Building Participative E-Governance in Smart Cities

Subjects: Public Administration

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The successful implementation of institutional and technological innovation is critical for the effective execution of e-governance in smart cities.

e-governance   institutional innovation   technological innovation   stakeholders' satisfaction

smart cities

1. Introduction

More than half of the global populace resides in urban areas, and this proportion is anticipated to be 75% by the year 2050 [1] [2]. Rapid urbanization necessitates cities to actively seek more smart approaches to address the various challenges that arise, including but not limited to security, stakeholder satisfaction, air pollution, traffic congestion, inefficient energy usage, and waste management [3][4]. Urbanization is an inevitable extension of worldwide social and economic advancement and industrialization. Urbanization continues to get more prominent in society, coupled with more obvious urban challenges [5]. The challenge of urbanization in the context of information technology has given rise to a novel concept known as the "smart city". This concept entails the use of appropriate artificial intelligence (AI) information and communication technology (ICT) and the Internet of Things (IoT) for promoting urban development [6]. Smart cities strive to enhance government services, citizen well-being and satisfaction, and overall operational efficacy through AI, ICT, and IoT [7][8][9]. Applying AI, ICT, and IoT frameworks is instrumental in addressing various problems arising from urbanization, comprising economic, social, and environmental dimensions. Moreover, the application of this technology extends not only to traffic monitoring and parking remotely, but also to the management of common public services electronically, e.g., e-governance [10].

Governance is a comprehensive and multifaceted concept encompassing complex mechanisms and networks involved in governing. It entails the activities of ruling, collaboration, and management [11][12]. Governance plays a vital role in urbanization due to the significance of relationships and networks across numerous stakeholders to combat smart cities' "wicked problems" [13]. Smart cities provide a unique approach to urban governance, wherein ICT and IoT are employed to facilitate improved cooperation and networking among various stakeholders [14][15]. Internet use and open data policy implementation improve information accessibility, thus promoting citizen engagement in public decision-making [16] to foster their satisfaction. A smart city is an ecosystem that facilitates the public and private sectors' collaboration with citizens to develop innovative solutions for urban issues [17]. In addition, a believed feature of smart cities is facilitating good governance. Good governance comprises decision-making processes driven by transparency, democracy, and inclusivity, with various stakeholders engaged [18][19]. Previous research on smart city governance emphasizes two fundamental elements. One key aspect is prioritizing various stakeholders' involvement [4][20][21], specifically focusing on citizen engagement and inclusive decision-making [22]. The second critical attribute involves using ICT and IoT in governance, facilitating stakeholders' engagement, cooperation, and transparent decision-making [23]. Smart city governance, which evolved from e-governance, strives to enhance administrative effectiveness, citizen-centricity, and collaboration between government and other stakeholders [24]. E-governance in smart cities emphasizes stakeholder collaboration supported by digital technologies [20][23].

Technological innovation in the public sector has recently attracted considerable attention in the academic literature [25]. The public sector should adopt technological innovation practices to solve several composite and complex issues, considering their constraints and existing resources in response to stakeholders' expectations and satisfaction [26][27]. The diffusion and adoption of innovation may be utilized. At the same time, the evaluation of technologies [28], smart city governance, and planning the literature culminate in the important contribution to the quality of the smart city environment, not only in terms of the results, but also in the process of realizing such results. Smart cities may not use the most advanced technologies, and still, they may be capable of providing successful and better outcomes [29] in the shape of sustainability, economic growth, and better safety and of providing a better process in the form of better decision-making, the implementation of policies, and the depletion of the number of conflicts. Institutional innovation is expected to be dynamic for realizing flexible smart city governance to stakeholders' satisfaction [30][31]. In this research, institutional innovation refers to deliberate variations in joint choice institutions that allow smart cities to be more effective and perform better to enhance stakeholders' satisfaction.

Scholars have begun exploring innovation in different domains extensively in current years, both within and on larger scales [32][33][34]. Nonetheless, a substantial focus must be analyzing the institutions that construct and change because of such innovative actions. An institutional approach furnishes significant new understandings of how smart city governance systems may or may not change cities' level of satisfaction.

The existing body of literature has demonstrated a positive correlation between e-governance in smart cities and the satisfaction of stakeholders [35][36][37][38]. However, investigating the influence of e-governance in smart cities is challenging due to the contextual nature of the relationship between smart city governance arrangements and stakeholders' satisfaction. Although previous studies in the literature displayed the influence of e-governance on citizen satisfaction [39], innovation and e-governance on smart city performance [40], rural population satisfaction on the service quality of common service centers of e-governance [41], e-governance as a mediating variable, stakeholders' involvement as a moderating variable between AI applications and cybersecurity [42], e-government services on village-level entrepreneur satisfaction [43], and stakeholder participation in e-governance projects implemented in public sector institutions [44], innovation has widely been neglected, especially between the relationship of e-governance and the satisfaction of stakeholders who use online government services.

2. E-Governance in Smart Cities

E-governance, as defined by Dawes (2008, p. 36) [45], "E-governance comprises the use of information and communication technologies (ICTs) to support public services, government administration, democratic processes, and relationships among citizens, civil society, the private sector, and the state." E-governance in smart cities defines a model of governance that attempts to maximize the application of ICT and strengthen the quality of public services provided to citizens. This approach also endeavors to stimulate citizen engagement in decision-making processes and developing policies. This initiative may enhance governance and facilitate the government's digital transformation [46]. The concept of a smart city in Korea advocates for an integrative approach to urban development at the local level. Smart cities are becoming prominent globally, increasing at a rapid pace.

Consequently, providing suitable convenience services for urban residents has become challenging [13]. In the specific context of Korea, the significance and rationality of self-governance are highly pronounced. While e-governance promotes a concept focused on providing services to the people, the development of smart cities at the local level also prioritizes the needs and interests of the people [47]. E-governance improves the government's ability to deliver services to citizens, collaborate with organizations, and facilitate communication promptly and transparently. The primary goal of e-governance is to simplify and streamline administrative procedures. Some of the advantages of e-governance include an eventual decline in corruption due to the digital recording of transactions in the Republic of Korea [48], an improvement in communication obstacles, an improvement in the quality of governance [49], a decrease in overall costs, and increased citizen engagement in governing systems [42]. Similarly, India has successfully implemented e-governance practices to facilitate efficient local and national elections using electronic voting machines, which not only enhance the overall process, but also offer benefits, such as time and cost savings alongside mitigating the risk of vote tampering [50].

A smart city is an urban region that uses various technologies, sensors, and digital media to collect particular data methodically. Smart cities maximize the use of systems by applying AI, ICT, and IoT. Like e-governance, smart cities also offer several advantages: the ability to save time for citizens, a diminished environmental impact, the enhanced efficiency of transportation systems, and the provision of remote security using surveillance cameras [6]. The existing studies on smart city governance emphasize two fundamental characteristics. The first important component focuses attention on the engagement of several stakeholders [20]. The consensus-building procedure has great significance in smart city governance for achieving an understanding among various stakeholders [51]. Interaction between stakeholders may encourage innovative and persistent urban growth [4]. Citizen involvement and community-driven decision-making have been emphasized in particular [22]. Vital citizen engagement in policy formulation can assist in determining citizens' needs and facilitate the development of better services to foster improved living standards. A smart city can encourage citizen engagement through a communication framework based on ICT.

The second key component involves using ICT in governance, facilitating active engagement, collaborative efforts, and transparent decision-making [23]. Smart cities implement ICT to stimulate economic growth, create avenues for transformative change, and promote inclusiveness [47]. Smart city governance is a concept that has emerged from the broader field of e-governance. Its primary objective is to enhance the performance of public administration, promote community-centric approaches, and facilitate effective networking between public agencies and other stakeholders [24]. The strategy described facilitates information sharing, resulting in a streamlined process that enhances service delivery to citizens, optimizes execution, and encourages accurate and inclusive decision-making [52]. The use of digital interactive tools has been

discovered to motivate citizen engagement in the decision-making process [19], thus serving to enhance equality [53] and inclusiveness [54].

E-governance in smart cities stresses developing cooperation and building agreement among stakeholders, bolstered by modern digital technologies [20][23]. To use modern digital technologies, installing ICT systems is essential, which implies the development of extensive urban infrastructure. Hence, political backing and dedication are crucial components in the effective development of smart cities [55][56]. The government supposes an important place in the development of smart cities by providing a vision, strategies, and a welcoming atmosphere for stakeholder engagement and cooperation [3]. Thus, several smart city initiatives adopt a top-down process, which opposes the principles of smart city governance. For instance, multinational ICT vendors undertake smart city initiatives, such as Songdo, to integrate ICT infrastructure in urban environments to offer a comprehensive urban management solution. Nonetheless, the city faced criticism because of its market-driven approach and perceived oversight of routine urban life through surveillance [57][58].

3. Innovation in Smart Cities

Smart cities have emerged as catalysts for innovation, creating development in processes, products, and services. The key technical obstruction for smart cities is to build up an adequate infrastructure that facilitates an optimal environment for information exchange, cooperation, and connectivity among citizens throughout the city [33]. Nam and Pardo (2011: pp. 286–287) [3] emphasize that mobile, remote, and prevalent technologies are not only critical features of smart cities but that *"Those technologies offer benefits to city dwellers in mobile lifestyle. Smart city applications evolve from smart places to networked inhabitants. While the wireless infrastructure is a key element of digital city infrastructure, it is only a first step. A set of technological requisites for a smart city comprises network equipment (fiber optic channels and Wi-Fi networks), public access points (wireless hotspots, kiosks), and service-oriented information systems. Ubiquitous/pervasive computing infrastructure is a key technological component in building a digital city"*.

Innovation can be conceptualized as a collection of innovative strategies executed in smart cities to optimize these environments. According to Glaeser (2011, p. 98) [59], the term "self-protecting innovations" refers to the ability of municipalities to develop internal strategies for managing various challenges, such as security, air pollution, traffic congestion, poverty, and other related issues. This notion can be referred to as a unique version of collaborative innovation [60][61], public innovation [62], or social innovation [63][64] with an emphasis on confronting urban challenges and finding urban solutions.

Institutional Innovation: The proliferation of the "smart city" concept, which envisions the "city of tomorrow", has ignited a significant discussion on innovation. This discussion includes both technological innovation and social and institutional innovation. This integration is considered a crucial element in the redevelopment of smart cities. The concept of institutional innovation introduces an innovative perspective on defining a city's intelligence. In this context, the technological resources, networks, and intangible systems comprising cloud computing and electronic devices should be seen as tools whose value originates from their contribution to realizing smart, sustainable, and inclusive city objectives [10]. From this viewpoint, a smart city is fundamentally interlinked with institutional innovation. The existing body of literature on "institutional innovation" includes various definitions, highlighting the difficulties of defining the analytical parameters of a phenomenon that primarily manifests itself through practical applications [61].

Institutions refer to the constructed frameworks, norms, and rules that facilitate and restrict people's actions in society, thus creating predictability and significance in social interactions [65][66]. In adherence to Hurwicz's (2007) [67] framework, an analogy is made between institutional players or organisms and institutional structures, with the term "institution" referring in particular to the latter. The difference is advantageous for understanding the institutional and legal foundations of organizations. The ability of an organization to assume the role of an individual with clearly given rights and responsibilities depends on the existence of an institutional framework.

The researchers' main emphasis is examining institutional innovation's impact instead of focusing on institutional theory. This research defines institutional innovation as "creating a new and more effective system to encourage people's behavior and the realization of socially sustainable development and innovation under the existing production and living environment" [68]. Institutional innovation has major significance for democratic societies and must be duly acknowledged. The existing body of literature discusses the concept of institutional innovation in the government sector and gives examples from the Seoul Metropolitan Government as case studies. In their research, O'Byrne et al., (2014) evaluated models of institutional innovation in the Seoul Metropolitan Government. The authors described that the government's collaborative techniques with civil society organizations and private sector institutions can enhance institutional innovation by strengthening creativity, leadership, and sustainability [69]. They concluded the positive impacts of institutional innovation on the governance system, citizens, and

networks associated with the Seoul Metropolitan Government. Using innovation as a governance instrument in Seoul resulted in stronger competitiveness for the city, leading to its position as the seventh-largest trading nation to the United States and its position as the 15th biggest economy globally.

Technological Innovation: According to Hollands (2015), the use of technology for improving smart city governance is primarily an effort to build a modern depiction of the smart city, largely influenced by modernistic beliefs [70]. This approach has yet to emphasize the priorities of the local community. Bellini et al. (2022) [71] argued that the widespread adoption of technologies shows a natural bias towards growing cities, as the technologies used for promoting urban growth lack appropriate urbanization processes. If a solution to this challenge remains elusive, the technology can experience a transformation and become "censored", thereby exerting control and control over urban stakeholders. Meijer and Bolívar (2016) [15] suggest a strong scientific understanding of the interaction between technological innovation in smart cities and governance mechanisms to combat this challenge. Janowski (2015) [72] contended that the use of technology in cities needs to be approached with careful consideration of regional characteristics and specific environments. It is because the success of technology is conditioned upon its context in a given environment. Hence, the functionality to enhance smart city governance adheres closely to the real needs of various stakeholders in the city and its current governance strategies. This perspective assists in a shift in the perceptions from a specific focus on technology-driven methods to a greater comprehension of technological innovation as a socio-technical process. The definition of technological innovation proposed by Mario Coccia (2021) [73] was adopted in this research. According to Coccia, technological innovation refers to "a complex system composed of more than one entity or subsystem of technologies and a relationship that holds between each entity and at least one other entity in the system for achieving specific goals".

This entry analyses the link between technological innovation and social perspectives, particularly emphasizing the interrelated emergence of technology and social conditions in smart city contexts. The aim is to understand how these factors mutually influence each other to ensure the stakeholders' satisfaction. The governance in smart cities entails the adoption and use of cutting-edge technologies and also "changes in routines, collaborations, and roles of actors" in the smart cities' governance [74]. This view states that the understanding of technology goes beyond its objective nature, contrary to common belief. However, it is highly connected with its social environment and shaped by a social contract. The factors influencing the adoption or denial of a technology may be closely linked to the social context. It is essential to examine the guidelines used to determine the superiority of technology and the various actors, including citizens, groups, and stakeholders, who participate in granting significance to technological developments. Therefore, there is a critical need to establish a link between the importance and substance of technology and its broader social setting. It is crucial because the social context clarifies the basis for the technological goals, impacts the layout and development of technical abilities, and examines the efficacy or failure of innovative technological adoption [75].

▌ 4. E-Governance and Stakeholders' Satisfaction

E-governance refers to a transformative system that city governments adopt to use artificial intelligence (AI), information and communication technology (ICT), and the Internet of Things (IoT) to establish interconnectedness among public entities and the private sector. To optimize e-government services and enhance security measures for the general public and other relevant parties, various governments have tried to adopt e-governance strategies [42]. However, according to a 2014 UN e-government survey [76], most citizens express concerns regarding their privacy and security when using e-government services. The academic literature about public management has been engaged in the ongoing endeavor of understanding the methods employed to assess the effectiveness of e-governance within smart cities. Certain academics posit that the evaluation of governance can be determined by its impact on various aspects, such as the environment, people, economy, mobility, and the overall quality of life experienced by the populace [77]. Other researchers have different opinions, and they claim that the main characteristics of governance are the various goals and objectives of participating actors. Different city stakeholders may like a project from the local government according to their demands that satisfy their needs. For instance, citizens would like to improve their natural environment, neighborhood, living standard, and basic health, water, and education facilities. At the same time, housing societies may want an environment that will flourish their business activities to attract tenants while security agencies may highlight crime reduction [14]. For citizens, as one of the key stakeholders, effective governance requires the efficient and sustainable provision of housing, transportation, sanitation, employment, sewerage system, water, power, and additional facilities at an augmented pace. It also requires great attention to access basic human growth indicators, including security, healthcare, education, social justice, and civic engagement [78].

As per previous research, diversity in objectives means that the success of e-governance can only be analyzed in terms of stakeholders' participation and satisfaction [79]. Uncertainty emerges when stakeholders are challenged with societal problems in their area and have yet to learn the impacts of their efforts to solve them. For example, Lee and Porumbescu concluded in

a study from South Korea that individuals who were regarded as elderly or possessed a disability display notably lowered levels of e-government use when compared to the general populace [54]. Hence, the governments launched information and communication technology training programs for all stakeholders, with a particular focus on vulnerable stakeholders, such as elders and individuals with disabilities, and drew standardized content to educate citizens on computer literacy, enabling them to use the Internet and online services [80] effectively. Likewise, the city government involved stakeholders in decision-making and implementing its policies, including citizens, business associations, institutions, and other target groups. They keep less prominence on autonomous legal instruments, such as regulation and legislation, but use the tools that can be more objective and have space for cooperation and consultation, such as awarding or gaining contracts, subsidies, and covenants as preferred between government and stakeholders [81][82]. It means that the priority of the city government is to refrain from dictating but to provide smart services without creating hassles to satisfy its stakeholders. For stakeholders, communication with the government is only one aspect to consider for their satisfaction. Besides communication, the involvement of stakeholders in public services, decision-making, and policy implementation is also an integral part of smart city e-governance. It is principally important that the process of engagement and involvement of key stakeholders in decision- and policy-making must be fair and transparent [20].

Prior scholars claimed that special attention must be devoted to a stakeholder's general interests (property interest, business interest, political interest, public interest, and state interest) for their satisfaction in smart city and urban governance; not doing so may have social, political, and institutional implications [51]. Stakeholder theory [83] is the most valuable and influential theory supporting the business' and stakeholders' relationship. In this case of stakeholders' satisfaction, importance is given to the relationship between smart city government and its governance system that may lead to better performance, e.g., stakeholders' satisfaction, as government institutions that integrate societal actors with their considerations enhance the satisfaction for their stakeholders. When the city government engages its stakeholders in policy and decision-making [63][84], enabling them to approach the necessities of life and collaborate with them to create and utilize ICT-based strategies to host e-government [23], stakeholders' satisfaction will be enhanced positively.

5. Contextual Impact of Institutional Innovation

Institutions are human-created structures, values, and procedures that facilitate and regulate the behavior of social actors and make social life predictable and purposeful [85][86]; understanding the institutional and legal bases of organizations has benefits in the distinction between institutional actors and arrangements. Within the confines of an institutional arrangement, an organization can only function as an individual entity with specific rights and responsibilities [32]. An institutional arrangement can be extremely simple or extremely complex. While institutionalists generally define institutions as controlling action in organizational fields [87], institutional arrangements can refer to a specific institutional actor (a firm's internal policies), an industry or demography (technology standards), all inhabitants of a country (levies and land rights), or individuals from multiple countries (human rights regulations, trade agreements).

Institutional innovation is vital for implementing dynamic governance systems while keeping stakeholders in mind and avoiding security breaches [55]. Variations in legislation and programmatic frameworks that organize decision-making, changes in enforcement strategies, fluctuations in structures to achieve specific goals, and adjustments in collaboration mechanisms between various actors may all fall into this category. Scholars have conducted extensive research on innovation in public administration governance in recent decades, both within cities and worldwide [88]. It includes strategies such as policy innovation [89], urban experimentation [90], urban security [91], and urban laboratory cities [92], which involve a diverse range of stakeholders, such as government, business, and civil society. Institutional innovation, in the wider context, is a political endeavor. Ignoring or neglecting the dynamics of authority and control is a typical critique against stakeholder engagement approaches [93]. To strengthen institutional innovation and adaptation procedures in cities, we must fundamentally redefine the concept of stakeholders' satisfaction through their engagement. Self-reflection, ambiguity negotiation, constructive development, and strategic engagement are all required for institutional innovation [94].

E-governance is rapidly being positioned at the core of the ambition of developing the smart city as a holistic idea [14], and scholars emphasize the relationship between smart governance and the need for integrated methods, such as stakeholders [95]. Stakeholder engagement in decision-making is critical for smart governance and is a prerequisite to becoming a smart city [20]. City governors prefer to engage stakeholders in decision-making to deliver upgraded smart services using ICT that increase their satisfaction [95].

6. Contextual Impact of Technological Innovation

Governance in smart cities is primarily responsible for managing information flows among stakeholders and collecting/accumulating/managing data collected through innovative technologies related to value-added processes in smart cities [96]. Moreover, generic enablers (factors that provide reclaimable key components for creating applications for prospective technologies) can certify data integrity and quality, collaborate with all stakeholders across value chains, and elevate internal and external awareness of smart city initiatives. Quintessential roles in city governance include project promotion, execution, structured finance, warrantying, and certification through technological innovation implementation. It emphasizes the importance of such bodies in promoting accountability, transparency, connectivity, and involvement among all stakeholders involved in their satisfaction [17]. E-governance in smart cities is predicated on the technologically innovative use of ICT infrastructure to meet predetermined goals, providing all stakeholders with streamlined, one-stop expertise associated with service system implementation [97].

Innovative technologies serve many purposes, and those used in the field of aging in place [98], technology applications in the care of community-living older adults with dementia [99], usage of electronic means to interact with stakeholders by firms [100], and implementation of easy-to-use technologies for stakeholders for better health at a reduced cost [101] contribute to the satisfaction of stakeholders involved in technology utilization. The viewpoint of [102] has influenced the general description of a smart city. It will be parallel to the depiction of e-governance in a smart city, which enhances the effectiveness of mechanisms in the field of health, education, disaster management, e-services, and safety through the convergence of innovative technology and global ecosystems to allow its stakeholders to live in a healthy environment and to provide simple access to better services [103]. Though some prior literature concedes that urban development poses challenges for traditional governance approaches to provide services to stakeholders and that these are crucial issues for contemporaneously embedded urban development [104], this needs to be discussed.

The e-governance concept is one approach that aims to consolidate issues of stakeholders' engagement with smart city developments [102][105]. While originally envisioned as a framework for e-service provision, it rapidly expanded to encompass all city components, including safety, health, and education. The concept intends to consolidate urban growth with the need for electronic services with ICT applications and by utilizing a variety of other innovative technological functions and optimizing the distribution of security resources [103]. Moreover, a smart city is defined as the integration of innovative technology and the natural environment that improves the efficiency of dealing with the utilities and enables the accessibility of a peaceful ecosystem for stakeholders [102]. They include issues such as stakeholder satisfaction and whether technological innovation has benefited those subjected to the intervention and those not. It is critical because stakeholders are at the heart of any urban safety intervention and vital to providing better services through ICT [105]. Measuring stakeholders' perceptions of urban security is an important aspect of e-governance in smart cities because it ensures that cities not only react to the demands of inhabitants and potential security risks, but also persist as an appealing place to live for stakeholders [17].

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