***Review Article***

**Agile Governance for Smart Cities: A Framework for Sustainable Public Infrastructure**

**Abstract**

The increasing complexity of 21st-century urban development has spurred a global move towards smart city initiatives associated with improving the quality of urban life, economic efficiency, and environmental sustainability. Smart city projects are, by their nature, interdisciplinary, have a multiplicity of stakeholders, evolve rapidly in technology, and must be sustainable over the long term, which all create specific challenges to their management. Regarding the methodology, a comprehensive review of scholarly journals and credible online materials is conducted. Key findings from the reviewed journals and materials on the agile governance framework for smart cities are presented thematically. In this review, a comprehensive, agile framework for smart city project governance is proposed, which is geared towards dynamic smart city project environments, particularly sustainable public infrastructure projects. The framework integrates principles of agile project management, collaborative governance, and metrics to address well-known pitfalls in smart city initiatives, including bureaucratic inertia, fragmented decision-making, and inactive citizen participation.

The proposed model focuses on iterative planning, adaptive policy in mechanisms, stakeholder co-creation, and performance evaluation in a continuous model using real-time data analytics. The applicability of the framework is validated by studying case studies of leading smart cities and extracting best practices from these. One of the examined case studies on the implementation of a smart city project was the Jogja Smart City project. Furthermore, the study investigates the part played by digital tools such as IoT, big data, and AI in improving transparency, accountability, and the responsiveness of smart city project governance. The results indicate that an agile governance approach contributes to improving project operation efficiency and innovation capacity, as well as the social and environmental resilience of public infrastructure projects. A model for practical and scalable intelligent and agile urban governance that facilitates sustainable urban transformation is the key contribution of this review. The paper recommends that governments and all concerned stakeholders in city and urban development need to integrate the concept of agile governance in smart city projects for sustainable public infrastructure.

**Keywords:** Smart City, Project Management, Agile Governance, Sustainable Infrastructure, Sustainability, Artificial Intelligence, Internet of Things, and Real-Time Data Analytics.

**1.0 INTRODUCTION**

Urbanisation is increasingly common around the globe as a way to build and grow communities. Over the years, more people have moved into cities worldwide. Large numbers of people are choosing to settle in cities every week. In 2050, around two-thirds of the world’s people will be urban residents, according to a United Nations report, with cities’ population set to double that of rural areas. The health and stability of the world’s future greatly depend on cities (United Nations, 2018). People living in cities are going up swiftly, resulting in more road jams, trash, and greenhouse gases (Sun & Weng, 2024; Gao & Zhu, 2022). Consequently, a growing number of cities are now involved in smart city initiatives, using and mixing innovative information and communication technologies (ICT) (UN-Habitat, 2024). Europe will have the largest number of smart city initiatives globally (Frost & Sullivan, 2018). As the number of European smart city initiatives grows and they try to implement smart city initiatives, facing technical, managerial, governance, and financial challenges, it is argued that it is important to know the underlying processes for effective implementations (Beckers & Mora, 2025). Some important characteristics that smart city initiatives have in common with firms’ digital transformation (DT) initiatives are shared (Anthony et al., 2021). Such characteristics include the use of infrastructure and service environment, based on ICT, and a great number of unique or different stakeholders involved in the change (Agboola et al., 2023).

Several governments have encouraged building a smart city to better handle city management and growth. Most studies say that smart city projects involve using current technologies to help make urban systems more efficient (Tan & Taeihagh, 2020). Most experts believe that by focusing on what local people require, smart city development enhances the daily lives of people (Huang-Lachmann, 2019). When physical, digital, and social systems are effectively brought together in cities to improve sustainability, prosperity, and inclusivity for local people, such cities are called smart cities, according to de Genaro Chiroli et al. (2025). Mainly, the concept of a smart city is defined by the use of new ideas to tackle the increasing social, economic, and environmental issues that growing cities face (Yigitcanlar et al., 2018). As cited by Lam and Yang (2020), it is predicted that there will be around $2 trillion of business opportunities related to smart cities in the future.

The building of smart cities is associated with many obstacles. Lam and Yang (2020) point out that government budgets are being strained, and much of their infrastructure requires updating. Alim and Polak (2016) explain that one obstacle to developing smart cities is the difficulty of obtaining public money. Another obstacle to developing smart cities is a lack of cooperation among key stakeholders (Marfuah et al., 2024). However, this can be addressed if multistakeholder development is integrated into building smart cities. Multistakeholder development means including municipal bodies, residents, and different private and not-for-profit organisations with various intentions. Availability of modern services is another key obstacle to building smart cities. Having modern services is necessary for a smart city, so providers should be highly inventive in what they do (Ojasalo & Kauppinen, 2016). Additionally, smart city development halts due to limited resources, budgetary, and apparently human, and this is also true for developing countries (Zatarain & Millan, 2021). Resistance to change, on the part of the government and society, is another challenge (Marfuah et al., 2024). It is not something that happens overnight to change an organisational culture, which by nature is bureaucratic and hierarchical, into one that is collaborative and adaptive (Noennig et al., 2024). New technologies are also accompanied by legal concerns regarding privacy and security, and the digital divide (Herawati et al., 2025).

Implementing the concept of agile governance in smart cities overcomes critical difficulties that accompany the complexity and swiftness of the urban ecosystem, where overshadowing technological innovations and changing citizen requirements necessitate mobility and agility (Noennig et al., 2024). Conventional structures in the field of governance in the context of administration presented in the past can be characterised by an orientation to long-term planning, formal compliance, and risk aversion, which are incompatible with the sequential, experimental, and explorative attributes of agile approaches. Such tension poses challenges to the application of smart city initiatives, which involve constant feeds, cooperation with stakeholders, and fast adaptation to new challenges in the city. As an example, a prolonged procurement cycle and bureaucratic regulatory environment may not support the agility that is required to develop sustainable public infrastructure, and this would limit the responsiveness of the city to technological and social innovation and change (Noennig et al., 2024).

Essentially, smart cities are a paradigm of urban development developed based on the widespread application of sophisticated technologies to improve urban life. Although the exact definitions and application of smart cities may differ slightly, the larger idea is to develop an ecosystem in which the cities operate more efficiently, and sustainably and are livable in general. This goal is a great one, but reaching it includes some competing priorities across stakeholders, citizens, and industry groups, matched with limited resources to bring those elements together and manage them. Hence, in building smart cities, agile governance must be part of effective management. Issues relating to the governance of smart cities have generally been well reviewed in the literature. However, less covered in the literature are the integration of agile governance frameworks in smart cities for public infrastructure sustainability.

The design of the agile governance in this context focuses on its ability to be flexible not only in the execution of the smart city projects, but also the policymaking with the collaboration of municipalities, the private sector, academic institutions, and the citizens being graced with encouragement. The issues surrounding infrastructural deficiencies and cheapening digital culture are essential elements toward equal access to the ecosystems amid smart cities (Lytras et al., 2024). Effective agile governance structures aim to bridge the discrepancy between formal, strategic objectives and agile, progressing project management that cities can strategically manage risks, as well as drive constant value to the population. This kind of governance promotes sustainability in terms of advanced community-oriented decision-making and a way of adapting learning that helps build resilience and integrated urban infrastructures within communities (Lytras et al., 2024; Noennig et al., 2024).

Agile governance integration into smart city project management is a transformative way of enhancing urban development. Typically, smart city initiatives are dynamic and complex which poses a problem for traditional governance structures. This review explores Agile Governance as a methodology that can increase public infrastructure projects' responsiveness, stakeholder engagement, and sustainability.

**2.1 Brief Evolution of the Smart City Concept**

The evolution of the concept of a smart city has been truly revolutionary since it came into existence at the turn of the 21st century. Smart cities, however, have initially been mainly associated with advanced technology, including such systems as sensors, high-speed internet networks, and big data platforms (Komninos et al., 2021). However, the meaning of the expression Smart Cities has taken a different and much more holistic 42-focused approach regarding the enhancement of the quality of life of the whole society (Albino et al., 2019). Smart cities are thus seen today as a complex ecosystem where people, technology and the environment come together towards better urban solutions (Komninos et al., 2021). Though individual smart cities are technology projects, they are more than that: good governance, community participation and sustainability in all senses are equally big parts of the picture (Hollander, 2018). Different approaches and implementation models of smart cities in development have been adopted. Study by Meijer and Bolivar (2015) reveals that some cities are concentrating more on the development of technological infrastructure, and some more focus on the enhancement of public services and citizen participation. Some cities also take a more integrated approach, that is, addressing various urban elements at once.

**2.2 Key Challenges Associated with Building Smart City Projects**

**Lack of Suitable Infrastructure:** Smart cities need physical infrastructure (sensors, poles, cameras) and solid IT infrastructure for data collection, processing and analysis. As important as new technologies can be for cities, the high costs and increasing complexity of installing and maintaining IoT sensors and high-speed internet access are challenges that many cities struggle with, and their ageing infrastructure does not help. The infrastructure needs to be scalable and flexible for growth and technology advancements (Al Nuaimi et al., 2015).

**Security, Transparency and Data Privacy:** Protection of citizens’ data and being transparent in how data is being collected and used is a very critical challenge. Smart technology causes privacy and cybersecurity risks which poses a hurdle to its adoption (Kitchin, 2016).

**Effective Coordination Between Public and Private Sectors:** Since it is important but challenging to have a connection between governmental entities and private businesses, project implementation and innovation rely on it (Obasa & Oluyomi, 2024; Danfulani & Gulseven, 2024).

**Political Differences:** Smart city projects need long-term funding and political support, but political differences and a lack of willingness or political will to change priorities change, which can disrupt projects by delaying or causing projects to be shut down (Akgun et al., 2024; Tan & Taeihagh, 2020).

**Incapacity and lack of skills:** Many city administrators and citizens lack the technical knowledge and skills to take care of, use and manage smart city technologies. Success will require citizen education and citizen engagement as 'smart citizens' (Manchester & Cope, 2019; Preston et al., 2020).

**Social inclusivity:** Smart city initiatives need to be conceived to help all the segments of the population and not aggravate social inequalities (Kolotouchkina et al., 2024; UN-Habitat, 2025).

**Funding issues:** High initial investment and ongoing funding for smart city projects can be too much of a load, often acting as a barrier. We often need public-private partnerships, but they are hard to manage (Tan & Taeihagh, 2020; Almarri & Boussabaine, 2023).

**Complexity in Decision making and Vision Alignment:** Clear priorities, measurable objectives and an aligned vision to steer the smart city development needs are extremely difficult to define and articulate among stakeholders which are needed as a foundation to provide the momentum that will prove that investments made in the development of a smart city were worth it and there is progress towards those objects (Reichental, 2021; Wiecher et al., 2022).

**Technological Challenges:** Advanced technologies such as AI, IoT and big data analytics are not broadly known and need to be adapted in context to traditional urban infrastructure project management approaches (Ishaq & Farooq, 2023; Wang et al., 2022).

**2.3 A Case Study**

**2.3.1 Jogja Smart City Project**

The implementation of the Jogja Smart City project, specifically related to the implementation of Virtual City Hall, offers a unique opportunity to achieve agile and digital governance principles (Pramudita & Syafiqurrohman, 2024). As such, smart city initiatives like the Virtual City Hall attempt to exploit digital technologies to improve urban service delivery, enhance governance processes and connect with citizens. Agile methodologies integrated into the governance framework of smart city projects can help the local government adapt to variable situations, enhance collaboration among different stakeholders and achieve the smooth design and delivery of services (Faber et al., 2018). In this case, the governance in a smart city needs to be agile, which means that decision-making can happen iteratively, flexibly and be adjusted quickly in response to feedback and evolving requirements. However, digital platforms and technologies, including digital twins and e-government platforms, are used to enable citizen participation and participation in smart city projects (Hämäläinen, 2021; Domingo et al., 2021). In addition, in order to implement smart city initiatives such as the Virtual City Hall, digital transformation, data-driven strategies, and the readiness of local governments to adopt technology are essential areas of knowledge.

Indeed, the full potential of smart city projects cannot be realised if government officials and citizens are not digitally literate, data security is not guaranteed and if the pressing implementation challenges are not dealt with (Fazil et al., 2022). Additionally, smart city governance not only encompasses the technological part but also includes the social and environmental parts. Following the sustainable development goals, by supporting citizen-driven approaches and increasing the resilience of cities, local governments develop inclusive and sustainable smart cities, bringing the quality of life of their residents to a new level (Kolesnichenko et al., 2021). Agile and digital approaches to governance stand to be of great benefit to the implementation of the Jogja Smart City project, as implemented through the Virtual City Hall. Local governments can increase service delivery while increasing transparency and building smart cities that can respond to the needs of their communities with the use of digital technologies, citizen engagement, and an agile approach.

According to Baltac (2019), smart city initiatives are reported for digital technologies to be used for improving governance, public services, and urban management. A firm, smart city governance framework with support, capacity, and value components is required for successful smart city projects (Nastjuk et al., 2022).

The complexities of smart city governance need to be navigated while taking into account socio-technical facets, as well as public and private stakeholders in the decision-making process. Acceptance and utilisation of digital public services are key indicators of trust and the user experience in the smart city project execution. Furthermore, a citizen-centred smart city mobile application promotes digital participation and governance.

**2.3.2 Transparency and Accountability**

To enable stakeholders to understand the magnitude to which they are impacted by a system, a system provider needs to adequately disclose what the system’s objectives were which design strategies were deployed, the probable positive or negative results of the system, the output of the system, how the system was operated and any remedies required among other critical elements (Sanyaolu, et al., 2023). Dasar Jogja Smart Service's presence of certain menus in the Jogja Smart Service application also shows honesty in the service and complies with regulations. The functionality of this application supports the government’s honesty pledge by providing real-time reports and data immune to manipulation. This application perceives the availability of simplified and central data immediately accessible to the public to be a measure of the area of attainment of legal conformity and adherence. The application of this mechanism makes it possible to create an environment in which it is possible to comply with legally established and legislation-relevant responsibilities. It furthermore advocates transparency and the disclosure of statistics. These are in line with the result presented by Fauzi & Setiawan (2020), that JSS is highly appreciated by the community and government institutions. This community is being constantly monitored by the authorities; consequently, there is responsibility for all services, and there is a higher amount of transparency in real-time reporting on JSS applications.

Agile management is a novel way to direct the engineering, information and communication technology (ICT) design and implementation and the project activity to develop a new product or service as described by Hong and Kim (2020). One of the core strategies outlined here is a high degree of adaptability and flexibility. A methodology or approach which an entity adopts to organise and control information is known as agile management. After this, this approach is incorporated into Government affairs to produce an agile Government capable of moving fast, flexibly and responsively. The idea is to achieve the kind of hyper-transparency that promotes values or procedures, signals policies and empowers teams to experiment with new approaches or outreach (Mergel, 2016). Mergel et al. (2018) then studied agile methods from the software engineering field. Agile government practice broadened the scope to include a broader range of factors, however, the goal is still to shift the organisation’s culture and collaboration methods to a greater level of adaptability.

**2.3.3 Appropriate Choices in Terms of Quality and Quantity**

Providing the right choices when it comes to the quality and quantity of its service, Jogja Smart Service is the best. As far as quality is concerned, it supplies the users with accurate information and services. This characteristic is visible in the app’s capability of showing data in real-time, to guarantee that the information shown to customers is true and relevant. The availability of quality choices in terms of quantity is also shown in Jogja Smart Service. The app allows for various service options that cover a vast range of community needs. Users therefore have access to a wide range of services available and information through this platform. The availability of appropriate choices is significant in the sense that users can choose and access services based on their own needs and choices. Jogja Smart Service provides an abundant choice, offering high flexibility for the community to enjoy the services they need. This application is a comprehensive and effective tool to support various aspects of the life of the community.

Based on the study conducted by Onwujekwe and Weistroffer (2019), the benefits of Agile Government can be seen in the results of different projects. Based on the results of this study, it is suggested that an agile methodology for information systems development in government or public sector organisations is paramount, but is challenging in the face of the bureaucratic nature of those organisations. A case study shows that, as stated by Wen et al. (2020), Agile Government has some advantages. Agile and FLOSS practices coupled with collaborative development technologies are used to create software which can be readily updated and replicated in different government sectors, they argue. Moreover, the structure of management used within Agile Government can be applied to future government and academic collaborations as a model.

**3.0** **METHODOLOGY**

A comprehensive, collecting, evaluating and synthesizing the literature on smart city project management with an emphasis on agile governance frameworks and sustainable public infrastructure was conducted in this study using a desk review methodology. The methodology is based on a structured protocol that guarantees transparency, replicability, and comprehensiveness of identification of relevant academic literature and credible online materials.

A search strategy, using keywords such as smart city, project management, agile governance, agile framework, and smart city governance, was developed to comprehensively capture peer-reviewed, grey literature and reliable online sources. These were searched in the following digital repositories and databases:

Academic Databases (Google Scholar, JSTOR, Research Gate, Scopus, Web of Science, IEEE Xplore, SpringerLink and ScienceDirect);

Google Scholar, UN-Habitat reports, World Bank smart city publications, and municipal government portals were grey literature sources.

The review journals and online materials range between 2015 and 2025, with over 70 per cent between 2019 and 2025.

Data extraction involves the identification and summarisation of important findings, methodologies, and conclusions of each of the selected studies. The key data generated from the reviewed journals and materials were presented as results in a thematic format.

**4.0 RESULTS AND DISCUSSIONS**

**4.1 Smart Cities Governance**

Urban development of recent times is the smart cities. Other forms of city development differ from traditional city development in construction methodology, operational approach and service impact (Shi & Cao, 2022). Liu and Yang (2022) view smart cities as sensor-equipped infrastructure, autonomous vehicles and AI-based services for a better life and efficiency of an urban environment with the image of seamless integration of technology into the urban landscape. However, a smart city is more than just technology (Gracias et al., 2023); it is smart city governance, a holistic approach to how technology, policy and citizen engagement can work together to achieve sustainable urban development.

Smart city governance consequently refers to the forms, regulations and procedures that use modern technologies to improve the management of urban areas (Alshwaheen, 2022). An adaptive, sustainable smart city framework consists of technology, good governance, environmental consideration and citizens (Mpfumira et al., 2024). Smart city governance means utilising Information and Communication Technologies (ICTs) to enhance government services, providing information to the public and boosting efficiency, particularly of relevance in the context of the increasing urban populace and the demand for efficient public services (Raghava Rao & Kumar, 2022). These cities use ICT to promote sustainability by optimal resource management and by reducing environmental footprints (Mrabet & Sliti, 2024).

**4.2 Challenges in Implementing Governance Frameworks in Smart Cities**

Although smart city governance frameworks might provide substantial value, their implementation is obstructed by a variety of technological, economic, social and institutional barriers. The biggest challenge here is the digital divide, which means unequal access to technology by various demographics. Low-income areas and marginalised communities do not have the infrastructure or digital literacy to be part of technology-driven governance. In essence, there stands a high risk of increasing pre-existing inequalities and even compromising the inclusiveness of smart city initiatives (Fang et al., 2019).

There are also the most important data privacy and security issues. The data collected via IoT devices and digital platforms is very prone to breaches, misuse, surveillance and whatnot. The trick is balancing real-time data and the need to protect individual privacy. To this end, governments need to carry out robust cybersecurity measures and legislation to ensure the ethical use of data (Reddick et al., 2020). Not only can smart city technologies effectively serve a city to improve its services, but there is a possibility that their adoption can be constrained by economic constraints.

Building and upkeep of advanced infrastructure can be a capital-intensive affair, which can be difficult for cities without a lot of money. In addition, private-sector partnerships may be overly relied on to the detriment of conflicts of interest and public accountability (Mikhaylov et al., 2018). Challenges in institutions include non-standardisation and non-coordination across different departments and government agencies. For example, smart city initiatives tend to involve cross-sector collaboration but can be stymied by siloed operations (and all the costs and inefficiencies that bureaucratic systems breed).

Furthermore, the pace of technological advancement may be so quick that present governance institutions cannot change to regulate the process of advancement. A second obstacle is social resistance, where citizens may oppose smart city projects because they venture to subvert entrenched systems and processes or because these are seen as being in the interest of elites. Overcoming such resistance is essential for building trust in and for ensuring that benefits are equitably distributed to all users of the health system (Broccardo et al., 2019).

The role of key stakeholders in any area in bringing forth desired results is crucial. Integrating an agile framework will help solve issues created by a lack of cohesion among the key stakeholders. Study by Bello et al. (2025) emphasised that agile frameworks contribute to ‘increased’ stakeholder collaboration as they encompass ‘the inclusion’ of adaptive planning when fast-changing plans and needs arise.

**4.3 ICT Governance for Effective Smart City Governance**

ICT is one of the important foundational, basic components for all smart cities (Pereira et al., 2018). Hence, ICT governance becomes an aspect that should be considered when governing a smart city. Planned, coordinated and enabled utilisation of urban technologies, urban data and urban technologies as means of communication for urban coordination also entails a redesign of urban governance and organisation (Bibri, 2021). It includes policies related to human capital, political and economic development, and governance activities, all of which depend on how ICT can be improved to implement the policies (Tan & Taeihagh, 2020). The imperativeness of smart cities is because they are necessitated by implementation levels of ICT and smart governance to effect better performance in service delivery (Ncamphalala & Vyas-Doorgapersad, 2022). Good governance interlaces with the digital transformation of the ICT process as a smart city governance paradigm of a more urban quality of life, rethinking urban ICT systems, competent human resources and enhancing the urban city resilience in a digital era (Sukmadiansyah dan Noviaristanti, 2022).

ICT can also lead to smarter governance (city government performing its functions more efficiently and effectively) (Pereira et al., 2017). Moreover, the fact that data, information, and communication technologies, as well as urban governance, are everywhere in discussions on smart cities (Odefadehan, 2021), buttresses the fact that ICT is very central to smart governance. This is the delivery of smart services by the smart cities to the residents, which are integrated into governance for development, as an integrated whole (Fatewar & Vaishali, 2021), through effective usage, for instance, of the Internet of Things (IoT), artificial intelligence or machine learning. This is further presented by Fauzi et al. (2020), where the utilisation of ICT was used as the biggest dominating factor for smart city governance applications.

Besides facing these challenges, the use of ICT infrastructure in the overall smart city concept often comes with other ICT infrastructure use, as it can be used in non-smart ways of monitoring, management and decision-making tools (Yandri et al., 2020). In the case of smart city, investment of human and social capital, traditional and modern communication, infrastructure, as well as participatory governance continue to be stressed (Bastos et al., 2022) The smart cities' observation and integration of the status of the infrastructures management, governance, people and communities, as well as natural environments is carried out through ICT (Kumar, 2019). The smart city vision includes merging the city’s physical and digital layers and integrating them fully into the city, and ICT is key to that vision (Kramers et al., 2016).

**4.4 Agile governance as a potential solution**

The challenge of implementing smart cities for sustainable public infrastructure can be overcome by agile governance. Marfuah et al. (2024) describe Agile Governance as a flexible and adaptive structure that helps to navigate the complexity and uncertainty within this paradigm. Applying agile principles, which include collaboration, iteration, feedback, and value to the customer, can make local government more adaptive, responsive, and result-oriented (Highsmith, 2018). The development of smart cities, therefore, can achieve greater collaboration with the government, the private sector, and society, with agile governance (Mora et al., 2023). When many different stakeholders are involved from the beginning, agile governance can make sure that the solutions that are developed match the needs and hopes of society (Marfuah et al., 2024). Local governments can, with the help of agile governance, also manage risks and uncertainties in smart city development. Such an approach allows local governments to use an iterative and incremental approach in experimenting with new solutions on a small scale, before making them available on a broader scale (Noennig et al., 2024). By doing that, it can lower the risk of project failure and ensure that investments made give the best possible results.

Several studies highlight the benefits of agile governance in smart city development, especially. According to Mora et al. (2023), agile governance can assist in collaboration between the government, private sector, and society to develop smart cities in India. Agile governance has been successful in Amsterdam in helping city governments quickly adapt to change and develop innovative solutions for building houses (Marfuah et al., 2024). A case study in Mexico City illustrates how agile governance can enhance transparency and accountability in the implementation of smart cities.

**4.5 Agile Governance Framework for Sustainable Public Infrastructure Initiatives**

This section explains the designed agile governance framework for sustainable public infrastructure initiatives. This framework integrates different dimensions of growing a smart city. This is a new approach to establishing sustainable smart cities. The integrated dimensions include smart living, sustainability, smart economy, humanism, smart government, resource management, citizen and society participation, market orientation, and institutional and digital dimensions. The inputs and contributions from the various dimensions will consequently help in the management of smart city projects.

**HUMANIST**

**RESOURCE MANAGEMENT**

**MARKET ORIENTATION**

**SMART ECONOMY**

**DIGITAL**

**SMART LIVING**

**SMART GOVERNMENT**

**CITIZEN & SOCIETY**

**SUSTAINABILITY**

**INSTITUTION**

**Figure 1:** A Designed Agile Governance Framework

**4.5.1 Smart Living Dimension**

Smart living is one of the key areas of sustainable smart cities. Smart Living is becoming a very important factor towards the rise of sustainable smart cities in many places all over the world. It involves using digital technologies, intelligent systems, to enhance the living experience of urbanites in issues like health, education, housing, security, and social engagement. This is with the aim of improving the quality of life, and having long-term sustainability and resilience (Smagilova et al., 2019). In contrast to strictly technical innovation, Smart Living focuses on the human-based solution, which supports well-being, inclusivity, and active participation of the citizen.

Across the world, the Smart Living concept could be adapted to suit local social, cultural and economic situations. As an example, there can be a combination of mobile health units and telemedicine to increase access in the underserved areas, as well as digital education platforms that can bridge the learning gap among those who are remote or low-income (Jones-Esan et al., 2024; Olaleye et al., 2023). With the combination of energy-efficient technologies and smart devices, smart housing satisfies the added comfort and convenience but also helps in conserving energy (Smart Lifestyle Australia, 2025). In the same way, AI-powered surveillance and predictive analytics can improve the safety of the population as long as the ethical imperatives and the issue of privacy are properly considered (Ziosi et al., 2024).

**4.5.2 Sustainability Dimension**

The Sustainability Dimension emerges as one of the central areas in the realization of sustainable smart cities, where the issue of the responsible use of natural resources and the minimization of the impact on the environment, as well as attention to climate resilience via incorporating the latest technologies, are in the spotlight (Janik et al., 2019; Kuntsman, 2020). It entails the introduction of intelligent energy systems (smart grids), green infrastructure, viable transportation solutions, and the use of the circular economy principles so that cities can be able to achieve their current and future demands without having to disrespect the ecological integrity (Bibri et al., 2023; Ahvenniemi et al., 2017).

The world can achieve this dimension by engaging in investments such as renewable sources of energy, streamlining waste and water networks to coordinate or integrate with the IoT, and instilling sustainability indicators into the workflows of city planners (Yigitcanlar et al., 2018). Such practices do not only decrease the amount of greenhouse gases they also positively impact the health of the population, the resilience of the city, and the ability to meet several Sustainable Development Goals (SDGs) by the United Nations, SDG 11 (Sustainable Cities and Communities) and, SDG 13 (Climate Action) in particular (United Nations, 2015).

**4.5.3 The Humanist Dimension**

The human dimension is also critical to agile governance for smart cities development. When talking about smart city development, it should be emphasised that the digital and technological aspects thereof should not be ignored, with people (and their humanist implications) rightfully playing a role in the mix. Smart cities offer a humanist approach to the design of urban environments that builds positive value for citizens in their lives. This facet also importantly informs the identification and alleviation of some negative facets of modern urban living, homelessness and climate anxiety. Philosophical humanism, ecological ethics, and sociocultural approaches are introduced as these aspects delineate how sustainability and livability are important (Xu et al., 2022). The more technologically oriented communications development initiatives in Smart city initiatives need to emphasise the human-centric nature (Rahbarianyazd, 2024). Sustainable development and prosperity of urban areas rely on the use of human, collective, and technological capital and are based on this concept of smart cities (Alverti et al., 2020). It would not be a smart city without the technological part and without the human dimension; it would not be a smart city.

**4.5.4 Resource Management Dimension**

The challenge with limited resources exists in every city. A Smart City is one which utilises its ICT to integrate resource management, including critical resources properly and limitlessly, to enhance the efficiency and effectiveness of use and to ensure equitable allocation across the large number of initiatives that are undertaken. For example, concerning water resources, smart cities use technology, for example, the Internet of Things and machine learning, to efficiently capture and manage the resources while working towards building a sensitive city by having a well-defined vision (Gușul & Butnariu, 2021; Šulyová & Kubina, 2022). Additionally, a Smart City can monitor and operate certain essential infrastructure functionality, control maintenance activity, and optimise resource usage while maintaining security (Joshi et al., 2016). The good examples of managing critical water resources are Sponge Cities. A more resource-efficient management and economy runs a smart city than an ordinary city, through the application of current methods of information technology to facilitate smart response to various public service needs, social management, and industrial operations (Impedovo and Pirlo, 2020). As they integrate into many parts of a city’s infrastructure, they are also a resource for a city to implement effective and environmentally sound housing initiatives. Smart city development makes managing energy a key element; that is, energising smart cities as much as possible with energy resources while ensuring their sustainability and self-reliability (Rajendiran, 2022).

**4.5.5 Smart Economy Dimension**

The smart economy under the smart cities promotes the encouraged development of e-business, e-commerce and new entrepreneurial opportunities. They realise or become conscious of the fact that the broadband economy is something that has to be actualised; there are steps that have to be taken to achieve vigorous economic development. Earlier stated that a smart city depends on ICT to improve service quality, strengthen control over public resources and focus on comfort, maintenance and sustainability. The other aspect is the smart economy dimension of smart cities, which refers to managing economic growth, participatory approaches to innovation and promotion of competitiveness, including stimulation of new businesses. As one of the key dimensions to assessing smart cities and accommodating the competitiveness of small and medium-sized enterprises in the city, the smart economy is examined (Ali & Nencioni, 2021; Youssef & Hajek, 2021). Intelligent city economies equally depend on ecosystems that can catalyse start-up businesses and data management.

**4.5.6 Smart Government Dimension**

The success of smart cities requires smart government, a concept that nurtures sustainable urban development, encourages social participation, and inclines the local communities toward taking up decision-making processes. The platform promotes collaboration and co-creation among various stakeholders and supports using technology for sustainable urban development and climate change adaptation.

The role of smart government in a smart city is how it develops and fosters such data ecosystems that interweave ICT across all of the dimensions of a city. That is, it contributes to sustainable urban development and engages local communities in the decision-making processes (Szarek-Iwaniuk & Senetra, 2020). Urban human resource management is viewed as a governance capability brought together from urban historical context, resource characteristics, facility layout, city sustainability, and service innovation (Lyu et al., 2022). The importance of smart government is to improve good governance and create collaboration between the local government organs, private parties, and community groups so that this collaboration becomes an important one for smart city programs (Triyanto et al., 2022).

**4.5.7 Citizen and Society Participation Dimension**

Sustainable construction of smart cities cannot be properly done without the Citizen and Society Participation Dimension, which makes sure that urban change is driven by the voices, needs, and rights of people who the city belongs to. This dimension will foster active civic participation, collaborative governance and digital inclusion, meaning that citizens will be able to co-create publicly available, both in terms of making decisions and in terms of design, policies, services and affairs of the city, together with the administration, using such tools as e-participation platforms, open data projects, and participatory budgeting (Adhikari et al., 2025; Mutiarin & Lawelai, 2023).

Consequently, citizen involvement begins to form a foundation of smart city governance and its benefits for enhancing democratic process, transparency, and citizen-based urban development (Basu, 2025). This means citizen involvement in smart cities is the involvement of citizens in the governance and management of the city, e-democracy, and active user involvement. This work is supported by Domingo et al. (2021). Involvement of the citizens is important for smart city initiatives to be successful because it lets cities be more citizen-centred towards urban innovation, increases the legitimacy and justice of governance processes (Soomro et al., 2017), and finally increases the quality of life (Kusumastuti & Rouli, 2021). The structure of smart city infrastructure driven by citizens’ collaboration within the governance process highlights the significance of citizens’ involvement in, in addition to two-way communication between the government and citizens as smart cities leverage new technologies to increasingly promote this dialogue via, online public consultations, discussions, Petitions (Ngo & Le, 2021; Park & Fujii, 2023). This also happens inside the city, in the form of co-creation activities, where citizens are no longer only passive consumers of city planners’ initiatives, but are actively involved themselves. The result is pride and ownership of these initiatives.

**4.5.8 Institutional Dimension**

In establishing effective connections between people and ICTs in smart cities, important institutional factors such as governance, regulations, and policy are likely to be vital factors for smart cities to offer services (Tan & Taeihagh, 2020). Designing and running a smart city requires active cooperation in a harmonious way among people, technologies, government, and policy (Kamil et al., 2025; Billhardt et al., 2018). Smart cities are state-run, and therefore, any paucity of these factors might cause issues. Governments have always had a challenge integrating new policies (Al Hinai et al., 2022).

In the case of smart cities, therefore, since technologies are by nature unpredictable and normally embedded, there is a risk that wrong policies will be brought in on that foundation (Rogers, 2025). Also, making systems whose modes of governance are more effective in such cities creates tensions and threats as the citizens resist efforts at stifling rights to privacy, freedom of expression and confidentiality. Accordingly, in addition to framing projects within a multi-stakeholder, municipally based partnership, better coordination is required between different sectors by breaking down silos and joining different sectors (Monzon, 2015).

**4.5.9 Digital: Real-time Analytics**

Digital platforms provide seamless modes of interaction between city administrators, stakeholders and citizens for the formation of transparent and collaborative urban governance. For instance, real-time traffic management systems help to increase public health outcomes and reduce congestion, and digital health monitoring systems help to reduce congestion and improve public health outcomes (Secinaro et al, 2022). In addition, open data policies implemented in platforms enable the participation of citizens in accessing and forming part of urban planning processes, hence having their voice heard in the development of policy and its implementation. Innovations in this regard transform smart city governance to be a technological endeavour as well as a people-centred initiative to create just, equitable and sustainable urban environments.

Smart cities will only be effective if they are able to integrate ownership from the communities within them and concurrently provide real-time, inclusive decision-making. Disengagement from community activities is not an additional activity in democratic and sustainable urban management (Arnstein, 2019). Including multiple voices helps city planners guarantee that the policies and initiatives embody what all the citizens need and desire, especially the strangers whose perspectives are absent from regular governance arrangements. In this context, digital platforms, notably online forums, mobile applications, and even social media channels, act as vehicles that offer accessible and user-friendly platforms for participation (Dawodu et al., 2021).

Smart city governance also entails making real-time decisions. Urban challenges, including traffic congestion, air pollution, and emergency response, are dynamic challenges and need rapid and data-driven solutions (Sarker, 2022). City officials are empowered to respond proactively to emerging issues through digital platforms with real-time analytics and predictive modelling (Adaji et al., 2025). For example, when a natural disaster occurs, it requires the deployment of resources in affected areas quickly, and to minimise loss, sensors and data feeds can instantly provide information about affected areas. Likewise, real-time air quality monitoring can trigger timely actions to minimise polluting impacts and shield public health (Ma et al., 2019).

**4.5.10 Market Orientation Dimension**

For a smart city, market orientation represents a program of action whereby city planners and developers prioritise the understanding and fulfilment of residents’ and other stakeholders’ needs and preferences as they pertain to the city (Starc-Peceny et al., 2017). Essentially, a widespread problem we see in city planning is the discounting of the contribution of marketers to the detriment of engineers and city planners (Starc-Peceny et al., 2017). A market orientation for a smart city means changing roles — the city planners should start to engage citizens and other key players from the very beginning of the planning process. In this approach, they seek their feedback, involve the community and customise community initiatives based on what its members want. Market insights with customer feedback provide projects that align better with community needs, leading to more efficient and effective sustainable initiatives (Alt et al., 2019).

Market-oriented smart cities can foster a more inclusive, responsive, and sustainable urban environment, using technology to do so, but keeping the human in the centre of urban development (Maček et al., 2019; Zhao et al., 2021). Furthermore, marketing can help intercept citizens' needs, as well as play a decisive role in mitigating resistance to change, putting efforts into communicating the new sustainable initiatives to the community so that new sustainable initiatives are met (Huertas et al., 2021).

Studies that have examined smart cities governance have not integrated these various dimensions. Critical integration of these dimensions will effectively yield sustainable smart cities for public infrastructure. Also, this framework can be applied by any government or concerned stakeholders in building smart cities and consequently establishing urban development.

In addition to the key dimensions of the suggested effective agile governance, these inherent components of the framework need to be paid attention to. Agile governance reiterates the principles of flexibility, adaptability, data-driven decision-making (OECD, 2023a), collaboration, and a value focus to deliver to the citizenry (Hardi et al., 2025). It allows city governments to dynamically respond to changes in technological aspects as well as urban challenges and drives sustainable outcomes by integrating planning and active public participation (Herawati et al., 2025; Awuzie & Monyane, 2020).

**5.0 CONCLUSION**

Smart city initiatives provide an important transformation in the governance, development, and sustainability of urban areas. Smart city projects are complex, multi-stakeholder, and technologically intensive and therefore require innovative project management and governance. Traditionally, as revealed by literature, project management frameworks have proved deficient in meeting the dynamic connectedness and continuum of needs of smart cities in terms of sustainability, stakeholder alignment, and rapid adaptation.

The key aim of the review was to demonstrate the relevance of agile governance, comprising flexibility, continuous feedback, cross-sector collaboration, and iterative development, as a robust framework that can be used to manage smart city projects around the globe. Introducing agile principles into public infrastructure planning and execution by city administrators and stakeholders helps to respond more appropriately to technological changes, citizen needs, and environmental challenges.

**6.0 RECOMMENDATIONS**

Building on the analysis and evidence, we propose the following key recommendations to guide action by policymakers, urban planners, and project managers heading smart city development.

**Making Agile Governance Routine:** Enforce agile governance principles among public infrastructure agencies to strengthen their ability to respond, earn trust and adapt projects over time.

**Form Multidisciplinary and Cross-Sectoral Hubs:** Set up bodies with government officials, business people, educators, and citizen groups to design and supervise all smart city projects together.

**Pay attention to Digital Infrastructure:** Build systems, like flexible online platforms linked with storage and cybersecurity that enable flexible and data-centred administration. In addition, hire and train employees who specialise in agile practices, technology, and sustainable development.

**Reduce risk:** Test out new initiatives in small settings and collect input quickly so the results can be adapted before spreading them wider. The goal of this approach is to reduce risk, save resources and drive innovation.

**Transparency:** Use transparent data sources and encourage people’s involvement by involving them in decisions. It helps earn people’s trust and keeps projects focused on things that matter to them.

**Chart Clear Policies that Promote Flow:** Review and update your rules and contracts so changes can be made quickly, keeping things flexible for agencies and employees and supporting innovation.

**Ethical Standards**

The review does not involve contact with humans.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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