

Smart Governance and the Promotion of Citizenship Rights for Mothers of Children with Disabilities: A Model for Digital Accessibility in Electronic Cities

Article Type:

Research Article

Ensiyeh Nourahmadi 

Department of family law studies,
Women Research Center, Alzahra
University, Tehran, Iran

Corresponding Author

E-mail: e.nourahmadi@alzahra.ac.ir

Abstract

Digital transformation and the development of smart cities have provided significant potential for enhancing the quality of life and improving the delivery of public services. However, in the absence of inclusive approaches, smart technologies may inadvertently lead to the reproduction of inequalities and the creation of new forms of digital exclusion. Mothers of children with disabilities constitute a particularly vulnerable group regarding these challenges, as they encounter multi-layered environmental, socio-economic, and technological barriers in accessing urban services and participating in social life. This study aimed at elucidating the role of smart governance in promoting the citizenship rights of this group. It has been conducted using a descriptive-analytical method through the thematic analysis of upstream documents, disability rights legislation, and interdisciplinary literature in the fields of smart cities, digital justice, and responsible artificial intelligence (AI). The research findings indicated that the realization of inclusive smart governance requires the establishment of four fundamental pillars: accessible digital infrastructure, data-driven decision-making, an appropriate legal-ethical framework for responsible AI, and the digital-economic empowerment of citizens. While identifying key obstacles such as algorithmic bias, the digital divide, privacy concerns, and institutional resistance, this study demonstrated the necessity of transitioning from "passive support" to "active empowerment". Finally, a "smart and inclusive governance" policy model was presented, in which technology is redefined as a tool for social justice, individual autonomy, and active citizen participation. By bridging the discourse of the smart city with the social model of disability, this model provides a conceptual framework for urban policymakers, public institutions, and digital service designers to advance urban justice and sustainable development.

Keywords

Artificial Intelligence, Citizenship Rights, Mothers of Children with Disabilities, Electronic City, Technological Justice, Data-Driven Governance.

Received: 01 July 2026

Revised: 14 July 2026

Accepted: 23 July 2026

Available Online: 23 July 2026

Cite this article: Nourahmadi, E, (2026). Smart Governance and the Promotion of Citizenship Rights for Mothers of Children with Disabilities: A Model for Digital Accessibility in Electronic Cities. *Journal of Knowledge Economy Studies (JKES)*, 3(2), 133-158. DOI: <http://doi.org/10.22034/kes.2026.2094444.1124>



Authors retain the copyright and full publishing rights.
Online ISSN: 3060-7329

Publisher: Hazrat-e Masoumeh University.

Introduction

The profound technological transformations of the twenty-first century have shifted the nature of public governance and urban management from traditional, physical models toward complex, intelligent, and data-driven ecosystems. Within this new paradigm, cities are no longer merely a collection of physical infrastructures; rather, they have evolved into platforms for the intelligent management of information flows and resource allocation, wherein emerging technologies—such as AI, the Internet of Things, and Big Data Analytics—constitute the foundation of governance decision-making. In this context, it has become imperative to redefine the concept of the “smart city” from a purely technological approach toward a value-based one, such that the success of these systems is measured not by the advancement of their tools, but by the degree to which they realize social justice, enhance human dignity, and provide equal opportunities for all segments of the society (Caragliu et al., 2013).

Nevertheless, the transition toward the digitalization of urban services does not necessarily guarantee justice and equality. If the design and implementation of urban technologies are conducted without regard for the structural, social, and economic characteristics of specific groups, these tools may, instead of bridging gaps, lead to new forms of “digital deprivation” and social exclusion. In this regard, the concept of the digital divide has expanded beyond mere physical access to tools, encompassing disparities in applied skills and the actual ability to benefit from technological opportunities (Colom, 2020). One of the most vulnerable groups situated at the intersection of these emerging inequalities is mothers of children with disabilities. As the primary caregivers and pillars of family health, these citizens face a “double challenge” within the urban environment. This challenge profoundly impacts not only their quality of life and mental health but also their economic participation and individual autonomy (Oliver, 1990).

The fundamental issue in this field is the existence of a form of “structural discrimination” within urban and digital environments. This challenge can be elucidated across three levels. First, the pressure arising from caregiver burnout, following continuous and round-the-clock responsibilities, leads to the social isolation of these mothers. Second, structural deficiencies in the design of public spaces and transportation systems, despite the existence of supportive laws, restrict their freedom of movement and accessibility (Taghvaei et al., 2010). Third, there is a governance gap in translating legal mandates into sustainable executive mechanisms. In effect, the citizenship rights of this group often remain confined to legal texts and encounter serious obstacles during implementation due to the lack of environmental and digital accessibility (Moradzadeh, 2011).

The necessity for conducting this research study stems from the fact that the traditional support approaches, based on welfare and compensatory models, are no longer capable of addressing the complexities of digital ecosystems. There is an urgent need to transition from a pattern of “passive support” toward “smart and inclusive governance”. The utilization of emerging technologies in e-cities is more than a mere

welfare measure. It constitutes a strategic investment in the knowledge-based economy that can enhance the economic participation of this group by unlocking the neglected human potential. Within this framework, emerging technologies can play a pivotal role in advancing the citizenship rights of mothers with children with disabilities. Smart transportation systems, digital health services, civic engagement platforms, AI-based navigation systems, and digital employment opportunities can mitigate the traditional barriers to social and economic participation. Nevertheless, the application of technology without considering the legal and ethical imperatives may give rise to new risks, such as algorithmic discrimination, privacy violations, and the widening of the digital divide. Consequently, smart governance requires a framework that integrates technology with the principles of justice, transparency, accountability, and human dignity (Floridi et al., 2018).

A review of the literature revealed a profound conceptual and operational gap between the domains of "smart cities" and "disability". Studies within the smart city field have predominantly focused on technical efficiency, resource management, and service optimization, while paying less attention to the dimensions of social justice and the rights of vulnerable groups. Conversely, disability studies have maintained a medical or rehabilitative perspective and have seldom addressed the role of data-driven governance and AI in promoting citizenship rights. Furthermore, in the existing literature, mothers of children with disabilities are frequently perceived as "service recipients", whereas their potential as "active citizens" within a smart city remains overlooked. Therefore, the lack of an integrated framework to bridge smart governance, digital justice, and the empowerment of this group constitutes the primary research gap of the present study.

Accordingly, the present research was conducted with the aim of proposing a comprehensive model for smart and inclusive governance. The primary research problem is predicated on the following question: How can a model of smart and inclusive governance be developed that enhances the citizenship rights of mothers with children with disabilities in e-cities through digital accessibility? To address this central problem, the study sought to answer the following sub-questions: First, what are the most significant legal, social, and technological barriers affecting the urban and digital accessibility of this group? Second, how can emerging technologies be utilized as tools for the empowerment and guarantee of the citizenship rights of these individuals? Third, what are the core components of a smart and inclusive governance model for promoting digital justice and social participation of these mothers? Finally, what legal and ethical requirements are necessary to prevent phenomena such as algorithmic discrimination and to ensure the equitable use of smart technologies within this framework?

Literature Review

The research literature in the fields of citizenship rights, urban management, and disability studies indicated a gradual conceptual transition from traditional legal and

protective approaches toward emerging paradigms of digital governance. Nevertheless, epistemological and analytical gaps among these fields remain clearly evident.

Citizenship Rights and Disability

In the field of citizenship rights, a substantial body of Iranian scholarship has focused on analyzing the status of this concept within Iran's legal system. [Taheri \(2016\)](#), in examining the status of citizenship rights in the Iranian legal system, analyzed the limitations, capacities, and gaps in official documents. Similarly, [Hosseini Beheshti \(2019\)](#), adopting an interdisciplinary approach, emphasized the necessity of establishing linkages among law, public policymaking, and executive structures to achieve the practical realization of citizenship rights. Furthermore, studies on civic awareness have demonstrated that knowledge of urban rights can facilitate the citizens' active participation in improving quality of life and access to public services ([Hossein Abadi & Zanganeh, 2018](#)). However, these studies have devoted less attention to the specific needs of vulnerable groups and persons with special needs.

Building on this body of literature, some recent studies have sought to move the issue of disability beyond the level of mere protection and reinterpret it within the framework of fundamental rights, human dignity, and the right to self-determination. In this context, [Dabirnia and Abedini \(2024\)](#), through their critique of charitable and medical approaches to disability, emphasized the necessity of transitioning toward social and human rights models. They demonstrated that the right to self-determination of persons with disabilities should not remain confined to welfare support; rather, it must be guaranteed through their effective and direct participation in decision-making, policymaking, and the administration of public affairs. This analysis is significant to the present study because the position of mothers of children with disabilities cannot be understood merely in terms of passive service recipients. Instead, they must be recognized as rights-holders whose everyday lives and ability to exercise their citizenship rights are directly affected by the quality of urban governance, the accessibility of services, and public decision-making mechanisms.

Nourahmadi's studies have also expanded this legal dimension from jurisprudential and familial perspectives. In examining the protection of the reproductive rights of women with disabilities under the Iranian legal system and international instruments, [Nourahmadi and Rezvanimofrad \(2023\)](#) emphasized that women with disabilities should not be subjected to restrictive or exclusionary policies; rather, the state and support institutions are obligated to guarantee and safeguard their fundamental rights. From a theoretical perspective, this approach is also important for understanding the position of mothers of children with disabilities, as it demonstrates that disability policymaking must move beyond the logic of minimal care toward the active recognition of this group's rights, agency, and capacity for participation. Moreover, in examining the jurisprudential and legal effects and implications of disability for spouses' non-pecuniary rights and obligations, [Nourahmadi \(2025\)](#) demonstrated that disability is not merely an individual or medical condition. In fact, its effects are reflected in family structure, the division of roles, the caregiving burden, and spouses' non-pecuniary

obligations. This analysis is of particular importance to the subject of the present study because it reveals that the caregiving burden borne by mothers of children with disabilities is not an exclusively private or familial matter. Instead, it must be recognized at legal, social, and policy levels, and appropriate support mechanisms must be designed to address it.

Smart Cities and Inclusive Governance

In the fields of urban management and sustainable development, conventional research has predominantly focused on system efficiency, traffic management, and energy efficiency (Lee et al., 2023). Nevertheless, recent developments in smart-city paradigm have highlighted the necessity of transitioning from sectoral management toward a holistic, integrated, and justice-oriented perspective. Within this framework, Mohammadi (2026), in explaining the structure of future cities, argued that digital intelligence must serve ecological sustainability and social justice. In his view, achieving this objective requires strategic coordination among "human capital", "technological capital"—through electronic municipal government and digital governance—and "sustainable urban management strategies". These elements together constitute the urban sustainability triangle. Despite this systemic perspective, considerable portions of the smart-city literature continue to devote limited attention to groups with special needs, including persons with disabilities, while primarily focusing on technological efficiency and resource management. This may marginalize the dimensions of social-justice and citizenship-rights pertaining to these groups (Angelidou, 2015).

At the international level, recent studies have also emphasized the complexities of digital governance in supporting vulnerable groups. Ntanda and Carolissen (2025) and Okafor et al. (2023) argued that, in the absence of a "digital inclusion" approach, smart cities not only fail to reduce the existing inequalities but may also exacerbate social divides affecting family-based caregivers. Furthermore, in discussions concerning the urban justice and data-driven governance, Burns and Andrucki (2021), Ibănescu et al. (2025), and Ntanda et al. (2026) demonstrated that models of smart-city governance can attain legitimacy and social effectiveness only when they are aligned with caregivers' intersecting and multilayered needs. Otherwise, digital environments and systems may not only fail to mitigate inequality but may also reproduce new forms of exclusion and marginalization. In the same context, a World Health Organization report emphasized that integrating assistive technologies into smart-governance infrastructure is an essential prerequisite for enhancing the well-being and quality of life of groups in need of support. It further identified the lack of data-driven policy frameworks for assessing the caregivers' well-being as a major global challenge (World Health Organization, 2024).

Digital Accessibility and Urban Justice

Environmental accessibility constitutes one of the focal points at the intersection of citizenship rights, urban justice, and disability studies. Although Iran has recognized the necessity of reasonable accommodation and accessibility through the enactment of

legislation such as the Comprehensive Law on the Protection of the Rights of Persons with Disabilities (2004) and other urban-planning regulations, statistical evidence and empirical studies indicated serious deficiencies in implementation and oversight. [Taghvaei et al., \(2010\)](#) demonstrated that a substantial proportion of urban furniture, educational spaces, and public places fall significantly short of accessibility standards. These shortcomings are also evident in the design of buildings and public transportation fleets (Aflaki, n.d.). Furthermore, [Sadeghi Fassaei and Fatemi Nia \(2015\)](#) emphasized that environmental and social barriers not only restrict the economic and social participation of persons with disabilities but also engender a form of negative self-perception among them, whereby individuals attribute the source of their deprivation to their personal characteristics rather than to structural and institutional deficiencies. Within this context, it may be argued that, for mothers of children with disabilities, accessibility does not merely mean facilitating mobility or using urban services; rather, it is directly associated with reducing time-related strain, caregiving burdens, and psychological pressure, as well as enhancing their opportunities for social participation.

In the field of assistive technologies, although the existing studies have primarily focused on individual empowerment—such as the use of technology for navigation, access to services, and the utilization of assistive devices—the dimensions of governance, institutional oversight, and legal regulation in this field have received comparatively less attention. In other words, while higher-order policy documents emphasize equal rights and non-discrimination, a significant gap remains in "data-driven governance models" for monitoring and evaluating the implementation of these rights in urban and digital environments. This gap becomes more pronounced when the discussion turns to "caregivers", particularly "mothers of children with disabilities", because much of the existing literature has regarded this group primarily as "recipients of welfare services" rather than as "active actors in the knowledge-based economy" or participatory stakeholders in urban governance.

Research Gap

Taken together, these studies demonstrated that although the fields of citizenship rights, urban management, disability studies, and digital governance have each illuminated part of the issue, a coherent model capable of integrating these dimensions within a unified theoretical and practical framework has not yet been fully developed. In particular, the existing literature clearly lacks a model that directly links smart urban governance with the citizenship rights of mothers of children with disabilities, social justice, and digital accessibility. Accordingly, drawing upon these theoretical and empirical developments, the present study sought to address this gap by focusing on the relationship among "smart urban governance", "citizenship rights and social justice", and "digital accessibility for mothers of children with disabilities". It further aimed at proposing a model of smart and inclusive governance in which technology functions not merely as a managerial instrument but as a mechanism for ensuring digital justice, reducing caregiving burdens, enhancing social participation, and facilitating the effective realization of citizenship rights.

Theoretical Foundations

The realization of the "smart and inclusive governance" model to enhance the citizenship rights of mothers of children with disabilities necessitates an understanding of the intersection between three foundational theoretical domains including the social model of disability, human dignity theory, and inclusive smart governance theory. These theoretical pillars provide the framework for understanding how structural barriers can be addressed through digital transformation.

The Social Model of Disability

The transition from traditional to modern perspectives in disability studies has shifted from the analysis of "individual/medical impairments" toward the "Social Model of Disability". According to this model, disability is not a biological characteristic but rather emerges from the interaction between individual characteristics and structural barriers present within social, economic, and urban environments (Oliver, 1990). Consequently, the concept of "accessibility" must not be confined to simple physical modifications like the installation of ramps. It must also encompass access to information, digital services, transportation, and economic opportunities (Sadeghi Fassaei & Fatemi Nia, 2015).

As noted by Doyle (1995), when individuals with disabilities are invited into environments designed solely for those without disabilities, the gap between their lived reality and urban infrastructure becomes starkly evident. This exclusion is not a direct consequence of the disability itself, but rather stems from the "disability of society" and its inability to adapt spatial configurations to the diverse needs of citizens. The persistence of these barriers—ranging from inaccessible public transportation to public buildings—not only disrupts daily mobility but also undermines human dignity and individual autonomy (Manafi, 2014).

The Human Dignity Theory

Alongside legal instruments, ethical and jurisprudential traditions strengthen the social legitimacy of policymaking. From a jurisprudential perspective, the specialized treatment of persons with disabilities is not viewed as a privilege or an act of benevolence, but rather as a "religious obligation" (Taklif-e Shar'i) grounded in the principle of inherent human dignity (Rezvanimonfared & Nourahmadi, 2021). As a fundamental principle (Qa'idah Usuliyyah), human dignity emphasizes the universality of rights, asserting that every human being is entitled to exercise their rights across all dimensions of life (Haghighatpour, 2013). From a jurisprudential standpoint, persons with disabilities are equal to all other members of society in every human dimension. Thus, the realization of their rights to achieve independent living necessitates the recognition of such rights by the ruling authority (Baharloui, 2017).

This fundamental principle underscores the imperative of providing equitable environments within the smart city for mothers of children with disabilities, as an integral component of preserving human dignity and fulfilling citizenship duties.

The Inclusive Smart Governance Theory

The digital transformation in urban management has shifted the smart city paradigm from a purely technology-centric approach to a governance-centric approach. While the initial focus was on the efficiency of infrastructural systems, such as transportation and energy management, contemporary studies demonstrated that urban intelligence only becomes meaningful when technology is employed to enhance the quality of life, civic participation, and the realization of social justice (Caragliu et al., 2013).

Indeed, the success of a smart city lies not in the volume of technology deployed, but in the strategic interaction between the three pillars of "technology", "humanity", and "governance institutions" (Nam & Pardo, 2011). From this perspective, there is a manifest necessity to transition from the "technological city" toward "inclusive smart governance"—an approach aimed at utilizing digital tools to mitigate inequalities and ensure equitable access for all social groups, particularly underrepresented populations.

Urban justice is realized only when technology is designed from the outset with human diversity in mind, rather than being addressed subsequently through incomplete, remedial measures. This conclusion is consistent with emerging literature on inclusive smart cities, which emphasizes that digital inclusion must be institutionalized at the levels of design, implementation, and evaluation (Makkonen & Inkinen, 2024). The success of these systems is measured not by the advancement of their tools, but by the degree to which they realize social justice, enhance human dignity, and provide equal opportunities for all segments of the society (Caragliu et al., 2013).

The Legal and Conceptual Framework

To operationalize the theoretical concepts within the real-world governance environment, this section is dedicated to elucidating the legal and conceptual framework governing the research. Here, legal obligations are presented as the operational foundation, while conceptual distinctions are delineated as the roadmap for smart governance.

Before presenting the proposed smart governance model, it is methodologically essential to examine the existing legal landscape in order to elucidate the systemic roots of exclusion. By analyzing the evolutionary trajectory of accessibility regulations, this section demonstrates how a persistent focus on physical infrastructure has resulted in a "technological blind spot" within the legal system of urban planning. Identifying these legal lacunae establishes a critical baseline, demonstrating why traditional legal frameworks are ineffective in addressing digital barriers and why the transition toward "inclusive smart governance" is an inescapable necessity.

International and National Legal Foundations

Creating accessible and inclusive urban environments is both a legal and a human rights obligation. At the international level, the Convention on the Rights of Persons with Disabilities (CRPD) recognizes accessibility as a prerequisite for the equal enjoyment of all human rights. Article 9 requires States Parties to eliminate barriers and ensure equal access to the physical environment, transportation, information, communication

technologies, and digital services ([United Nations, 2006](#)). Furthermore, General Comment No. 2 clarifies that accessibility must be integrated into legislation, public services, digital technologies, and urban planning through universal design principles ([Committee on the Rights of Persons with Disabilities, 2014](#)).

The concept of "accessibility" has undergone a paradigmatic shift in recent decades. Initially, it was presented in a limited capacity under the heading of a "barrier-free environment". In the 1980s, the discourse of "accessible design", focusing on the functional utility of buildings and the urban environment, superseded it. In the 1990s, the emergence of "universal design" expanded the scope of this concept, encompassing issues such as multi-sensory guidance systems and integrated architectural components for all users, regardless of their physical ability (The Convention, 2014, p. 120).

In Iran, international obligations are reinforced by Article 3(9) of the Constitution of the Islamic Republic of Iran (1980), which requires the government to ensure 'the elimination of unjust discrimination and the creation of equitable opportunities for all, in all material and intellectual spheres'. This principle supports substantive equality by encouraging governments to remove structural barriers faced by persons with disabilities. In this regard, the concept of 'citizenship rights', as the principal foundation, requires a transition from a 'charity-/welfare-based' perspective to a 'rights-based' approach ([Katouzian, 2019](#)). Under this model, mothers of children with disabilities are defined not as passive recipients of welfare services but as citizens entitled to participation, autonomy, and equal access to public safety and healthcare ([Ghari Seyyed Fatemi, 2009](#); [Mir Mohamad Tabar, 2023](#)).

In the Iranian legal system, coherent legislation in the urban sphere began with the "Urban Planning Law" (1955) and the "Law for the Establishment of the Supreme Council for Urban Planning and Architecture" (1972). Although these laws provided a framework for urban development, land use, and building density, their nature was such that they excluded non-normative bodies from their design. Only following the Iran-Iraq War the necessity of addressing the needs of veterans and persons with disabilities led to specific regulatory interventions like the "Guidelines and Standards for Accessibility".

The term "accessibility" is defined as the modification of the environment and transportation means to ensure free and safe movement. Despite the ratification of the "Comprehensive Law for the Protection of the Rights of Persons with Disabilities (2004/1383), Article 2", which mandates that agencies adapt public buildings, the legal landscape remains heavily dependent on annual budget allocations and the absence of independent national oversight. The failure to enforce compliance in the private sector and weaknesses in implementing executive guarantees for building permits have resulted in an environment whose regulations focus solely on "physical architecture", remaining completely detached from the evolved needs of a digital society.

The Law on the Protection of the Rights of Persons with Disabilities (2018) requires public institutions to provide accessible environments, information services, and communication technologies, thereby strengthening the legal foundation for inclusive urban governance. However, current realities indicate a profound gap between supportive

legislation and physical implementation. The existing statistics indicate a low level of spatial adaptation; specifically, only a small percentage of urban furniture and educational and public spaces comply with accessibility standards (Taghvaei et al., 2010).

Recent qualitative observations and administrative reports confirmed that this low rate of adaptation remains an endemic feature of urban management, rather than a transient historical statistic. Although Iran has taken steps through the enactment of laws such as the 'Law for the Protection of the Rights of Persons with Disabilities' (2004), deficiencies in enforcement, supervision, and challenges regarding legal guarantees continue to impede the realization of equal opportunities (Moradzadeh, 2011; Nasib et al., 2012). These deficiencies are also evident in building design and public transportation fleets (Aflaki, n.d.), which ultimately results in limited socio-economic participation for persons with disabilities and may even undermine their self-efficacy (Sadeghi Fassaei & Fatemi Nia, 2015). Historical data regarding the urban adaptation (Taghvaei et al., 2010) serves as a longitudinal baseline, illustrating a systemic 'institutional inertia' that persists to date. This inertia underscores the necessity of moving toward the 'Inclusive Smart Governance' model proposed in this study to overcome these deep-seated structural barriers.

An examination of domestic legal instruments, particularly the Law on the Protection of the Rights of Persons with Disabilities (1396), indicated that while the principle of accessibility is recognized (Articles 1, 2, and 5), a significant 'technological blind spot' persists. The principal lacuna is that the Law does not establish detailed operational standards regulating web accessibility, smart systems, AI, algorithmic transparency, or the right to an explanation. Furthermore, while Article 5 provides sanctions for transportation-related failures, no specialized oversight mechanism exists for digital environments. Consequently, significant lacunae persist regarding the smart governance, and reliance solely on the existing regulations is insufficient for the smart-city context.

The legislative focus in Iran—crystallized in the directives of the Tehran Municipality (2005 & 2007) and the resolutions of the Supreme Council for Urban Planning and Architecture—has consistently been limited to physical accessibility (sidewalks, leveling of transit stations, ramps, and tactile paths for the visually impaired). While these regulations are vital, they reflect a traditional, physics-centered view of the city; a view in which the "city" is assumed to be a collection of static physical assets.

Consequently, these legal frameworks suffer from a "technological blind spot" and fail to encompass the "smart city". While the contemporary urban governance is moving toward algorithmic decision-making, data-driven service delivery, and digital platforms, the existing legal discourse remains tethered to 20th-century physical standards. These laws fail to recognize "digital accessibility" as a component of the right to the city. As a result, the invisible barriers of smart governance—such as algorithmic discrimination and digital exclusion—remain entirely outside the realm of oversight and regulation.

Having established the legal foundations and the state's mandatory obligations toward mothers of children with disabilities, it is essential to elucidate the technological

and operational concepts that provide the framework for the realization of these rights. Indeed, the transition from an “electronic city” to a “smart city” represents a paradigmatic shift in which tools are utilized to serve the legal objectives.

Thus, it may be posited that, in accordance with upstream documents, smart city development is not a technological choice, but rather a legal obligation to achieve equal opportunities for vulnerable groups.

Conceptual Differentiation (Electronic vs. Smart vs. Inclusive Governance)

In contemporary research literature, making a precise distinction between the concepts of “Electronic City”, “Smart City”, and “Smart Governance” is indispensable for legal and policy analysis. In this study, these concepts are not merely understood as levels of technological development; rather, they are framed as mechanisms for mitigating the structural barriers confronted by mothers caring for children with disabilities.

Electronic City, Access Infrastructure and Reduction of Caregiving Burden: The concept of the electronic city is primarily predicated on Information and Communication Technology (ICT) infrastructure. This paradigm refers to a community that facilitates interaction between citizens and public administration through the utilization of integrated portals, online services, and broadband infrastructure (Makkonen & Inkinen, 2024). For mothers caring for children with disabilities—who grapple with severe time constraints and the physical and psychological pressures inherent in continuous caregiving responsibilities—the electronic city serves as a necessary tool for minimizing the need for frequent in-person visits and conserving time. However, the electronic city, at best, merely guarantees “digital access” and is insufficient on its own for realizing urban justice. It may transition services from a physical to a digital format without accounting for the specific needs of individuals with disabilities, thereby overlooking the underlying barriers to accessibility or digital literacy.

Smart City, Social Transition and Human-Centered Inclusivity: In contrast to the electronic city, the “Smart City” is a multidimensional, umbrella concept. It is not merely a technical project but is regarded as a “social and organizational process” aimed at achieving sustainable and inclusive development (Lee et al., 2023). Within this framework, technology is considered “smart” only when integrated with human and social capital, prudent resource management, and citizen participation to foster sustainable economic growth and a high quality of life (Makkonen & Inkinen, 2024). Regarding mothers caring for children with disabilities, the smart city represents not a static condition, but a transition wherein health, education, and welfare systems are designed in a coordinated and proactive manner. In this interpretation, urban smartness is valid only when it facilitates the identification of the caregivers’ lived needs and the removal of the existing inequalities, rather than posing the risk of reproducing the “algorithmic discrimination” by reducing the human-centric approach to mere technological tools.

Smart Governance, Institutional Guarantee and Citizen-Centered Agency: Recent research indicated that failures in realizing inclusive cities often stem not from technological limitations, but from governance failures—such as technocratic and “top-

down" models—that constrain meaningful citizen participation (Ntanda et al., 2026). For mothers caring for children with disabilities, smart governance implies that they should not merely be passive recipients of services, but active participants in the design and evaluation of those services. Smart governance is thus the institutional and legal guarantor of achieving urban justice for mothers caring for children with disabilities.

The fundamental difference in this study lies in the distinction between the function of the "electronic city" (which is merely the digitization of processes) and "smart governance" (which is a human-centric approach based on distributive justice).

The Intersection of Rights and Smart Governance

Despite the structural differences among the aforementioned concepts, the point of convergence for all of them lies in the necessity of realizing "social justice". Subsequently, by synthesizing the aforementioned legal components and conceptual frameworks, a model of the intersection of these two domains is delineated, which will serve as the basis for the analysis of the findings of this study in subsequent sections.

Consequently, in this study, the "Electronic City" is regarded as the technical prerequisite; the "Smart City", as the inclusive, human-centered platform; and "Smart Governance", as the institutional and legal guarantor of achieving urban justice for mothers caring for children with disabilities. This distinction demonstrates that advancing the citizenship rights of this demographic is not attained solely through technological development, but through the confluence of digital infrastructure, inclusive service design, and participatory governance.

Accordingly, the present conceptual framework provides the contextual and conceptual level of the study. However, the final model of the study was not derived directly from this conceptual distinction; rather, it was obtained through content analysis of the sources and the synthesis of legal, technological, and governance-related findings. For this reason, the final model is presented in the Findings section and then in the form of the final conceptual figure.

The outcome of this intersection is the transition from a "hardware-centric smart city" to an "inclusive smart city", wherein digital access is redefined not as a luxury amenity, but as a citizenship right for mothers of children with disabilities.

Methodology

The present study was conducted with the aim of developing a model for "smart and inclusive governance to promote the citizenship rights of mothers of children with disabilities", based on a qualitative approach, a descriptive-analytical method, and a systematic review. This approach was selected because of the complex, multidimensional, and phenomenological nature of the research problem, which lies at the intersection of public governance, citizenship rights, digital technologies, social justice, and disability studies.

Data collection was carried out through the identification, evaluation, and synthesis of all studies relevant to the research topic, relying on library-based data, including both

physical and cybernetic sources, as well as searches in Persian and international databases. These searches were conducted in Noormags (noormags.ir), Civilica (civilica.com), Google Scholar (scholar.google.com), the Comprehensive Portal of Humanities (ensani.ir), the IranDoc Repository (ganj.irandoc.ac.ir), and the Noor Digital Library (noorlib.ir). They were supplemented by a manual search of the reference lists of the retrieved articles. The search period was set from 1383 to 1404 AH, corresponding to 2004 to 2025 CE. The search strategy was based on the combination of the keywords “disability”, “smart governance”, “citizenship rights”, “mothers of children with disabilities”, “digital accessibility”, “urban justice”, and “inclusive technology”.

The initial search of the databases yielded a total of 148 raw records. After removing duplicates, 106 unique records remained for initial screening based on title and abstract. To determine the source eligibility, predefined inclusion and exclusion criteria were established. The inclusion criteria comprised: (a) scientific-research articles, laws, legal documents, conventions, or official policy reports; (b) publication within the 2004–2025 period; and (c) direct engagement with at least two intersecting domains of the research topic, such as smart governance and disability, or digital accessibility and citizenship rights. The exclusion criteria comprised: (a) non-research writings, blog posts, and short notes; (b) studies focused solely on general physical accessibility without addressing digital governance or caregiver challenges; and (c) sources with unsatisfactory or inaccessible full texts.

Following the screening stage, 54 full texts of the articles and documents were retrieved and assessed for eligibility. Ultimately, 38 final sources were deemed eligible and included in the qualitative synthesis. These final sources were organized into four main categories: first, legal and policy documents, including the United Nations Convention on the Rights of Persons with Disabilities (2006), the Law on the Protection of the Rights of Persons with Disabilities of the Islamic Republic of Iran (2017), and urban accessibility standards and relevant urban planning and architectural laws; second, international theoretical and scientific sources in the fields of smart governance, inclusive smart cities, digital justice, responsible AI, and the social model of disability; third, domestic empirical studies related to urban accessibility, the citizenship rights of persons with disabilities, and their social and economic participation; and fourth, policy reports and technological standards, including digital accessibility standards, data governance frameworks, and ethical principles of AI.

Data analysis was conducted using qualitative content analysis, manually and through systematic note-taking, open coding, and axial categorization, so as to avoid software-induced reductionism. Data saturation was determined when no new primary concept or code could be extracted from the final sources, thereby achieving theoretical sufficiency. As a result of this systematic open-coding process, initial concepts related to the research topic were extracted, including “environmental barrier” (resulting from the lack of ramps and appropriate pathways), “governance weakness” (resulting from the lack of enforcement oversight), “access gap” (resulting from unusable digital services), “technological risk” (resulting from algorithmic discrimination), and “empowerment”

(resulting from digital literacy). Finally, by explicating the relationships and structural linkages among these themes, the final model of smart and inclusive governance was developed. All cited articles, books, and legal documents were systematically referenced in the text and reflected in the reference list, thereby preserving the intellectual property rights of the respective authors.

Data Extraction and Analysis Linkage

To establish a transparent and auditable link between the raw qualitative data and the final conceptual model, a systematic data extraction chain was employed. The qualitative content analysis progressed from primary source excerpts, through open coding (initial concepts), to axial categories (themes), and finally to the four main dimensions (pillars) of the smart and inclusive governance framework.

Table 1 illustrates this analytical trajectory, showcasing how specific legal lacunae, empirical challenges, and technological requirements were conceptualized and integrated into the final governance pillars.

Table 1.

The Analytical Chain of Data Extraction and Coding Based on the Documentary Content Analysis

Primary Source	Representative Evidence	Open Code	Subcategory (Axial Theme)	Main Dimension (Selective Theme)
United Nations Convention on the Rights of Persons with Disabilities (CRPD, Art. 9); General Comment No. 2 (2014)	Accessibility should be ensured for the physical environment, transportation, information and communication technologies, and digital services.	- Digital accessibility - Universal design - Equal access	Accessible Digital Services	Accessible Digital Infrastructure
Web Content Accessibility Guidelines (WCAG 2.2); ISO 30071-1:2019	Public digital services should comply with internationally recognized accessibility standards and support assistive technologies.	- Accessible interfaces - Assistive technologies - Inclusive design	Digital Accessibility Standards	Accessible Digital Infrastructure
OECD Recommendation on Digital Government Strategies (2014); OECD Digital Government Index (2020)	Governments should use integrated data and evidence-based decision-making to improve the public service delivery.	- Open data - Data integration - Evidence-based policy	Data-Driven Decision Making	Data-Driven Governance
UNESCO Recommendation on the Ethics of AI (2021); OECD AI Principles (2019)	AI should ensure fairness, transparency, accountability, human oversight, and privacy protection.	- Algorithmic fairness - Transparency - Privacy protection	Responsible AI Governance	AI Legal and Ethical Governance
United Nations Sustainable Development Goals (SDGs 10 & 11); ITU Digital Inclusion Framework (2023)	Digital technologies should promote inclusion, reduce inequalities, and strengthen the citizens' participation in society.	- Digital literacy - Citizen participation - Social inclusion	Digital Empowerment	Digital Empowerment of Citizens

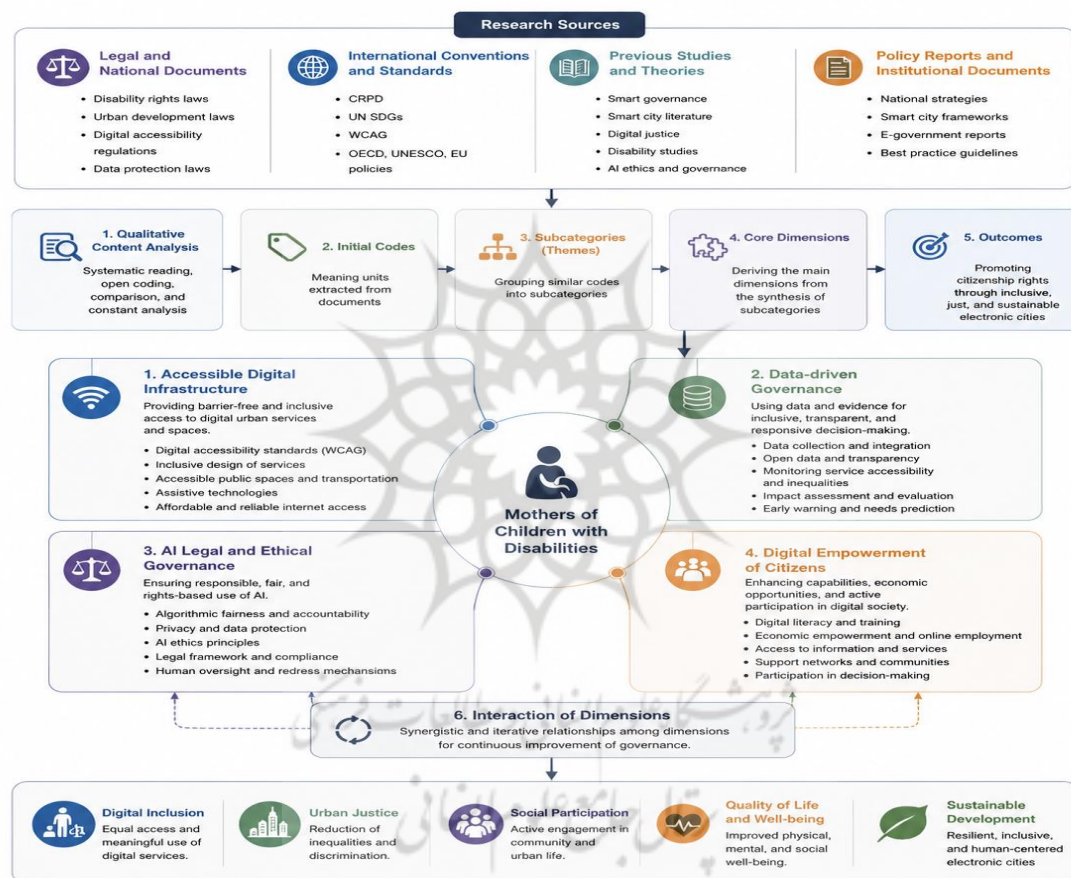
(Source: The Researcher's Findings)

Findings

The findings of this study were structured around the four main pillars of the inclusive smart governance model, which were derived from the qualitative content analysis of legal documents, international conventions, academic literature, and policy reports. The synthesis of these sources led to the categorization of the research findings into four distinct dimensions of Accessible Digital Infrastructure, Data-Driven Governance, Ethical and Legal Frameworks for AI, and Digital Empowerment.

Figure 1.

The Conceptual and Methodological Framework of Inclusive Smart Governance for Mothers of Children with Disabilities



(Source: The Researcher's Findings)

The transition from a 'technological city' to 'Inclusive Smart Governance' represents the fundamental shift required to address the rights of mothers of children with disabilities. Unlike the traditional e-government, inclusive smart governance transcends mere service delivery. It refers to regulatory and institutional mechanisms that prioritize transparency, institutional accountability, and the active participation of marginalized stakeholders in the policy-making cycle (Ntanda et al., 2026).

The findings of this study demonstrated that for this group, smart governance is the institutional guarantor of urban justice. It requires a framework where technology is not a neutral tool, but is integrated with the principles of human dignity and social justice

(Caragliu et al., 2013; Floridi et al., 2018). In this model, 'Inclusive Smart Governance' serves as the operational layer that coordinates the synergy between 'Accessible Digital Infrastructure', 'Data-Driven Decision-Making', and 'Ethical AI Frameworks'. Consequently, the legitimacy of smart urban management is no longer measured by its technical efficiency, but by its ability to eliminate structural barriers and prevent the reproduction of inequality through digital empowerment.

Figure 1 presents the final conceptual and methodological framework developed in this study to illustrate the sequential process through which diverse documentary evidence was transformed into an integrated governance model for promoting the citizenship rights of mothers of children with disabilities. The framework combines the methodological stages of qualitative content analysis with the conceptual structure of the proposed governance model, thereby providing a comprehensive representation of the research process and its outcomes.

The framework begins with Research Sources, which serve as the primary evidence base for the study. Four complementary categories of documents were systematically reviewed: (1) Legal and National Documents, including disability rights legislation, urban development laws, digital accessibility regulations, and data protection laws; (2) International Conventions and Standards, such as the Convention on the Rights of Persons with Disabilities (CRPD), the Sustainable Development Goals (SDGs), the Web Content Accessibility Guidelines (WCAG), and policy frameworks developed by OECD, UNESCO, and the European Union; (3) Previous Studies and Theories, encompassing the literature on smart governance, smart cities, digital justice, disability studies, and AI governance; and (4) Policy Reports and Institutional Documents, including national strategies, smart city frameworks, e-government reports, and best-practice guidelines.

These documentary sources were then subjected to qualitative content analysis, involving systematic reading, open coding, constant comparison, and iterative interpretation. This analytical process generated a set of initial codes, representing meaningful concepts extracted from the reviewed documents, such as digital accessibility, inclusive service design, algorithmic fairness, privacy protection, digital literacy, and citizen participation. Through continuous comparison and abstraction, conceptually related codes were subsequently organized into broader subcategories (themes), including digital accessibility, inclusive digital services, data integration, transparency and accountability, privacy and data protection, digital capabilities, and socio-economic participation.

The synthesis of these themes resulted in the identification of four core dimensions, which constitute the principal components of the proposed governance framework.

The first dimension, Accessible Digital Infrastructure, represents the technological foundation of inclusive governance. It emphasizes the provision of barrier-free digital services, compliance with accessibility standards, inclusive service design, accessible public infrastructure, assistive technologies, and affordable digital connectivity to ensure equal access to urban digital services.

The second dimension, Data-driven Governance, functions as the operational

intelligence layer of the framework. It promotes evidence-based and transparent decision-making through integrated data collection, open data policies, continuous monitoring of service accessibility, impact evaluation, and predictive analysis for identifying the emerging needs and supporting proactive governance.

The third dimension, AI Legal and Ethical Governance, establishes the regulatory and ethical safeguards required for responsible use of AI. This dimension encompasses algorithmic fairness and accountability, privacy and data protection, AI ethical principles, legal compliance, and mechanisms for human oversight and redress, ensuring that intelligent technologies remain transparent, explainable, and rights-based.

The fourth dimension, Digital Empowerment of Citizens, focuses on strengthening the capabilities of mothers of children with disabilities through digital literacy, economic empowerment, access to online services and information, support networks, and active participation in public decision-making. Rather than viewing beneficiaries as passive recipients of services, this dimension positions them as empowered participants within the digital society.

Finally, the integration of these four dimensions contributes to the achievement of five overarching governance outcomes: Digital Inclusion, by ensuring equitable access to digital services; Urban Justice, through reducing inequalities and discrimination; Social Participation, by promoting active engagement in community and urban life; Quality of Life and Well-being, through improvements in physical, psychological, and social welfare; and Sustainable Development, by fostering resilient, inclusive, and human-centered smart cities. All in all, these outcomes demonstrated how the proposed framework translates legal principles, technological innovation, ethical governance, and citizen empowerment into an integrated model for advancing the citizenship rights of mothers of children with disabilities.

Accessible Digital Infrastructure

The transition from traditional to modern perspectives in disability studies has shifted from the analysis of 'individual/medical impairments' toward the 'Social Model of Disability' (Oliver, 1990). In this context, legislative focus in Iran—crystallized in the directives of the Tehran Municipality (2005 & 2007) and the resolutions of the Supreme Council for Urban Planning and Architecture—has consistently been limited to physical accessibility, such as sidewalks, leveling of transit stations, ramps, and tactile paths for the visually impaired. While these regulations are vital, they reflect a traditional, physics-centered view of the city; a view in which the 'city' is assumed to be a collection of static physical assets. These laws fail to recognize 'digital accessibility' as a component of the right to the city. One of the most significant findings of this discussion is that accessibility in a smart city should not be confined to physical retrofitting. The findings indicated that if urban services, information systems, participatory platforms, and electronic portals are not designed to be compatible with screen readers, plain language, multimedia formats, and assistive technologies, the smart city effectively excludes a portion of its citizenry. Consequently, in the digital age, the 'right to accessibility' must be understood as the right to access digital infrastructure, services,

data, and interfaces, rather than merely the right of physical passage through barriers (Paciello, 2000).

Data-Driven Governance

The qualitative synthesis showed that the current urban administrative processes regarding disability are largely reactive and complaint-oriented. The findings indicated that the specific socio-spatial barriers encountered by mothers of children with disabilities are not systematically integrated into the policy cycle due to a lack of inclusive data-collection mechanisms. From the analysis of theoretical frameworks on urban justice and smart cities (e.g., Burns & Andrucki, 2021; Makkonen & Inkinen, 2024), four essential components of data-driven governance were identified: citizen-led data collection, real-time analytics, AI-assisted decision-making, and interactive smart dashboards.

Ethical and Legal Frameworks for AI

The research findings indicated that in the absence of an ethical-legal framework, AI has the potential to exacerbate inequality. This issue becomes particularly critical when training data reproduces historical biases or when persons with disabilities are not adequately represented in the design of such systems. In such instances, 'algorithmic fairness' shifts from a theoretical principle to a practical necessity (Newman-Griffis et al., 2022). Within this framework, the four components of 'algorithmic justice', 'data privacy and security', 'the right to explanation', and 'accountability and transparency' constitute the ethical-legal core of the research model. These components demonstrated that smart governance lacks sufficient legitimacy without the protection of data rights and the right to appeal. In applications of AI involving vulnerable groups, the principles of the best interest, transparency, and security must take precedence over purely functionalist logic (Brophy & Craven, 2007; Paciello, 2000).

Digital Empowerment

The findings suggested that technology must transition from a tool of consumption to a medium for production and economic independence. This proposition is formulated in the 'digital empowerment' section of the research model and is reinforced by the sub-components of 'digital literacy and training', 'online employment opportunities', 'support networks and communities', and 'economic and social empowerment'. The significance and function of this section are that utilizing a smart city must lead to an increase in the agency of women and mothers of children with disabilities, rather than merely increasing the speed of service delivery. In particular, online employment and digital support networks can compensate for some of the time and caregiving constraints faced by this group, thereby leading to their relative economic independence. This finding is consistent with contemporary approaches to technological justice, which view technology as a tool for reducing time poverty, increasing participation, and expanding social opportunities (Makkonen & Inkinen, 2024).

Discussion

The findings of this study indicated that the governance of urban citizenship in the digital age requires a shift from passive support to active empowerment. For mothers of children with disabilities, smart-city technologies are not inherently inclusive. In the absence of appropriate legal, ethical, and institutional safeguards, they may reproduce the existing inequalities and generate new forms of algorithmic discrimination (Makkonen & Inkinen, 2024; Newman-Griffis et al., 2022; Zhou et al., 2024). Accordingly, technology should be understood not merely as a technical instrument, but as a legal-social mechanism through which urban justice may be advanced or undermined (Brophy & Craven, 2007; Paciello, 2000).

Policy and Institutional Implications

Beyond the conceptual interpretation of the model, the findings necessitate specific policy reforms to ensure that these dimensions are embedded within the institutional fabric of urban governance.

The policy implications of this model require a shift from reactive, complaint-oriented processes toward proactive, data-driven, and rights-based regulatory systems. To bridge the gap between normative support and executive realization, the legal and institutional frameworks governing smart cities must explicitly recognize digital accessibility as part of the citizenship rights and translate this recognition into enforceable standards for service delivery, platform design, and institutional accountability.

Legal and Regulatory Reform

First, the existing legal framework should be revised so that digital accessibility is explicitly recognized as a legal entitlement rather than an indirect or implicit policy aspiration. As the findings demonstrated, current regulations largely emphasize physical accessibility, whereas electronic services, urban portals, and AI-supported decision-making systems remain insufficiently regulated. Thus, legal reform should extend accessibility obligations to digital environments, including smart city platforms, electronic service portals, and algorithmic systems used in urban administration.

In practical terms, this means that accessibility standards should be aligned with universal design principles and should cover screen-reader compatibility, plain language interfaces, multiple communication formats, and assistive technologies. Such reform would help ensure that the right to access the city is not confined to the built environments, but also includes the digital infrastructures through which contemporary urban citizenship is increasingly mediated.

Data-Driven Monitoring and Accountability

Second, the governance of urban services should move beyond a complaint-based logic and adopt continuous, data-driven monitoring mechanisms. The findings indicated that the everyday barriers experienced by mothers of children with disabilities often remain invisible in conventional administrative systems unless they are systematically collected and analyzed. For this reason, citizen data collection, real-time analytics, AI-assisted

decision-making, and smart dashboards should be institutionalized as part of a broader accountability framework.

Such tools would allow municipalities and relevant agencies to detect service gaps, identify exclusion patterns, and respond more rapidly to emerging inequalities (Kitchen, 2014; Townsend, 2013). However, these mechanisms must not be implemented as purely technocratic instruments. They should be accompanied by independent oversight, continuous evaluation, and clearly assigned institutional responsibility. Only under these conditions can data-driven governance function as a tool for justice rather than a mechanism of administrative control.

Digital Accessibility and Universal Design

Third, digital accessibility should be treated as an essential dimension of universal design and not merely as a technical preference. The findings suggested that urban services and platforms must be compatible with screen readers, simple language, multimedia formats, and assistive technologies, especially for users who experience intersecting forms of disability-related and caregiving-related exclusion. Moreover, accessibility should be evaluated not only at the design stage, but also during implementation, licensing, and post-implementation monitoring.

In this regard, the participation of mothers of children with disabilities in testing and evaluating digital services is essential. Their lived experience can reveal barriers that are often overlooked in formal design processes. Therefore, universal design should be understood as a participatory and iterative standard that connects technical functionality to lived accessibility and social inclusion.

Ethical AI and Algorithmic Accountability

Fourth, the deployment of AI in smart-city governance requires a specific ethical and legal framework. Without such a framework, algorithmic systems may reproduce or amplify the existing inequalities, particularly for groups whose needs are already underrepresented in administrative datasets. The findings therefore supported the establishment of algorithmic justice, data privacy and security, the right to explanation, accountability, transparency, algorithmic auditing, and the right to appeal as core regulatory principles.

In this context, the right to explanation is not a procedural luxury but a substantive requirement of fair governance. Similarly, algorithmic auditing should be regarded as a preventive safeguard against bias, opaque decision-making, and the unauthorized reproduction of discriminatory patterns (O'Neil, 2017; Shahbazi & Shabani Kolahi, 2024). Representatives of disability groups and caregiving mothers should also participate in the design, testing, and monitoring of these systems so that ethical oversight is grounded in lived experience rather than abstract compliance.

Digital Empowerment and Participation

Finally, digital empowerment should be pursued as a concrete policy objective rather than a secondary by-product of technological modernization. The findings showed that digital literacy, online employment, support networks, and participatory platforms can

reduce caregiving-related time poverty and increase the agency of mothers within both urban governance and digital economy. For mothers of children with disabilities, such empowerment is particularly important because it expands access not only to information, but also to participation, income generation, and civic engagement.

Thus, policy interventions should include the targeted digital literacy programs, access to remote and flexible employment opportunities, and the creation of supportive digital communities that enable mothers to connect, share knowledge, and participate in urban decision-making. In this way, digital empowerment contributes to the transformation of mothers from passive recipients of services into active urban agents with recognized social and economic capacity.

Taken together, these policy implications indicate that inclusive smart governance must be grounded in enforceable accessibility standards, participatory data systems, ethical AI regulation, and empowerment-oriented social policy. Without such institutional anchoring, smart-city modernization may reproduce rather than reduce urban inequality. Conversely, when these reforms are implemented in a coordinated manner, smart governance can become a rights-based mechanism for inclusion, accountability, and justice. Accordingly, the discussion shows that the realization of urban justice depends not only on conceptual clarity, but also on institutional redesign and regulatory commitment.

Discussion and Conclusion

This study aimed at developing a smart governance model to promote the citizenship rights of mothers of children with disabilities. It demonstrated that the mere development of electronic infrastructure, in the absence of reforms to legal and ethical frameworks, does not lead to equality. By bridging the gap between the existing legislative frameworks and the requirements of emerging smart technologies, this research addressed the critical absence of a coherent legal strategy for protecting vulnerable populations in digital urban spaces.

The principal finding of this research was that urban justice in digital age can only be achieved through the integration of four elements of “accessible digital infrastructure”, “data-driven governance”, “ethical and legal frameworks for AI”, and “digital empowerment”.

The contributions of this article can be summarized at three levels. First, this research expanded the concept of “technological justice” for the target group, demonstrating that technology must transition from a tool of consumption to a tool of production, independence, and participation. Second, it presented an inclusive smart governance model as a practical roadmap for municipalities and public institutions—a model in which drivers, core themes, and ultimate outcomes are coherently interconnected. Third, this research moved beyond a mere reporting of laws to an analysis of the law and its implementation gaps. More specifically, it showed that the Law for the Protection of the Rights of Persons with Disabilities, despite its fundamental importance, has yet to explicitly and operationally incorporate concepts such as algorithmic discrimination, the right to explanation, and digital accessibility.

As a result, the final conclusion is that the realization of citizenship rights of mothers of children with disabilities in the smart city requires a revision of urban and legal policies so that digital accessibility, algorithmic auditing, and institutional accountability are institutionalized as binding requirements within the urban management system. On an operational level, municipalities must move away from purely reactive and complaint-based oversight toward intelligent monitoring systems, thereby transforming the "right to equal access" from an abstract rule into a lived daily experience. Therefore, the research indicated that in the era of digital governance, accessibility is no longer a philanthropic act but a "fundamental citizenship right". Therefore, by placing mothers of children with disabilities at the center of policymaking, this article has proposed a novel model of distributive justice in the smart city.

Limitations and Future Research Directions

Although this study has endeavored to provide a theoretical and analytical framework to explain the nexus between smart governance, digital accessibility, and the enhancement of citizenship rights for mothers of children with disabilities, its results must be interpreted with due regard for certain conceptual, bibliographic, and empirical limitations. First, the international peer-reviewed literature regarding the intersection of AI, urban governance, and the rights of persons with disabilities is still in its formative stages. A significant portion of available resources has been published not as extensive empirical research, but as policy documents, normative guidelines, and institutional reports. Consequently, while these sources are useful for the preliminary formulation of an analytical framework, they are subject to limitations in terms of empirical generalizability and data-driven robustness.

Second, the present research is primarily legal-analytical in nature, with its main focus directed toward the examination of documents, laws, governance requirements, and conceptual modeling. Consequently, it has not utilized extensive field data to assess the lived experience of mothers of children with disabilities in their interaction with smart urban services in Iran. As a result, certain objective dimensions of the issue, including the quality of platform utilization, real-world accessibility barriers, patterns of digital exclusion, and variations stemming from socio-economic contexts, require complementary field investigations. Furthermore, another contextual limitation of the research is the lack of explicit, binding, and up-to-date national standards in the field of digital accessibility within the Iranian legal system—a situation that both complicates the legal assessment and restricts the ability to evaluate the institutional compliance.

On this basis, future research may pursue several complementary and essential paths. First, the conduct of survey-based, mixed-method, and phenomenological studies to examine the lived experience of mothers in encountering smart urban platforms and services, in order to extract indigenous digital accessibility indicators and align them with international standards like WCAG. Second, the development of intersectional research aimed at simultaneously analyzing the impact of variables such as disability, poverty, ethnicity, gender, and the digital divide on the quality of access to urban services, as the experience of this group cannot be explained by a single variable alone.

Third, conducting legal studies and expanding normative modeling regarding the civil and administrative liability of developers, operators, and public entities utilizing smart systems particularly in cases where algorithmic bias leads to discrimination or deprivation of services. In this domain, leveraging the capacities of Iranian jurisprudence and law to elucidate the foundations of liability, compensation, and institutional accountability can contribute to the enrichment of indigenous literature. Fourth, the design and testing of technical-legal protocols for the algorithmic auditing of urban systems to identify and rectify gender, disability-related, and social biases in smart decision-making process. Fifth, the utilization of quantitative analyses and Big Data to study patterns of mobility, access to services, and the spatial distribution of deprivation in the city, to provide the necessary empirical evidence for more precise and equitable policymaking.

In sum, the continuation of this research trajectory requires a transition from purely normative analysis to the integration of legal, empirical, and data-driven approaches. In this way, we can transcend the level of theoretical formulation and succeed in providing valid implementation models for the realization of digital accessibility, urban justice, and the effective protection of citizenship rights of mothers of children with disabilities.



REFERENCE

- Comprehensive Law on the Protection of the Rights of Persons with Disabilities (2006).
 Constitution of the Islamic Republic of Iran. (1979, amended 1989).
https://www.servat.unibe.ch/icl/ir00000_.html.
- United Nations Convention on the Rights of Persons with Disabilities (CRPD, Art. 9); General Comment No. 2 (2014).
- Law on the Protection of the Rights of Persons with Disabilities (2018).
- Aflaki, A. (n.d.). Unenforced regulations: The forgotten rights of persons with disabilities. *Municipalities Journal*, 8 (82), 117.
- Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities*, 47, 95-106.
- Baharloui ,Abdollah, Nemati, Meysam. (2017) Citizen Rights: Its Components, Foundations, and the Obligations of the State Toward Them. *Andisheha-ye Huquq-e Omumi*, 6(2), 41-58.
- Brophy, P., & Craven, J. (2007). Web accessibility. *Library trends*, 55(4), 950-972.
- Burns, R., & Andrucki, M. (2021). Smart cities: Who cares?. *Environment and Planning A: Economy and Space*, 53(1), 12-30.
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2013). Smart cities in Europe. In *Creating smart-er cities* (pp. 65-82). Routledge.
- Colom, A. (2020). *The Digital Divide: By Jan van Dijk*, Cambridge, Polity Press, 2020, 208 pp.,£ 17.99 (paperback), ISBN: 978-1-509-534456.
- Committee on the Rights of Persons with Disabilities. (2014). *General Comment No. 2 (2014): Article 9: Accessibility*. United Nations.
- Dabirnia, A., & Abedini, Z. (2024). The ruling approach on the right to self-determination of people with disabilities in international documents and Iranian legal system in the present era. *Comparative Studies on Islamic and Western Law*, 11(3), 65-88.
<https://doi.org/10.22091/csiw.2024.9129.2393>.
- Doyle, P. (1995). *The concept of justice in contemporary political theory*. Oxford University Press.
- Floridi, L., Cows, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... & Vayena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and machines*, 28(4), 689-707.
- Ghari Seyyed Fatemi, S. M. (2009). *Human rights in the contemporary world*. Tehran: Shahr Danesh Institute for Legal Studies and Research.
- Haghighatpour, H. (2013). *Dignity in Islamic Jurisprudence and Law*. Tehran: Imam Sadiq University.
- Hossein Abadi, S., & Zanganeh, Y. (2018). The impact of awareness of urban law on active citizenship (Case Study: Sabzevar). *Geography and Urban Space Development*, 4(2), 189-204.
- Hosseini Beheshti, S. (2019). Assessing the charter on citizens' rights: A multi-disciplinary critique. *Interdisciplinary Studies in the Humanities*, 11(3), 1-29.
 10.22035/isih.2019.3425.3648.
- Ibănescu, B. C., Ursache, I. M., Damian, D. A., & Gheorghiu, A. (2025). Bridging urban digital divide: Digital helpers and the governance of smart cities. *Transylvanian Review of Administrative Sciences*, 69-85.
- International Organization for Standardization. (2019). *ISO 30071-1:2019—Information technology—Development of user interface accessibility*.

- International Telecommunication Union. (2023). *Digital Inclusion Framework*. ITU.
- Islamic Parliament Research Center. (2018). *Law on the Protection of the Rights of Persons with Disabilities* (Islamic Republic of Iran).
- Katouzian, N. (2019). *Family Law*. Tehran: Enteshar Joint Stock Company.
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1-14.
- Lee, J., Babcock, J., Pham, T. S., Bui, T. H., & Kang, M. (2023). Smart city as a social transition towards inclusive development through technology: A tale of four smart cities. *International journal of urban sciences*, 27(sup1), 75-100.
- Makkonen, T., & Inkinen, T. (2024). Inclusive smart cities: Digital inclusion, accessibility, and urban governance. *Sustainability*, 16 (4), 1-19.
- Manafi, S.(2014). Iranian Disability Website.
- Mir Mohamad Tabar, S. A., Afshar, Z., & Mahmoudi, S. (2023). Meta-analysis of awareness of citizenship rights in Iran (2001-2021 Period). *Journal of Geography and Regional Development*, 21(2), 287-314. 10.22067/jgrd.2023.82695.1286.
- Mohammadi, Gh. A. (2026, February 18). Integrating green human resource management and sustainable urban management: Providing a unified framework for the development of e-municipalities and social responsibility. In *Proceedings of the 23rd National Conference on Management and Human Sciences Research in Iran, Tehran*(pp. 1162–1171).
- Moradzadeh, H. (2011). Rights and obligations of persons with disabilities within the civil liability system. 1st ed. Tehran: Shahr Danesh Institute for Legal Studies and Research..
- Nam, T., & Pardo, T. A. (2011, June). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th annual international digital government research conference: digital government innovation in challenging times* (pp. 282-291).
- Nasib, S. M. H., Jahan Bin, E., & Jahan Bin, S. F. (2012). Review on the rights of the disabled in Iran (in the light of civil & welfare support of the government). *Basic Rights*, 8(16), 141-168.
- Newman-Griffis, D., Bennett, C. L., Dudley, J., & Coy, A. (2022). Disabled data justice: Rethinking disability data in AI systems. *AI and Ethics*, 2, 1-14.
- Nourahmadi, E. (2025). The legal effects and consequences of disability on the non-financial rights and obligations of couples in Imamiyyah jurisprudence and Iranian law. (e77880). *Biannual Journal of Family Law and Jurisprudence*, (), e77880. 10.30497/flj.2025.248831.2229.
- Nourahmadi, E., & Rezvanimofrad, A. (2023). Protecting the right to fertility of women with disabilities in the Iranian legal system and international instruments. *Islamic Law*, 20(77), 119-143.
- Ntanda, A., & Carolissen, R. (2025). Technology's dual role in smart cities and social equality: A systematic literature. *Journal of Local Government Research and Innovation*, 6, 238.
- Ntanda, A., Marwa, N., Mosupye-Semenya, L., & Carolissen, R. (2026). Barriers to restorative social justice in South African smart cities: Urban segregation, governance and resource distribution. *Environment & Urbanization*, 09562478261436303.
- OECD. (2014). *Recommendation of the Council on Digital Government Strategies*. OECD Publishing.
- OECD. (2019). *OECD Principles on Artificial Intelligence*. OECD Publishing.
- OECD. (2020). *Digital Government Index: 2019 Results*. OECD Publishing.
- Okafor, C. C., Aigbavboa, C., & Thwala, W. D. (2023). A bibliometric evaluation and critical review of the smart city concept-making a case for social equity. *Journal of Science and Technology Policy Management*, 14(3), 487-510.

- Oliver, M. (1990). The politics of disablement—New social movements. In *The politics of disablement* (pp. 112-131). London: Macmillan Education UK.
- O'neil, C. (2017). *Weapons of math destruction: How big data increases inequality and threatens democracy*. Crown.
- Paciello, M. (2000). *Web accessibility for people with disabilities*. Crc Press.
- Rezvanimofrad, A., & Nourahmadi, E. (2021). The rights of persons with disabilities in the Law on the Protection of the Disabled 1396 with an approach to Letter of Imam Ali (AS) to Malik Ashtar. *Quarterly Journal of Nahj al-Balagha Research*, 8(32), 61-80. 10.22084/nahj.2020.21219.2504.
- Sadeghi Fassaei, S., & Fatemi Nia, M. A. (2015). Disability, the hidden part of society: A sociological study on the status of disability in Iran and the world. *Social Welfare Quarterly*, 15(58), 159-194. <http://refahj.uswr.ac.ir/article-1-2338-fa.html>.
- Shahbazi, A., & Shabani Kolahi, S. (2024). Legal Challenges of Privacy Protection in Smart Cities considering International and Iranian law. *Journal of Modern Technologies Law*, 5(1), 221-234.
- Taghvaei, M., Moradi, G., & Safarabadi, A. (2010). Investigation and evaluation of Isfahan city parks conditions base on existing standard for access of weak and disabled people. *Geography and Environmental Planning*, 21(2), 47-64.
- Taheri, M. (2016). *A critical review of the position of citizen rights in the Iranian legal system with a focus on the Charter of Citizen Rights*. In *Proceedings of the National Conference on the Clarification of Citizen Rights*. SID. <https://sid.ir/paper/893226/fa>.
- Townsend, A. M. (2013). *Smart cities: Big data, civic hackers and the quest for a new utopia*. WW Norton & Company.
- UNESCO. (2021). *Recommendation on the Ethics of Artificial Intelligence*. UNESCO.
- United Nations. (2006). *Convention on the Rights of Persons with Disabilities*. <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>.
- United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations.
- World Health Organization. (2024). World health statistics 2024: Monitoring health for the SDGs. <https://www.who.int/data/gho/publications/world-health-statistics>.
- World Wide Web Consortium (W3C). (2023). *Web Content Accessibility Guidelines (WCAG) 2.2*. <https://www.w3.org/TR/WCAG22/>.
- Zhou, S., Loiacono, E. T., & Kordzadeh, N. (2024). Smart cities for people with disabilities: A systematic literature review and future research directions. *European Journal of Information Systems*, 33(6), 845–862. <https://doi.org/10.1080/0960085X.2023.2297974>.