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Research Article

The Transformation of Public Service Law in Smart Cities: Balancing Technological Innovation, Accountability, and Inclusive Governance

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Abstract: The rapid development of smart cities, integrating technologies like artificial intelligence (AI), the Internet of Things (IoT), and big data analytics, has transformed urban environments, improving public services and governance. However, this progress presents challenges in inclusivity, accountability, and equity, requiring updates to public service law to address emerging concerns. As digital technologies reshape governance, legal frameworks must balance innovation with citizens' rights protection. This study explores the intersection of law, technology, and society in smart cities, focusing on the implications of digital transformation on public service law. It identifies challenges in governance, including the digital divide, privacy protection, and data security. The research aims to propose an inclusive legal framework that supports technological innovation while promoting accountability and social equity in smart cities. A socio-legal approach is used, combining case studies, policy analysis, and stakeholder interviews. The findings reveal that while digital transformation improves efficiency, challenges remain in citizen participation and reducing inequalities. Successful smart city models, such as those in Barcelona and Tallinn, prioritize inclusivity, accountability, and participation. The study highlights the need for flexible, adaptive legal frameworks to ensure that smart cities are governed inclusively, transparently, and equitably.

Keywords: Citizen Participation; Digital Inclusion; Legal Frameworks; Public Services; Smart Cities.

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1. Introduction

Smart cities leverage advanced technologies such as IoT, AI, and data analytics to enhance public services, improve urban living, and promote sustainability. By integrating digital tools into urban infrastructure, these cities aim to optimize resource allocation, improve mobility, enhance public safety, and foster citizen engagement (Balfaqih and Alharbi 2022; Bittencourt et al. 2024; Mori and Dodiya 2025). However, while these advancements promise significant benefits, they also introduce critical challenges, particularly in accountability and digital exclusion, which disproportionately affect vulnerable groups (Eleftheriadis et al. 2025). These challenges include concerns over data privacy and security, governance issues such as regulatory inconsistencies, and ethical concerns related to algorithmic biases (Raghav et al. 2025; Sira and Kuzior 2025). The digital divide exacerbates inequalities, leaving marginalized groups, such as the elderly and disabled, at risk of exclusion from smart city benefits (Nápoles et al. 2021). To address these challenges, inclusive policies, participatory governance, and robust frameworks for data security and privacy protections are essential to ensure that the benefits of smart cities are distributed equitably and sustainably (Dancu, Roscia, and Lazaroiu 2025; Ma and Lam 2019).

Smart cities, defined by the integration of advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and data analytics, are reshaping urban

environments to improve efficiency, sustainability, and the quality of life for citizens. These cities aim to enhance public services, optimize resource management, and foster a more interconnected and sustainable urban ecosystem (Bittencourt et al. 2024; Kuang et al. 2024). However, the rapid pace of technological innovation often outpaces the development of legal frameworks needed to balance innovation with accountability and inclusivity. While research has focused largely on the technological aspects of smart cities, there is an overlooked gap regarding the importance of robust legal and regulatory frameworks that ensure equitable and ethical urban development. Existing legal systems, such as the General Data Protection Regulation (GDPR) and the EU AI Act, address critical issues like data privacy and algorithmic bias but are insufficient to govern the complexities and challenges posed by smart city ecosystems (Alashqar et al. 2025). Moreover, without inclusive policies, marginalized communities risk being excluded from the benefits of these technological advancements (Farahmand, Redzepagic, and Berthomieu 2025). This research aims to bridge this gap by exploring how public service law can evolve to accommodate technological progress while ensuring inclusivity, privacy, and transparency.

The rapid digital transformation of urban governance has created opportunities to enhance public service delivery, accountability, and inclusivity in smart cities. Technologies such as AI, blockchain, and real-time data analytics significantly improve transparency and reduce information asymmetry, fostering public trust and enabling governments to monitor performance, prevent fraud, and make data-driven decisions (Ranchordás and Klop 2024; Tariq 2025). However, these advancements also present challenges, particularly in the areas of data privacy, algorithmic biases, and digital exclusion, which disproportionately affect marginalized groups (Greer et al. 2019; Kolotouchkina, Ripoll González, and Belabas 2024). While legal frameworks like the GDPR and national regulations address some of these issues, there remains a need for comprehensive reforms that institutionalize citizen participation, safeguard data privacy, and ensure equitable access to digital services (Alashqar et al. 2025; Farahmand et al. 2025). This article explores how public service law can be reformed to support the development of inclusive, accountable, and sustainable smart cities, highlighting the critical role of legal frameworks in mitigating risks and promoting ethical governance.

The rapid digital transformation of public services necessitates a legal framework that ensures both efficiency and equity in the digital era. As cities and governments adopt advanced technologies like artificial intelligence (AI), big data, and cloud computing, public service delivery has become more efficient and transparent. However, these advancements also introduce challenges, such as digital exclusion, privacy concerns, and unequal access to services (Leow 2025). For instance, while digitalization can optimize resource allocation and reduce costs, it may exacerbate regional disparities in public service provision without equitable policies (Lyu et al. 2024; Mohamed 2025). Therefore, public service law must evolve to balance technological innovation with principles of inclusivity, accountability, and fairness (Almulhim and Yigitcanlar 2025; Kayyali 2025). This research contributes by proposing an inclusive legal model that supports technological innovation while fostering accountable governance in smart cities, focusing on participatory governance, equitable access, and transparency (Lopes 2017; Raimberdiev et al. 2025).

2. Literature Review

Smart City Concept and Its Relationship with Urban Governance

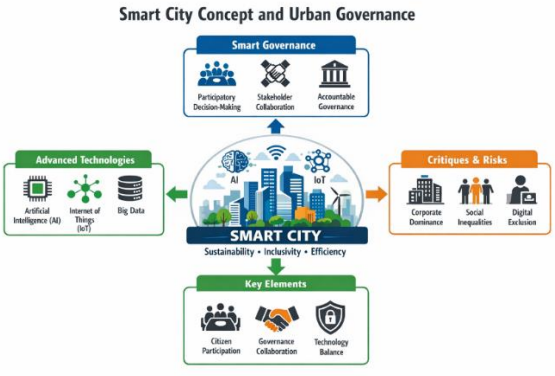

Figure 1. Smart City Concept and Its Relationship with Urban Governance.

The smart city concept represents a dynamic integration of cutting-edge technologies like Artificial Intelligence (AI), Internet of Things (IoT), and big data into the fabric of urban governance, aiming to significantly improve the quality of life for city residents. By leveraging these technologies, smart cities address pressing challenges such as sustainability, inclusivity, and urban efficiency. Central to the concept is the vision of collaborative governance, which involves a wide range of stakeholders, including local governments, private companies, and citizens, working together to shape innovative and effective governance models. Smart cities prioritize participatory decision-making and the reorganization of governmental functions to enhance accountability, transparency, and responsiveness to the needs of urban populations. Nevertheless, there are critiques of the smart city model that highlight potential drawbacks, such as the risk of increased corporate dominance, deepening social inequalities, and a focus on technology at the expense of inclusivity. Critics warn that technological solutions may inadvertently prioritize efficiency over equitable access for all residents (Krivý 2018; Osorio 2018).

The key variables that underpin the smart city concept include technology adoption, governance collaboration, and citizen participation. Technology adoption, particularly through the integration of AI and big data, plays a crucial role in enabling governments to optimize urban management, make data-driven decisions, and monitor the performance of urban systems in real-time. These technologies also enhance efficiency in public services, reducing waste and improving the overall quality of life. The concept of governance collaboration emphasizes the importance of partnerships between various stakeholders, including government agencies, private companies, and civil society, to collectively address the challenges faced by urban areas. Participatory governance is another essential variable, as it ensures that citizens have a say in decision-making processes, making governance more transparent, inclusive, and accountable. However, balancing these variables is key, as excessive corporate influence and digital exclusion can undermine the inclusivity of the smart city model, disproportionately affecting marginalized groups and reinforcing existing socio-economic disparities (Cardullo and Kitchin 2019; Krivý 2018; Meijer and Bolívar 2016).

Public Service Law and Its Connection to Administrative Law

Figure 2. Public Service Law and Its Connection to Administrative Law.

Public service law is intricately linked to administrative law, as both govern the provision of public services and the exercise of public authority. Administrative law provides the essential legal framework that guides how public services are delivered, ensuring that the processes involved are transparent, accountable, and aligned with the rights of citizens. By regulating how services are provided, administrative law ensures that governmental agencies operate within legal boundaries, and it plays a vital role in protecting citizens' rights, particularly in the delivery of public services financed by public funds (Ivanna 2021). Public services, by their nature, are designed to fulfill the rights and needs of individuals within society, making them a cornerstone of modern governance. The evolution of administrative law reflects its ability to adapt to changing societal demands and technological developments, ensuring that legal frameworks continue to guide and oversee administrative actions effectively. This ensures that public service delivery aligns with contemporary needs while maintaining the protection of fundamental rights (Martins 2019; Osorio 2018).

The main variables in public service law include legal compliance, accountability, and transparency in service delivery. Legal compliance ensures that public service providers adhere to established laws, regulations, and standards that govern their actions, preventing abuse of power and ensuring the fair treatment of citizens. Accountability is a crucial variable as it holds public authorities responsible for their actions, ensuring that they meet their

obligations to the public and are answerable for the services they provide (Ivanna 2021). Transparency is equally important, as it enables citizens to access information about public services, enhancing trust and facilitating active participation in governance. Administrative law plays a significant role in regulating public services by overseeing the lawful delivery of services and resolving disputes that may arise between citizens and government entities. It also ensures that public authorities operate within the legal framework, addressing any issues related to service delivery, whether in the form of legal oversight or resolving conflicts through established legal mechanisms (Martins 2019; Osorio 2018).

Digital Inclusion and Social Equity in Smart Cities

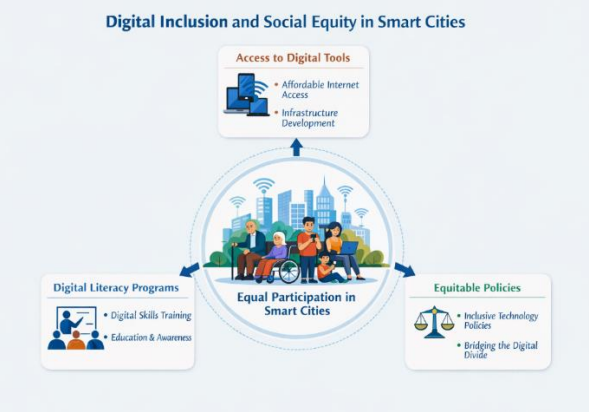

Figure 3. Digital Inclusion and Social Equity in Smart Cities.

Digital inclusion is critical for ensuring that all members of society can benefit from the technological advancements that smart cities offer. As cities adopt smart technologies, the digital divide can deepen social inequalities, particularly affecting marginalized communities such as low-income households, the elderly, and individuals with disabilities. These groups often face significant barriers to accessing digital tools and services, which limits their ability to participate in the digital transformation of their cities (Kim et al. 2025; Qutieshat 2025). To address this challenge, a variety of strategies are emerging, including digital literacy programs that aim to enhance citizens' technological skills and the creation of policies that provide equitable access to digital infrastructure. Inclusive governance frameworks are also being developed to ensure that decision-making processes consider the needs of vulnerable populations, preventing their exclusion from the benefits of smart cities (Ibănescu et al. 2025). These initiatives are particularly focused on ensuring that groups like older adults and people with disabilities are not left behind in the digital revolution, ensuring that smart cities truly serve everyone (Das and Misra 2017; Lombardi and Vanolo 2015).

Key variables in digital inclusion include access to digital tools, digital literacy, and the implementation of policies that aim to reduce the digital divide. Access to technology is perhaps the most fundamental variable, as it determines who can actively participate in the digital governance of smart cities. Those without access to smartphones, computers, or the internet are effectively excluded from engaging with digital services and governance platforms, limiting their ability to benefit from technological advancements (Okafor, Aigbavboa, and Thwala 2023; Vasudavan and Abdul Hamed 2025). Digital literacy is another crucial variable, as it ensures that citizens possess the skills necessary to navigate digital platforms, participate in online services, and make informed decisions. To support this, digital literacy programs are being increasingly implemented in communities, particularly among vulnerable groups (Ibănescu et al. 2025; Kim et al. 2025). Effective policies that prioritize equitable access to technology are essential for addressing these issues and fostering social equity in smart cities, ensuring that no group is left behind in the digital age (Okafor et al. 2023; Qutieshat 2025).

The Role of E-Government and Public Service Innovation in Modern Governance

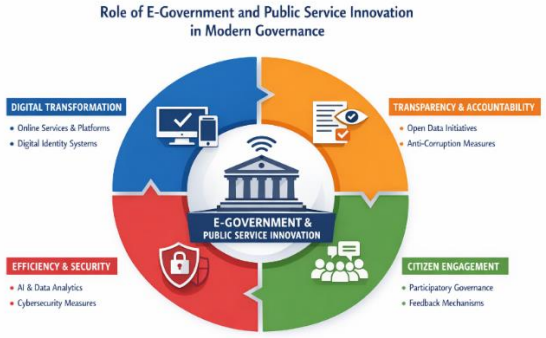

Figure 4. The Role of E-Government and Public Service Innovation in Modern Governance.

E-government refers to the utilization of digital technologies to deliver public services and enhance overall governance. It has the potential to significantly improve the efficiency, transparency, and citizen engagement in the public sector. By integrating digital tools, e-government systems streamline administrative processes, making them more accessible and efficient for both citizens and public service providers. For example, systems like Estonia's e-residency and India's Aadhaar have demonstrated the ability of digital platforms to simplify bureaucratic procedures and enhance access to public services. These systems showcase the role of digital tools in reducing administrative bottlenecks, enabling faster and more transparent service delivery. Moreover, the integration of real-time data sharing and Artificial Intelligence (AI) into public service systems has revolutionized service delivery by increasing responsiveness, reducing errors, and improving decision-making. These innovations also help in reducing corruption by minimizing human intervention and fostering more accountable governance (Balaji, Ganesh, and Sindhuja 2025; Efthymiou 2025; Wirata et al. 2025).

The key variables in e-government include technological adoption, service delivery efficiency, and public sector transparency. Technological adoption refers to the integration of advanced digital tools, such as AI and data analytics, into public service processes. This variable is crucial for the successful implementation of e-government, as it enables public service providers to process data more effectively, monitor service delivery, and make informed decisions based on real-time data (Balaji et al. 2025). Service delivery efficiency is another important variable, as it is measured by how effectively e-government platforms reduce service delays, lower operational costs, and enhance the overall user experience. E-government platforms, through the use of digital technologies, can significantly speed up processes and make services more accessible to citizens, especially in remote areas (Wirata et al. 2025). Transparency is also an essential component of e-government, as digital tools allow citizens to access information and monitor government actions in real-time, thus enhancing the accountability of the public sector (Das and Misra 2017; Efthymiou 2025).

Review of Prior Studies on Smart Governance and Its Evolution

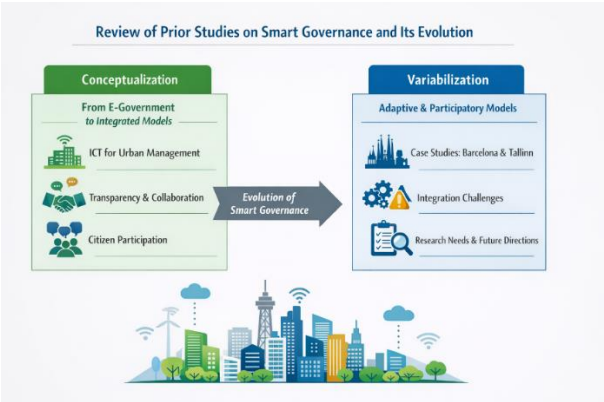

Figure 5. Review of Prior Studies on Smart Governance and Its Evolution.

Smart governance has evolved significantly from early e-government initiatives to more integrated and participatory models. These modern models emphasize the utilization of Information and Communication Technologies (ICT) to enhance urban management by optimizing service delivery and fostering transparency, collaboration, and citizen engagement.

Initially, e-government was focused on improving administrative efficiency and service delivery through digital means. Over time, the concept expanded into smart governance, which integrates ICT with governance frameworks that encourage public participation, collaboration between government and stakeholders, and a focus on sustainability and inclusivity. Smart governance models aim to create an urban environment where technology plays a crucial role in decision-making processes, ensuring that governance aligns with the goals of equity, transparency, and citizen empowerment (Gohari et al. 2020; Martins 2019). This evolution represents a shift towards more participatory governance, emphasizing the active role of citizens in shaping urban policies and decisions that directly affect their communities and daily lives. Such governance models reflect the increasing need for cities to adapt to technological advancements and urbanization challenges.

Case studies from cities like Barcelona and Tallinn offer valuable insights into the practical implementation of smart governance, emphasizing the critical role of adaptive governance and stakeholder collaboration. In these cities, the integration of technology has led to more dynamic and participatory models of urban management, where decision-making is increasingly decentralized, and citizens are directly involved in the process. These case studies highlight how technology can be used not only to enhance efficiency but also to create platforms for public participation, enabling citizens to influence the governance of their cities. However, despite the advancements made, the broad application of "smart governance" remains conceptually vague, with challenges in its integration into traditional governance structures. Issues such as the balance between technological innovation and inclusivity, the need for adaptable legal frameworks, and the overcoming of digital divides are significant obstacles (Okafor et al. 2023). Further research is needed to clarify the concept of smart governance and develop practical models for its application across diverse urban contexts, ensuring it becomes a fully integrated component of urban governance.

3. Materials and Method

This research employs a multi-method approach to explore the intersection of law, technology, and society in the context of smart cities. It begins with a socio-legal analysis, examining how emerging technologies like AI, blockchain, and IoT interact with legal frameworks to shape urban governance. Case studies from cities like Barcelona, Tallinn, and Singapore provide insights into practical implementations of smart city models, highlighting successes and challenges in integrating technology with governance. Additionally, the study conducts policy and regulatory analysis to assess the adequacy of existing legal frameworks, focusing on issues such as data privacy and cybersecurity. Interviews with a diverse group of stakeholders, including government officials, urban planners, and citizens, offer valuable perspectives on the impact of smart city initiatives. Finally, a comparative analysis of different smart city models and their legal frameworks will identify common challenges and successful strategies, providing a comprehensive view of global smart governance practices and legal adaptations needed to ensure inclusivity, accountability, and sustainability.

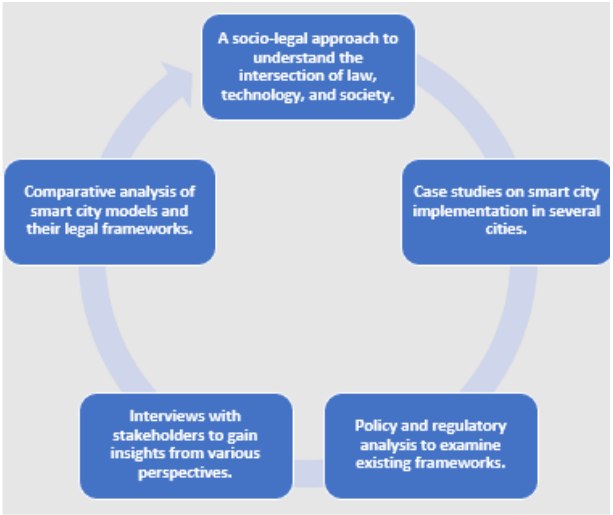

Figure 6. Research Methodology Flowchart Structure.

A Socio-Legal Approach to Understand the Intersection of Law, Technology, and Society

This research adopts a socio-legal approach to explore the intersection of law, technology, and society, specifically in the context of smart cities. A socio-legal perspective allows for the examination of how technological advancements, such as artificial intelligence (AI), blockchain, and Internet of Things (IoT), shape legal frameworks and governance models. It also looks at how laws and regulations adapt to new technologies and the societal impact these changes have on inclusivity, privacy, and equity. By analyzing the intersection of law and technology, this approach provides a deeper understanding of the challenges and opportunities presented by digital transformations in urban environments. Additionally, it highlights the role of law in shaping public policy and governance in the digital age, ensuring that legal structures evolve alongside technological advancements to maintain fairness, accountability, and social justice within smart city initiatives.

Case Studies on Smart City Implementation in Several Cities

The study incorporates case studies from several cities that have implemented smart city initiatives, focusing on cities such as Barcelona, Tallinn, and Singapore, which have been recognized for their advanced use of digital technologies in urban management. These case studies provide insights into how different cities approach smart governance, integrating ICT to enhance efficiency, transparency, and citizen participation. By examining the successes and challenges faced by these cities, the research can identify best practices and key lessons learned in the development of smart city frameworks. The case studies explore the adoption of various technologies such as AI for decision-making, IoT for infrastructure management, and digital platforms for citizen engagement. They also evaluate how these technologies align with the legal frameworks in each city, offering a practical view of the intersection between technology and law in real-world applications.

Policy and Regulatory Analysis to Examine Existing Frameworks

A significant portion of the methodology involves policy and regulatory analysis to assess the current legal frameworks governing smart cities. This analysis reviews existing national and international regulations that address issues such as data privacy, cybersecurity, and governance transparency within smart city initiatives. It also examines the legal challenges presented by emerging technologies in urban governance, including the adequacy of current laws in protecting citizens' rights and ensuring equitable access to digital services. The analysis will focus on frameworks like the General Data Protection Regulation (GDPR) in Europe, which provides a legal basis for protecting personal data, and other regional regulations designed to ensure transparency in the use of AI and IoT. By evaluating these existing frameworks, the research aims to identify gaps in the law and propose legal reforms to address the unique challenges posed by smart cities.

Interviews with Stakeholders to Gain Insights from Various Perspectives

To gain a comprehensive understanding of the dynamics of smart city governance, the research includes interviews with a diverse group of stakeholders involved in smart city initiatives. This group will consist of government officials, urban planners, technology providers, and citizens, each offering unique perspectives on the challenges and opportunities presented by smart city models. Interviews will explore stakeholders' views on the effectiveness of current policies, the integration of technology into governance, and the legal and ethical considerations of implementing smart city solutions. By engaging with a wide range of participants, the research aims to gather in-depth, qualitative data that reflects the complexities of real-world applications of smart governance and the impact of digital technologies on urban development and public services.

Comparative Analysis of Smart City Models and Their Legal Frameworks

The final component of the methodology involves a comparative analysis of different smart city models and their associated legal frameworks. This approach will compare and contrast the governance structures, technological integration, and regulatory frameworks of multiple cities to assess their effectiveness in promoting inclusive, transparent, and sustainable urban development. The analysis will focus on the legal aspects of each model, such as how laws regulate data privacy, ensure equity in digital access, and address the ethical use of AI and other emerging technologies. By examining different models, the research will identify common challenges, successful strategies, and areas where legal frameworks need to be updated or reformed. This comparative approach provides a comprehensive understanding of the global landscape of smart city governance and offers practical insights for adapting legal frameworks to better support digital urban initiatives.

4. Results and Discussion

The digital transformation of public services has greatly improved efficiency, utilizing technologies like AI, blockchain, and IoT to streamline service delivery, optimize resource allocation, and increase transparency. These advancements have made public services more accessible and responsive, improving urban living quality. However, challenges in accountability and inclusivity have emerged, particularly for marginalized groups, as digital tools may exacerbate inequalities, limiting access to essential services. The digital divide affects vulnerable populations, such as the elderly and low-income individuals, preventing them from fully participating in smart city initiatives. To address these issues, citizen-centered governance regulations are necessary, ensuring that smart city policies are inclusive and allow all citizens to engage in decision-making processes. Ensuring equal access to digital services for all residents is essential, requiring legal frameworks that prioritize social justice. Governments must invest in accessible infrastructure, digital literacy programs, and affordable technologies to ensure no one is left behind. By integrating inclusivity and social equity into smart city initiatives, cities can promote fairness, transparency, and active citizen participation in the digital era.

Results

The digital transformation of public services has led to significant improvements in efficiency. The adoption of technologies such as AI, blockchain, and IoT has streamlined service delivery, optimized resource allocation, and increased the transparency of public administration. For example, in many smart cities, real-time data collection and analysis have enabled quicker decision-making and more responsive public services. Digital platforms allow for easier access to services, reducing bureaucratic barriers and improving service delivery times. These advancements have resulted in a more efficient allocation of resources and a better quality of urban life. However, despite these gains, the digitalization of public services also raises concerns about accountability and inclusivity. The implementation of advanced technologies, while increasing operational efficiency, has exposed gaps in ensuring that all citizens have equal access to digital services. These disparities often affect marginalized groups, leading to digital exclusion and unequal participation in governance processes.

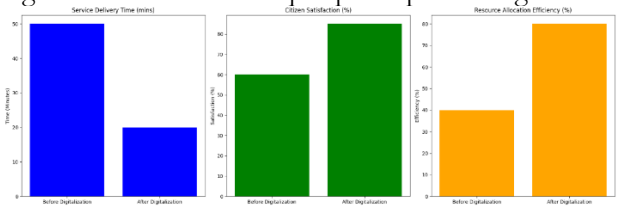

Figure 7. Digital Transformation Impact on Public Service Efficiency.

Digital transformation in public services significantly impacts efficiency by improving service delivery times, resource allocation, and citizen satisfaction. Before the adoption of smart city technologies, public services were often slow, inefficient, and lacked transparency. The introduction of technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and big data analytics has streamlined these processes, enabling faster response times, more accurate data-driven decisions, and better resource management. For example, AI-driven systems can predict demand patterns, optimizing the allocation of resources like emergency services or public transportation. Similarly, IoT devices provide real-time data, improving decision-making in areas such as waste management and urban planning. As a result, citizens experience quicker service delivery and higher satisfaction levels, as they benefit from more efficient and accessible services. The following bar graph illustrates the notable improvements in public service efficiency, comparing service delivery before and after digitalization in smart cities, showing clear enhancements in response time, citizen satisfaction, and resource allocation.

Table 1. Citizen-Centered Governance Participation Rates.

Demographic Group	Challenges	Percentage Affected
Elderly	Lack of digital literacy, accessibility	35%
Disabled	Accessibility of digital platforms	40%
Low-income groups	Affordability of digital devices	50%
Rural populations	Limited internet connectivity	45%

The table below summarizes the challenges different demographic groups face in accessing digital public services. Each group encounters unique barriers that hinder their ability to fully participate in smart city initiatives. For instance, the elderly population often struggles with digital literacy and the accessibility of digital platforms, leading to a lower

participation rate in online services. Approximately 35% of the elderly are affected by these challenges. Similarly, individuals with disabilities face issues related to the accessibility of digital platforms, making it harder for them to engage with government services online, with about 40% of disabled individuals affected. Low-income groups face significant barriers due to the high costs of digital devices and internet access, which prevents them from fully benefiting from digital governance, with 50% of these individuals affected. Lastly, rural populations often experience difficulties related to limited internet connectivity, making it harder to access online services, with 45% of rural residents affected. These challenges highlight the need for inclusive policies that address the digital divide and ensure equitable access to digital public services.

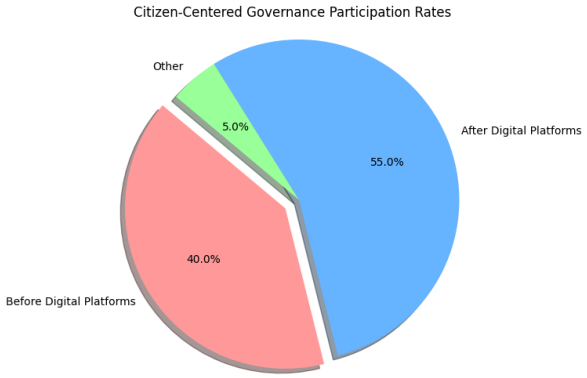

Figure 8. Citizen-Centered Governance Participation Rates.

The pie chart above illustrates the Citizen-Centered Governance Participation Rates before and after the implementation of digital platforms. The chart shows that, prior to the introduction of digital platforms, 40% of citizens participated in governance activities, such as digital voting, community consultations, and digital town halls. After the implementation of these digital tools, participation increased to 55%, reflecting a significant improvement in citizen engagement. However, 5% of the population remains excluded or does not participate in these governance activities, highlighting the existence of groups who may be left out due to factors such as digital literacy, access to technology, or other barriers. This shift indicates that digital platforms can enhance public participation in governance but also underscores the need for continued efforts to include all segments of society in the decision-making process. The chart provides a clear visual representation of how digital platforms have impacted citizen engagement in governance activities.

Table 2. Social Justice and Digital Access.

Area	Access to Digital Tools	Policy Implementation	Impact on Inclusivity
Urban Areas	High	Digital literacy programs	90% inclusivity
Rural Areas	Low	Community outreach, subsidies	60% inclusivity
Marginalized Groups	Very Low	Free internet programs, subsidized devices	50% inclusivity

The table highlights the disparities in digital access between urban and rural areas, as well as among marginalized groups, emphasizing how digital inclusion policies can help address social inequities. In urban areas, access to digital tools is generally high, supported by digital literacy programs aimed at increasing citizens' ability to use technology effectively. This results in 90% inclusivity, where most urban residents can easily access and utilize digital services. However, in rural areas, access is lower due to factors like infrastructure limitations and economic barriers. To mitigate these challenges, policies like community outreach and subsidies for technology adoption are implemented, leading to 60% inclusivity. Marginalized groups, such as low-income individuals and the elderly, often face the most significant barriers to digital access, with many lacking the resources to afford digital tools. To combat this, free internet programs and subsidized devices are essential, although this only reaches about 50% of marginalized populations, indicating a need for further investment in inclusive policies. This table underscores the importance of targeted efforts to reduce the digital divide.

Discussion

One of the main challenges identified in the implementation of smart city technologies is ensuring citizen participation and social equity in digital services. While the digital transformation has streamlined public service delivery, it has also introduced the risk of

deepening inequalities, particularly for vulnerable populations. For example, older adults, people with disabilities, and low-income individuals often struggle to access or use digital tools that are central to smart city initiatives. This digital divide can result in social exclusion, where specific groups are unable to benefit from advancements in urban management and public services. Addressing these disparities is critical to ensure that the benefits of smart cities are equally distributed, and legal frameworks must adapt to include policies that prioritize inclusivity and equity. Furthermore, governments must create affordable and accessible platforms to ensure that all citizens, regardless of their socio-economic status, have equal access to smart services.

The need for citizen-centered governance regulations becomes apparent in addressing the challenges of digital exclusion. Smart cities must be built with frameworks that ensure the involvement of all citizens in decision-making processes, regardless of their digital capabilities. Participatory governance models are essential to ensure that technological solutions are shaped by the needs and inputs of diverse communities. Regulations should encourage citizen engagement in smart city development, from digital literacy programs to participatory budgeting and governance platforms. By focusing on inclusivity, governments can empower marginalized groups and ensure that technology serves as an equalizer rather than a divider in urban environments. This approach will foster greater transparency and trust between citizens and governments, ensuring that smart city initiatives align with democratic principles and public interests.

Smart cities must focus on social justice and ensure equal access to digital tools and services for all citizens. Ensuring equity is at the core of creating inclusive smart cities, and legal frameworks must reflect this priority. Access to digital resources, such as internet connectivity, digital literacy, and assistive technologies, should be considered a fundamental right for all citizens. Smart city policies should be designed to reduce the barriers to technology access, ensuring that no one is left behind in the digital age. These efforts will contribute to reducing inequalities within cities, fostering a sense of belonging, and promoting social cohesion. Cities that integrate social justice principles into their smart governance frameworks will be better positioned to create sustainable, inclusive environments where all residents can thrive.

5. Comparison

A comparative analysis of various smart city models reveals different approaches to balancing innovation, accountability, and inclusivity. Cities like Barcelona and Tallinn represent successful examples of smart governance, where the integration of ICT has been used to enhance urban management, decision-making, and public services. These cities focus on transparency and citizen participation, which are central to the concept of smart governance. They use technologies like AI, IoT, and blockchain to optimize service delivery, improve efficiency, and ensure accountability in governance. Additionally, Barcelona and Tallinn have made substantial progress in fostering collaborative governance by engaging multiple stakeholders, including citizens, in decision-making processes. In these cities, inclusive governance is a key priority, with digital platforms and public services designed to be accessible to all citizens, regardless of their socio-economic background. By ensuring widespread access to digital resources and fostering public participation, these cities have demonstrated how smart governance can lead to more efficient, accountable, and inclusive urban environments.

In contrast, many other cities, especially in the Global South and some developing countries, face significant challenges in achieving the same level of success in their smart city initiatives due to the digital divide and growing inequality. These cities often struggle with infrastructure limitations, lack of resources, and unequal access to digital tools, which prevents large segments of their populations from benefiting from technological advancements. For example, marginalized groups, including the elderly, low-income households, and rural populations, often face barriers to accessing essential digital services. The lack of digital literacy programs further exacerbates this divide, leaving these groups with limited capacity to participate in governance or access digital services. In these cities, smart city policies often fail to adequately address the needs of the most vulnerable populations, leading to social exclusion. As a result, these cities risk deepening existing inequalities, as the benefits of digital transformation primarily accrue to more advantaged groups, leaving many behind in the process.

The comparison between successful smart cities like Barcelona and Tallinn and cities struggling with digital divide issues highlights the importance of developing inclusive and accessible governance frameworks. In cities with successful smart governance models, technology serves as an enabler of accountability, participation, and efficiency, ensuring that the digital transformation benefits all citizens. However, in cities facing challenges such as poor infrastructure and the exclusion of marginalized communities, smart city initiatives may unintentionally widen social gaps. To address these disparities, it is essential to implement policies that prioritize equitable access to technology, digital literacy, and affordable services. Successful smart cities not only promote innovation but also emphasize the need for inclusivity, ensuring that all residents, regardless of their social or economic status, can participate in and benefit from digital governance. In this context, accountability and social equity must remain central components of any smart city model to ensure that no one is left behind in the digital age.

6. Conclusion

The transformation of public service law in smart cities must be adaptable to technological changes. As urban areas increasingly adopt digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data analytics, the legal frameworks governing public services must evolve to accommodate these innovations. These technologies enable cities to improve efficiency, transparency, and citizen engagement, but they also present new challenges in terms of privacy, accountability, and accessibility. Public service law must ensure that technological advancements do not undermine citizens' rights or create new forms of exclusion. The law must be flexible enough to support technological progress while maintaining core values such as equity and accountability. This adaptability is essential to effectively regulate emerging technologies and guide smart city development in a way that benefits all citizens, preventing the marginalization of vulnerable groups and ensuring that technological progress aligns with broader societal goals of inclusivity and fairness.

An inclusive approach is crucial for the successful development of smart cities. While smart city technologies hold great potential for improving urban living, they also risk exacerbating existing social inequalities if not implemented inclusively. Ensuring that all citizens, regardless of their socio-economic status, have access to the digital tools, services, and platforms that enable participation in governance is essential for fostering social equity. Marginalized communities, including the elderly, disabled, and low-income populations, are often at risk of being excluded from the benefits of smart city initiatives due to a digital divide. To address this, smart city frameworks must incorporate policies that provide equitable access to technology, promote digital literacy, and ensure that vulnerable populations are not left behind. By emphasizing inclusivity, smart cities can ensure that the benefits of digital governance are shared equally, fostering a more democratic and participatory urban environment where all voices are heard and valued.

This research contributes to the development of modern urban law frameworks by highlighting the need for legal reforms that integrate technology with inclusivity and accountability. As cities move toward more technologically advanced governance models, the law must evolve to address the complexities introduced by digital transformation. Existing legal frameworks often struggle to keep pace with the rapid pace of technological change, creating gaps in regulation and leaving citizens vulnerable to privacy breaches, discrimination, or exclusion. This research advocates for the creation of legal frameworks that not only accommodate emerging technologies but also prioritize the protection of citizens' rights and promote social justice. By addressing these concerns, the legal systems governing smart cities can ensure that technology serves the common good and fosters equitable urban development. This study lays the groundwork for future legal frameworks that will guide the development of smart cities in a way that balances innovation with the fundamental principles of fairness, transparency, and inclusivity.

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