart governance factors for Tehran's future development.

**Table 2:** Summary of key Research Background

No.	Authors	Title	Key Findings
1	Ghaffari et al. (2023)	Envisioning Smart Governance for Tehran City	68 codes categorized into 3 main themes: political, social, and economic envisioning with 6 sub-themes for smart governance strategies in Tehran Municipality.
2	Gheiravani et al. (2023)	Smart Governance Model Focusing on Human Resource Development	All smart governance components in public sector identified and validated. Smart governance model established focusing on HR development and training.
3	Najafi Rostaqi & Abdolhosseinzadeh (2023)	Smart Governance Challenges and Solutions for Parliament	International experiences presented in areas of contextual factors, IT infrastructure enhancement, structural redesign, and technical solutions.
4	Karimi et al. (2023)	Smart Network Governance Dimensions in Banking System	Seven-dimensional model: behavioral, structural, mechanism factors, comprehensive development, legal considerations, ICT, and economic stability with 26 indicators.
5	Deghati et al. (2023)	Factors Affecting Network Governance Establishment	ICT factors, high-speed internet, technological infrastructure, information confidentiality, and service reliability identified as most important factors.
6	Hosseini et al. (2022)	Antecedents and Consequences of Smart Governance	Smart infrastructure, interaction, e-government, rule of law, and smart management identified as highest priority antecedents using Fuzzy Delphi.
7	Willis & Nold (2022)	Emotional Data Framework for Smart City Governance	Smart city governance requires multidimensional emotional data, active participation, extensive planning involvement, and governance empowerment.
8	Liu & Chi (2022)	Smart Governance Requirements and Modernization	Smart governance requires diverse talent support, people's government participation, favorable work environment, and administrative involvement.

## **MATERIALS AND METHODS**

### *Research Design*

This study employs a mixed-methods approach combining qualitative and quantitative techniques to identify and validate factors affecting smart governance for future Tehran by 2050. The research has practical applicability as smart urban governance is currently a concern for both academic and executive stakeholders, with findings applicable to various practical domains.

The study follows a sequential exploratory design, beginning with qualitative data collection and analysis (document analysis and interviews) followed by quantitative validation (Delphi technique). This approach allows for in-depth exploration of smart governance factors before subjecting them to expert validation.

### *Participants and Sampling*

The participant selection process followed a purposive sampling strategy targeting experts with advanced degrees in management disciplines who had published research on smart governance and possessed minimum 10 years of relevant work experience. The sampling continued until data saturation was achieved, following the principle of theoretical sampling where new participants were selected based on emerging concepts and categories.

The initial phase included 16 participants, with two additional interviews (15 and 16) conducted to confirm saturation. The final sample for the Delphi validation phase comprised 22 experts selected through snowball sampling, including PhD students, university instructors, assistant professors, associate professors, and full professors.

### *Data Collection*

Data collection employed multiple methods:

1. Document Analysis: Systematic review of academic and policy documents related to smart governance and urban development in Tehran.
2. Semi-structured Interviews: In-depth interviews with experts following an interview protocol designed to elicit comprehensive

views on smart governance factors. Interviews were recorded, transcribed, and analyzed.

3. Delphi Technique: A researcher-designed survey using a 5-point Likert scale (strongly agree, agree, no opinion, disagree, strongly disagree) was administered to experts to validate identified factors.

## **DISCUSSION AND FINDINGS**

- The data analysis followed a systematic approach:

1. Thematic Analysis: Transcribed interviews were analyzed through open coding, categorization, and theme identification. This process involved organizing textual data into concepts, assigning codes, and developing categories and themes.
2. Delphi Analysis: The Delphi technique was employed to validate identified components through expert consensus. This involved multiple rounds of questionnaires, with statistical analysis of responses using measures of central tendency and Kendall's coefficient of concordance to assess agreement levels.

The analysis followed a rigorous process of code development, categorization, and theme identification to ensure the validity and reliability of findings. The integration of qualitative insights with quantitative validation strengthens the robustness of the research outcomes.

## **RESULTS AND DISCUSSION**

The results are organized according to the three research questions examining political, economic, and socio-cultural characteristics of smart governance for future Tehran by 2050.

### *Political Vision of Smart Governance*

The analysis of expert interviews regarding the political vision of smart governance resulted in 8 main themes and 38 sub-themes, as presented in Table 3. The main themes identified include:

1. Legal Considerations: Encompassing attention to upstream documents, multiple licensing systems, amendment of laws and procedures, and protection of citizenship rights.

**Table:** Key Design Elements and Their Impact on Anxiety Reduction in Schizophrenia Patients

Design Element	Description	Citation
Familiar Cognitive Patterns	Use of cues, color coding, and consistent layouts to reduce confusion and anxiety	(Smith & Karol, 2024) (Golembiewski, 2013)
Multisensory Design	Incorporation of natural light, soothing sounds, and tactile materials	(Malhotra & Abrol, 2024) (Spence, 2020)
Homelike Environments	Design resembling home environments to enhance feelings of safety and comfort	(Rodríguez-Labajos et al., 2024) (Dan, 2016)
Neuro-Architectural Principles	Reduction of environmental stressors and facilitation of social support	(Dan, 2016) (Golembiewski, 2013)
User-Centered Design	Involving patients in the design process to meet their specific needs	(Smith & Karol, 2024) (Golembiewski, 2013)
Sensory Rooms	Use of multisensory elements to create a calming and regulating environment	(Doroud et al., 2024) (Molloy et al., 2024)

2. Smart Planning: Including process-oriented organizational structures, institutionalization of smart planning culture, and use of smart strategic planning models.
3. Political Governance Integration: Focusing on strong leadership, policy-making, citizen-centered performance management, meritocracy, and future-oriented approaches.
4. Smart Network Governance: Addressing smart infrastructure, digital transformation, e-government formation, and information-based intelligence.
5. Access to Smart Statistics and Information: Covering mechanized databases, electronic information units, and information quality assessment.
6. Reduction of Administrative Corruption: Including trust in governance, corruption reduction, and universal justice.
7. Smart Security: Focusing on protecting citizens' privacy, recognition of citizenship rights, and strong security standards.
8. Transparency: Addressing accountability to supervisory bodies, transparency in administrative automation, and employment affairs.

These findings align with previous research highlighting the importance of legal frameworks, institutional structures, and transparent governance processes in smart city development (Ruhlandt, 2018; Ruijter et al., 2023).

#### *Economic Vision of Smart Governance*

The analysis of expert interviews regarding the economic vision of smart governance identified 8 main themes and 51 sub-themes, as presented in Table 4. The main economic themes include:

1. Optimal Capacity Building for Urban Economy: Including sustainable financial resources, cost reduction, and quality improvement.
2. Integration of Urban Revenues: Focusing on Internet of Things (IoT) applications, foreign investment attraction, and smart budgeting.
3. Smart Organizational Performance: Addressing transparent resource allocation, employee motivation, standardization of services, and e-government portals.
4. Economic Stability and Prosperity: Including crisis control, economic stability, and efficient management.
5. Smart Cost Management: Covering mechanized accounting systems, cost calculation capabilities, and optimal credit allocation.
6. Reward System Management: Addressing electronic citizen suggestion systems, legal frameworks for rewards, and performance reporting.
7. Efficiency and Effectiveness: Focusing on budget-expense correlation, organizational goal achievement, and electronic accountability.
8. Organization of Electronic Businesses: Including startup activities, market development, and commercialization infrastructures.

Table 3: Composition and classification of themes

No.	Main Themes	Sub-themes
1	Legal Considerations	Attention to upstream documents
2		Multiple licensing
3		Amendment of laws and procedures
4		Revision of laws with technological changes
5		Making identity verification systems independent
6		Protection of citizenship rights
7	Smart Planning	Process-oriented organizational structure
8		Institutionalization of smart planning culture at multiple organizational levels
9		Use of smart strategic planning models
10	Political Governance Integration	Strong leadership at the head of urban affairs
11		Policy making
12		Citizen-centered performance management
13		Meritocracy
14		Future-oriented approach in urban planning
15		Giving coherence to policy-making and executive structure
16	Smart Network Governance	Smart infrastructure
17		Digital transformation plan
18		Formation of integrated e-government
19		Process-oriented organizational structure
20		Information-based intelligence
21		Smart management
22	Access to Smart Statistics and Information	Existence of mechanized databases in multiple domains
23		Accurate electronic statistics and information unit for goal evaluation
24		Design and development of a comprehensive statistical system
25		Expansion and pervasiveness of information technology in multiple areas
26		Ease of use in capable software for information integration
27		Information quality assessment
28		Information authenticity assessment
29	Reduction of Administrative Corruption	Trust in governance
30		Reduction of corruption in the public sector
31		Universal justice and ethics-orientation
32		Government oversight and efficiency
33	Smart Security	Protecting citizens' privacy
34		Recognition of citizenship rights
35		Strong security standards
36	Transparency	Accountability to supervisory bodies and participation units
37		Transparency in administrative automation
38		Transparency in administrative and employment affairs

**Table 4:** Composition and classification of themes

No.	Main Themes	Sub-themes
1	Optimal Capacity Building for Urban Economy	Ensuring sustainable financial resources
2		Reducing costs in administrative automation compared to previous years
3		Proportion between allocated budget and expenses incurred in projects
4		Increasing quality and reducing the cost of communication services
5		Determining the quality of work in relation to costs incurred using technology
6		Replacement of up-to-date equipment to reduce costs using technology
7	Integration of Urban Revenues	Focus on Internet of Things (IoT) in the urban domain
8		Attractiveness for foreign investment in urban management projects
9		Formation of think tanks in areas related to municipality
10		Use of smart budgeting for economic planning
11		Development of smart capacity and services
12	Smart Organizational Performance	Establishing transparent connection between resources spent and outputs
13		Increasing motivation among employees and managers
14		Aligning managers' authorities and responsibilities
15		Standardization of smart services
16		Very strong executive management in the organization
17		Time management of tasks to reduce costs using technology
18		Providing diverse services and expanding coverage of electronic services in the country
19		Providing e-government services to people through a unified electronic portal
20	Economic Stability and Prosperity	Control of economic crises
21		Stability in the economy
22		Efficient management
23		Expected outputs using electronic automation
24	Smart Cost Management	Mechanized accounting system and its connection with mechanized revenue system
25		Ability to calculate full costs with current system activity
26		Users' familiarity with cost analysis concepts and methods
27		Technical and economic efficiency in the organization using technology
28		Optimal allocation of credits among sectors
29		Macro management in implementing operational budgeting
30		Positive changes in the environment governing government performance
31		Aligning managers' authorities and responsibilities
32		Expected outputs using electronic automation
33		Clear processes and consequently cost impacts throughout the process

No.	Main Themes	Sub-themes
34	Reward System Management	Implementation and establishment of electronic citizen suggestion system
35		High financial ability in organizations to support effective electronic programs
36		Having easy legal and regulatory frameworks in the area of rewards and electronic accountability
37		Implementation of transparent continuous performance reports using technology
38		Use of smart budgeting for economic planning
39		Relationship between revenue from service sales and current expenses
40	Efficiency and Effectiveness	Proportion between allocated budget and expenses incurred in projects
41		Achievement of organizational goals
42		Reducing costs in administrative automation compared to previous years
43		Level of electronic responsiveness
44		Increasing organization's electronic communications
45		Implementation of smart and targeted filtering
46		Developing skilled and specialized workforce in each job skill
47		Task time management
48	Organization of Electronic Businesses	Activities of startups and innovative businesses
49		Shaping the market and stimulating demand
50		Commercialization infrastructures
51		Development of domestic virtual networks

These economic factors align with research emphasizing the importance of financial sustainability, efficient resource management, and technological innovation in smart city development (Al-Sharif & Pokharel, 2022; Hamzehkoei et al., 2021).

#### *Socio-Cultural Vision of Smart Governance*

The analysis of expert interviews regarding the socio-cultural vision of smart governance identified 7 main themes and 39 sub-themes, as presented in Table 5. The main socio-cultural themes include:

1. Active Social Participation: Including participation-oriented structures, civic identity cultivation, and stakeholder platforms.
2. Social Culture Building: Focusing on website accessibility, online public services, and citizen education.
3. Electronic Education: Addressing public education facilitation, human resource readiness,

and knowledge enhancement.

4. Electronic Participation: Including stakeholder engagement, public discourse, and data exchange.
5. Social Responsibility: Covering urban renovation, environmental improvement, and sustainable development.
6. Quality of Life Improvement: Focusing on democratic processes, user-friendly systems, and social indicators.
7. Accountability: Addressing timely responses to challenges, media relations, and process transparency.

These findings complement previous research highlighting the importance of citizen engagement, participatory governance, and social infrastructure in smart city development (Caputo, 2023; Haltfoová, 2018).

**Table (5):** Composition and classification of themes

No.	Main Themes	Sub-themes
1	Active Social Participation	Participation-oriented organizational structures
2		Cultivating civic identity
3		Participation in organizing urban information
4		Creating platforms for collaborators and stakeholders
5		Advisory services to citizens
6	Social Culture Building	Easy access to urban institutions' websites
7		Providing online public services to citizens
8		Education and awareness of services for citizens
9		Easy access to electronic infrastructures
10		Easy access to urban data and information
11		Improving service quality
12		Facilitating public education
13		Capability and readiness of human resources
14		Providing new learning opportunities
15		Existence of knowledge enhancement standards
16	Electronic Education	Implementing education methods based on systems thinking
17		Emphasis on network structure for knowledge promotion
18		Development of public education in information and communication technology
19		Education on commercialization of research
20		Stakeholder participation
21		Public discourse
22		Service delivery and empowerment
23	Electronic Participation	Collaboration and data exchange
24		Renovation of deteriorated urban areas
25		Improvement of urban spaces
26		Cooperation and companionship of citizens
27		Achievement of sustainable development
28		Increasing green space according to global standards
29		Pollution reduction
30	Waste management	
31	Improving Quality of Life	Increasing the role of democracy in society management
32		User-friendly electronic systems
33		Improving individual and social life indicators
34		Online public services
35		Faster and more accurate services
36	Accountability	Immediate and instant response to challenges
37		Accountability to media and public opinion
38		Transparency of work process stages
39		Timely information regarding natural disasters

### Delphi Validation Results

- The Delphi validation process assessed expert agreement on the identified factors across three rounds. Tables 6-8 present the results for political, economic, and socio-cultural factors, respectively.
- Key findings from the Delphi validation include:
  1. Political Factors: The highest rated factor was strong leadership at the head of urban affairs (average 8.91), while the lowest rated were designing a comprehensive statistical system (4.21) and trust in governance (4.15).
  2. Economic Factors: The highest rated factors were smart budgeting for economic planning and task time management (both 8.68), followed by electronic accountability level and

organizational electronic communications (both 8.32).

3. Socio-Cultural Factors: The highest rated factors were improvement of urban spaces (8.94), consulting services for citizens (8.91), and immediate response to challenges (8.64), while the lowest rated was improving service quality level (4.21).

The overall validation was assessed using Kendall's coefficient of concordance, which measured 0.507, indicating a good level of agreement among experts. This coefficient confirms the reliability of the identified factors and provides a solid foundation for developing a comprehensive smart governance framework for Tehran's future development.

**Table 6:** Political Vision- Top Factors (Score  $\geq 7.5$ )

Main Theme	Sub-theme	Expert Agreement (%)	Importance Score
Political Governance Integration	Strong leadership at head of urban affairs	100	8.91
	Citizen-centered performance management	100	8.57
Legal Considerations	Amendment of laws and procedures	100	8.64
	Protection of civil rights	95.45	8.71
Smart Network Governance	Smart management	90.90	8.19
Reduction of Administrative Corruption	Reduction of corruption in public sector	100	8.68
	Universal justice and ethics orientation	100	8.32
Access to Smart Information	Information authenticity verification	95.45	8.09

**Table 7:** Economic Vision - Top Factors (Score  $\geq 8.0$ )

Main Theme	Key Sub-themes	Expert Agreement (%)	Average Score
Integration of Urban Revenues	Using smart budgeting for economic planning	100	8.68
Efficiency and Effectiveness	Time management of tasks	100	8.68
	Level of electronic accountability	100	8.32
	Organization's electronic communications	100	8.32
	Achievement of organizational goals	100	8.27
Smart Organizational Performance	Aligning managers' authorities/responsibilities	100	8.29
	E-government services through unified portal	100	8.23
	Development of capacity and smart services	100	8.22
Smart Cost Management	Optimal allocation of credits among departments	100	8.32
	Mechanized accounting system connection	100	8.18
Optimal Capacity Building	Budget-expense correlation in projects	100	8.18

**Table 8:** Socio-Cultural Vision - Key Validated Factors (Score  $\geq$  7.5)

Main Theme	Key Sub-themes	Expert Agreement (%)	Average Score
Social Responsibility	Improvement of urban spaces	100	8.94
Active Social Participation	Consulting services for citizens	100	8.91
Electronic Participation	Stakeholder participation	100	8.91
Accountability	Immediate response to challenges	100	8.64
	Transparency through work process stages	100	8.61
	Accountability to media and public opinion	100	8.23
	Timely information regarding disasters	100	8.24
Electronic Participation	Service delivery and empowerment	100	8.22
Quality of Life Improvement	Individual and social life indicators	100	8.18
Social Culture Building	Easy access to urban institutions' websites	95.45	7.95
	Citizens' cooperation and assistance	95.45	7.95
	Online public services	95.45	7.95

**Table 9:** Kendall's correlation coefficient value for the second round of Delphi

Kendall's Coefficient of Concordance	
N	101
Kendal	0.507

**RESULT AND CONCLUSION**

This study has identified and validated key factors affecting smart governance for future Tehran by 2050 across political, economic, and socio-cultural dimensions. The findings provide a comprehensive framework that can guide Tehran's urban governance transformation as it moves toward 2050, emphasizing the importance of integrated approaches that consider the complex interplay between technological systems, organizational structures, and human factors. The research contributes to both theoretical understanding and practical implementation of smart governance in rapidly developing urban environments like Tehran. Theoretically, it advances knowledge by providing a holistic model integrating diverse factors across multiple dimensions. Practically, it offers policymakers and urban planners a validated framework for developing strategic initiatives to address Tehran's pressing urban challenges.

*Recommendations for Officials and Decision-makers*

Based on the study findings, we offer the following recommendations:

1. Identify and create synergy between various institutions and organizations active in smart governance to prevent duplication of efforts.
2. Develop strategies to increase citizens' sense of belonging to the municipality, enhancing cooperation and policy adherence.
3. Create a comprehensive vision of smart governance for future Tehran with the municipality as a central coordinating entity.
4. Utilize data-driven approaches to improve public transportation, energy optimization, pollution reduction, and waste management.
5. Foster collaboration between the municipality and other stakeholders, including private companies, universities, and civil society organizations.
6. Implement smart technologies and data analytics to create continuous improvement in urban life and resource management.

*Recommendations for Future Research*

For future research, we recommend:

1. Expanding the geographical scope to validate findings at the national level.
2. Identifying specific implementation activities, roles, and responsibilities for executing

smart governance strategies.

3. Conducting longitudinal studies to address the time limitation of the current research and track developments over time.
4. Investigating specific implementation mechanisms for each identified factor.
5. Exploring the interrelationships between political, economic, and socio-cultural factors and their combined impact on smart governance outcomes.

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