SMART CITIES: CHARACTERISTICS, IMPACT, AND FUTURE WITH GENERATIVE ARTIFICIAL INTELLIGENCE

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ABSTRACT

Smart cities are a growing global trend and include cities like New York, London, and Shanghai. Much of this growth is due to increased urbanization and recent technological advancements. The motivation for many non-smart cities to become a smart city is the ability to improve the lives of its citizens by better managing city services, like traffic congestion, public transportation, and emergency services. With the adoption rate of smart cities increasing, it is important to understand the true nature of smart cities, the full commitment, and risks associated with becoming a smart city before investing the time, money, and resources into becoming one. This article provides insight into the concept, impact, key characteristics, and benefits and challenges for smart cities. This includes a review of some of the globe's top ranked smart cities and highlights the potential impact that generative artificial intelligence can have on the future of smart cities.

INTRODUCTION

Have you ever heard of a smart city? What makes a city smart? Are some cities smarter than others? These are some common questions asked when thinking about smart cities. While many people may have heard of a smart city, the characteristics, realized benefits, and impact of smart cities may not be clear. One of the main reasons that smart cities are a growing trend is that these cities have the potential to improve the lifestyle of their citizens, so there are likely to be more in the future. However, there are some real challenges that must be overcome for a non-smart city to transition into a smart city. This article discusses what a smart city is, some of the critical characteristics and technologies that help to support smart cities, some of the globe's top ranked smart cities, and highlights the potential impact that generative artificial intelligence (GAI) can on the future of smart cities.

PURPOSE

The purpose of this article is to provide insight into the concept and implementation of smart cities, the impact of these types of cities, and highlight the potential impact that GAI can have through a literature review. Given the nature of these types of cities, the literature is relatively recent. As such, the review begins in the early 1990s and includes defining what a smart city is, reviewing some of the key benefits and challenges associated with smart cities, highlighting some of the characteristics and features of smart cities of smart cities and the potential impact smart cities might have in the future. Moreover, this article aims to provide insight into questions like: Will there be more smart cities in the future? What challenges are associated with higher levels of adoption? What is the potential impact of GAI on smart cities?

OVERVIEW OF SMART CITIES

The focus of this literature review is on smart cities and the potential impact that these types of cities can have, and the future with GAI. Specifically, the discussion will define smart cities, provide a historical review, detail the characteristics, highlight the benefits and challenges, and importantly, provide insight into the potential impact that GAI can have on the future of smart cities. To begin this discussion, the following provides an overview of what a smart city is.

Defining Smart Cities

Over the past years, there has been a significant shift in the world's population. Since 1985, the world's urban population has risen from less than 2.0 billion to 4.2 billion in 2018 (Ghosh, 2019) and about 56% of the world's population now lives in cities. Likewise, more than 80% of Global Gross Domestic Product is generated in those cities (World Bank, 2023). In 2009, for the first time, the population of cities equaled the population of rural areas. This rapid growth has put significant demands on the city's ability to provide public services like adequate housing, electricity, water supply, health care, education, employment opportunities (Buhaug et al., 2013) which are allocated to by where people live (Ritchie et al., 2024).

Although the number of smart cities has been increasing, there is still controversy over agreeing on a common definition of a smart city. Mosannenzadeh and Vettorato (2014) created a conceptual framework to define smart cities. They posited that a smart city is a sustainable and efficient city with a high quality of life that aims to address challenges such as improving mobility, optimizing the use of resources, and improving social development by using ICT in its infrastructure and services, collaborating between its key stakeholders, integrating governance, community, and industry, and investing in social capital while Mohanty et al. (2016) postulated that smart cities utilize ICTs to better use resources, improve public services for its citizens and environment. Azizalrahman and Hasyimi (2019) views smart cities from a broader perspective of a sustainable city and develops a model that includes technology, community, economy, and energy, which

facilitates the development of an intelligent city and clearly distinguishes between smart cities and low-carbon and sustainable cities. The National Grid (2020) defines smart cities as using ICT to improve their operations, from street lighting to public transport. They then define characteristics of what makes a city 'smart' in terms of infrastructure that uses connected digital technologies, connected technology to improve environmental and sustainability criteria, progressive city planning, and efficient public transportation and traffic systems.

While there is not complete agreement on the definition of a smart city, there are some similar themes to these perspectives (Azizalrahman & Hasyimi, 2019), including reliance upon technology, improving the lives of the citizens, and sustainability efforts. Mohanty et al. (2016) suggests that the "smartness" of a city describes its ability to bring together all its resources, to effectively operate with maximum possible efficiency to fulfil the purposes it has set itself by effectively using smart components, including smart transportation, smart grid, and smart governance and technologies such as The Internet of Things (IoT) and cyber physical systems

Brief History of Smart Cities

The concept and idea of a smart city is relatively recent and marked by sporadic movement forward. The first significant undertaking towards smart cities can be traced back to the 1970s when Los Angeles created the first urban big data project (GlobalData, 2020). The city managers used IBM mainframes to develop a database of 500 social and physical factors for census tracts throughout the city. The goal was to use the data to inform policy and action to reduce poverty and combat urban decay by providing real-time data to urban policy decision-makers. Next, the 1990s witnessed a global surge in computing technologies, particularly with the onset of the internet. This period marked the rise of city governments utilizing digital technologies to address city problems, including Bangalore in India, San Diego in the U.S., Southampton in the U.K., and Brisbane in Australia, among others. (Hollands, 2008). According to GlobalData (2020), the first smart city was arguably Amsterdam, which created a virtual digital city in 1994, marking the start of the term "smart city. They also established a Digital City, which served as an open network to provide easy access to the internet and improve communication between the government and residents (Bratt, 2022).

Amsterdam created a Smart City platform in 2009 and a partnership among governmental agencies, knowledge institutions, companies, and foundations while IBM improved the knowledge and experience in computing technologies and pioneered a multi-million-dollar "Smarter Cities" marketing initiative. Since 2010, technology firms have reconfigured existing technologies, including sensor networks, communications networks, and automation systems, to modernize existing infrastructure and integrate them into future designs (Pierce et al., 2017). In 2012, Barcelona deployed the Internet of Things (IoT) across urban systems, including public transit, parking, street lighting, and waste management. These innovations helped reduce congestion, lower emissions, and save on water and power (Adler, 2016).

The recent past has seen a transition in the way smart cities are perceived with more focus on people. Trencher (2019) indicates that the concept of smart cities has seen the emergence of its

second generation, the so-called smart city 2.0. The first generation smart city 1.0 was largely techno-economically driven and interested in digital technology diffusion and smart city projects' economic and corporate potential. In contrast, smart city 2.0 has shifted towards a decentralized, anthropocentric approach and ways to foster collaboration and community involvement. Among the critiques, some contest that neoliberal economic interests in smart city planning and strategies prevail at the expense of environmental and social concerns (Cardullo et al., 2019). Carrasco-Saez et al. (2017) note that the top-down tendency of many smart cities is the fundamental cause of many smart city project failures because of a lack of understanding of what the citizens want.

Characteristics of Smart Cities

While there is not a clear definition of a smart city, there are some common characteristics among smart cities. Some of the more important characteristics include the use of technology and the IoT to improve connectivity, data processing, and automation. Bibri (2021) claims that as connected networks and technology become spatially omnipresent across urban environments, cities can become smarter, helping solve environmental problems and responding to socio-economic needs. The National Grid (2020) suggests several defining characteristics for smart cities including having an infrastructure that uses connected digital technologies, using connected technology to improve sustainability efforts, progressive city planning, public transportation and traffic systems that are highly efficient, and hospitable urban space. However, Collier (2020) emphasizes the importance of data and posits that data plays a crucial role in the development and functioning of smart cities, as data is used to make decisions and improve the lives of its citizens. Tull (2023) seems to agree and notes the importance of data and suggests that connectivity allows data to be collected, processed, and analyzed in real-time, which allows for automated decision-making that can enhance and improve quality of life for citizens in the community. Carnis (2018) forwards a similar perspective regarding transit systems and suggests that efficient public transportation and traffic systems can automated with the use of data and algorithms to manage traffic efficiently and are vital components of smart city initiatives that are aimed at improving urban smart cities. As noted by the National Grid (2020), strong, progressive governance is another important characteristic of smart cities. This is primarily due to the need to have strong, knowledgeable leadership to sustain smart city projects. Gil-Garcia et al. (2016) highlights this need and suggests that smart government is necessary to improve citizen engagement, accountability, and interoperability. Becoming a smart city requires that the people making decisions have a clear understanding of the smart city goals, how to achieve these goals, and sustained support to ensure these smart city projects come to fruition.

Impact of Top Smart Cities

There are about 140 smart cities worldwide, and the number is increasing and many of the top smart cites like Zurich, London, Amsterdam, and Shanghai are having a positive impact. Smart cities have traditionally been studied from a technocentric perspective. However, such technological conceptualizations of smart cities have changed to a human-centric smart cities

perspective (McBride et al., 2022). Scholars (Lara et al., 2016; Almeida et al., 2018) and city leaders have begun to explore smart cities from this new perspective. According to Zurich's Bruno Lanvin, President of the Smart City Observatory, Zurich's leading position as a smart city includes demonstrating its ability to be "a livable city with strong human-centric policies." At the same time, "Giving priority to inclusion and diversity helps make a city more vibrant for citizens and enterprises" (Wray, 2023). Canberra has implemented several intelligent city solutions to improve the well-being of its residents. According to Thinger.io (2023), the city has introduced an innovative ticketing system for public transport, which makes commuting more accessible and more convenient. Canberra has also updated its lighting systems, improving its people's visibility and safety. Tekin et al. (2024) found that London's smart city initiative indicated that spatial inclusion is the primary focus where inclusive housing, transport, and health management systems are promoted. In Singapore, the government launched a "Smart Nation, Smart Towns" program that encouraged citizens to develop creative ideas to make their communities more livable and efficient. They also have over 100,000 cameras that surveillance public spaces to ensure public safety (Goyal et. al., 2023).

Sustainability is also gaining importance for the success of smart cities. Several cities worldwide pursue selective strategies to attract talent and investments through net-zero enterprises. Zurich has implemented initiatives in public transport greenhouse gas emissions to transform itself into a smart city. It has decreased its transportation related GHG per person in the city by implementing new operational and design measures, such as limiting the expansion of the car traffic network and parking (Menendez & Ambuhi, 2022). Zurich is working towards a net zero emissions goal to become climate-neutral by 2040 (IMD Report, 2023). Oslo has the most electric, hybrid, and alternative fuel vehicles of any other city worldwide and plans to reduce emissions by 95 percent by 2030 (Locke, 2023). Toh (2022) notes that the Tokyo Metropolitan Government launched a city decarbonization effort to achieve zero emissions in Tokyo by 2050. The government recommended fundamental energy, urban infrastructure, and land use changes to reduce carbon emissions. Walbank et al. (2023) reported that London has 346 IOT companies, the highest number of electric vehicles charging stations, and green-certified buildings in Europe and America. Shanghai has implemented intelligent grid systems, smart traffic management, and smart street lighting, resulting in savings from reduced energy use and emissions (Arumugam, 2022).

Smart mobility plays a crucial role in smart cities by providing efficient and sustainable transportation solutions that reduce congestion, improve air quality, and enhance quality of life (Wolniak, 2023). Santilli (2023) posits that Singapore has implemented an extensive intelligent transportation system that includes real-time adaptative traffic signals and data to optimize traffic flow and reduce congestion, while Goyal (2023) maintains that Singapore has one of the world's most extensive mass rapid transit systems, known for its reliability and efficiency. In London, people check into buses and underground trains with their phones, use curb-side electric vehicle charging, and use mobile apps to promote healthy walking routes around the city (Puttkamer, 2023). Shanghai provides full 5G coverage in the downtown area and fiber coverage across 99 percent of the city (Arumugam, 2022). Topos Magazine (2022) reports that Hamburg provides smart traffic management, smart parking, and a car-sharing app that allows users to book their tickets after seeing the fastest route from all available means of transport.

The focus of this section has been on providing an overview of smart cities, their relative history, and the impact that some smart cities are currently having. The following discussion focuses on the benefits and challenges of smart cities, which helps to provide a better perspective on why some non-smart cities are more likely to transition into becoming smart cities than others.

OVERVIEW OF BENEFITS AND CHALLENGES FOR SMART CITIES

Smart cities are intriguing and growing globally. Much of this is due to increased urbanization and the impactful benefits associated with smart cities, like an improved lifestyle for its citizens and more sustainable environment. However, there are also some challenges with establishing and maintaining a smart city, like the heavy investment in technology and the need for progressive governance. Figure 1 provides an overview of some of the main benefits and challenges for smart cities, which is followed by a more detailed discussion that provides further insight.

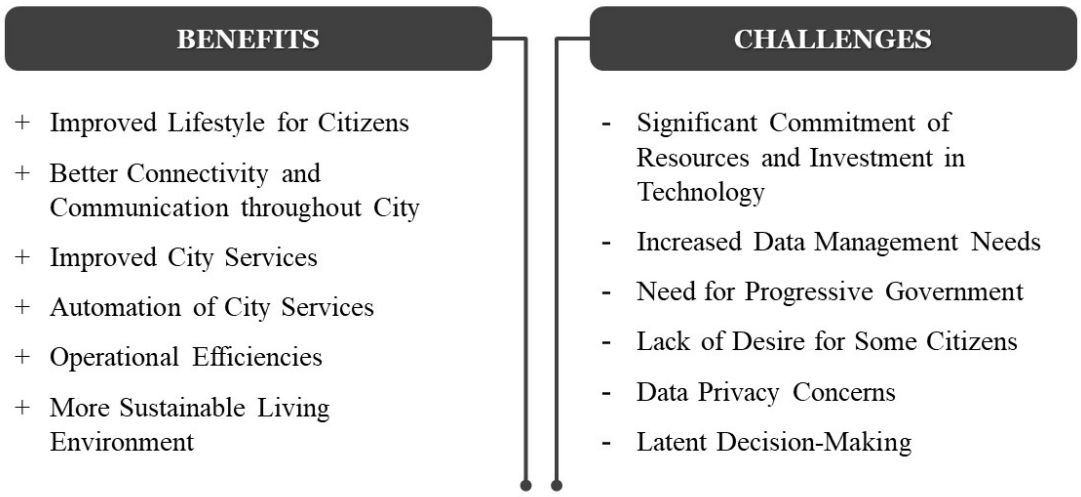

FIGURE 1. DIAGRAM OF BENEFITS & CHALLENGES FOR SMART CITIES

Benefits of Smart Cities

There are several benefits associated with smart cities. Many of these benefits are so impactful that they serve as motivation for more non-smart cities to transition into smart cities. One of the most impactful and important benefits is the improved lifestyle for the citizens in the community. Woetzel et al. (2018) highlight lessons learned from municipal leaders who are realizing that smart city strategies should start with people, as it is not just about improving city operations, but also about using technology to make better decisions and deliver an improved quality of life for the citizens in the community. Zhao and Zhang (2020) agree and posit that all citizens in the community can benefit and experience the convenience brought by smart cities to their lives. Much of the improved lifestyle is due to smart cities offering technology based innovative solutions to

improve the quality of life of urban communities in a sustainable and equitable manner (Ramírez-Moreno et al., 2021).

Another key benefit for smart cities is the increased technology, which leads to better connectivity and communication throughout the community. As noted earlier, Mosannenzadeh and Vettorato (2014) discuss how one of the key aspects of a smart city is the use of the IoT and technology to lead to an upgraded lifestyle for its citizens due to things like enhanced mobility, optimized use of resources, and integrated community services. The National Grid (2020) suggests that smart cities can improve every facet of city living for their residents including faster and public Wi-Fi and improved community engagement. This is an important benefit that can directly benefit the community. Having free and reliable WIFI with ample access points throughout the community is a particular motivator for many citizens.

The increased use of technology not only benefits the citizens, but it is the foundation for helping the city to deliver on providing improved services. Wang and Zhou (2023) posit that smart cities can help to improve the services like public safety, medical services, daily commutes, and environmental quality through smart solutions. This can include things like crime reduction due to faster and better response times from public safety, decreased commute times with better traffic systems, better public health with systems that are able to identify health problems and trends, and more sustainable environments. For example, a strategy used by many smart-cites to improve public safety is to have ample webcams throughout the city that are connected directly to fire and police departments. This helps with faster responses from public safety, easier tracking and identification of crimes, and improved evidence for prosecuting criminals. Furthermore, smart cities typically have better responses to natural disasters, as city services can be better directed and used more efficiently during a crisis or times with limited resources.

Automation is another key feature associated with smart cities. That is because smart cities have advanced systems that can handle more data and process data in real-time, which can lead to automated decision-making. Meijer and Bolívar (2015) note that smart cities are not only smart in terms of how they can automate routine functions, but also in how the technology enables them to improve decision-making (Meijer & Bolívar, 2015). With recent technological advancements in artificial intelligence (AI) and GAI are helping technologies like self-driving cars, robots and city brains to transition some aspects of smart city life from automated to autonomous (Cugurullo, 2020).

Efficiency is another benefit that smart cities. These efficiencies are driven by the city's use of technology and connectivity to better process data and integrate operations that can help the city to use less energy and operate more efficiently. Meijer and Bolívar (2015) note that they can automate tasks to better serve citizens, maintain buildings, and manage traffic systems to improve the efficiency, equity and quality of life for its citizens in real time. For cities, these efficiencies often lead to a reduction in operating costs, which can be reinvested in other city operations.

Finally, many smart cities are more sustainable than non-smart cities. As discussed earlier, the National Grid (2020) emphasized sustainability as a key characteristic of smart cities and notes that these cities use technology to improve environmental and sustainability efforts. In addition, some smart cities focus on reducing the use of traditional gas and electric energy and increasing

the use of alternative energy sources like wind and solar energy (Krishna, 2016). For example, many smart building spaces seek to achieve net-zero energy consumption to improve sustainability efforts, which can help lower a city's carbon footprint and improve sustainability. With more efficient use of the city's resources and less use of energy, many smart cities are more sustainable and have lower carbon footprints than non-smart cities.

CHALLENGES WITH SMART CITIES

With all the benefits associated with smart cities, there may be a question of why are there not more of them? While there is a lot of growth in smart cities, there are also some challenges that must be dealt with to become a well-functioning smart city. Unfortunately, some of these challenges are quite significant and serve as barriers that hinder adoption for many non-smart cities seeking to become smart cities.

One of the main challenges is the commitment and significant amount of time, energy, and resources necessary for a city to transform into a smart city. Zhao and Zhang (2020) propose that the design and construction process of a smart city is quite complex, involving many departments, regions, and data cross types. The design can also vary greatly from city to city based on things like size, current state of readiness, and willingness of the community. Fundamentally, smart cities rely heavily upon technology so it can be challenging to transition into a smart city because current operations may need to be restructured in order to incorporate the different types of technologies, software, and data types. This can be a real barrier, as different departments can be at different levels of readiness.

Another barrier to non-smart cities transitioning to having more smart elements is the necessary long-term investment in technology. Puron-Cid and Gil-Garcia (2022) conducted research on smart cities and the long-term financial sustainability of smart cities and found that for some cities smart city projects are too expensive and not financially sustainable for some city governments. That is because smart city project investments typically include things like financial support, reorganization, labor, and time, as becoming a smart city often requires a significant shift from how the city is currently operating. This can includes upgrading a significant number of operations to shift to be technology based, like new computers, rewiring, installing cameras, sensors, etc. It is important to note that there is more than the initial investment to consider, as technologies change regularly and need to be updated in order to continue to maximize the benefits of being a smart city.

Another important aspect of being a smart city is ensuring that the proper systems are in place to manage data. Zhao and Zhang (2020) clarify the importance of data processing and suggest that if there is no data transmission, then there is no data processing, no data storage, or data reprocessing. Smart cities generate a tremendous amount of data, which is processed by the technological systems that are in place. With the appropriate systems, smart cities are able to use technology to process lots of data quickly, reliably, and intelligently. This is important, as the most critical aspects of being a smart city are based on processing data.

Another complex challenge is the need for coordination between the city's governance and its citizens. The is necessary because the main beneficiary of transitioning into a smart city is the community. Therefore, it is important for city governance to ensure that there is not only buy-in to becoming a smart city, but also ongoing efforts to ensure that the community is part of the decision-making process. Meijer and Bolívar (2015) note successful efforts at smart city government in Amsterdam where there was a unique partnership between businesses, authorities, research institutions and the citizens to develop the Amsterdam Metropolitan Area into a smart city with a focus on the themes living, working, mobility, public facilities and open data.

However, this can sometimes be a challenge because with the heavy use of technology and data, there are people who do not desire to live in a smart city. Some of this is attributable to the benefits not being equally accessible for all citizens, as the primary beneficiaries are citizens that already have access to technology. Kharas and Remes (2018) highlight this concern and note that there is a risk of deepening inequality unless governments recognize that technology solutions are as important to the poor as they are to the affluent.

While other citizens are concerned with data privacy, security, and misuse. In this case, data breaches and security threats are managed by the city. In many cases citizens are not aware of or confident in the protocols in place to secure their data. This is a major concern for many citizens, as they desire to understand what type of data is being collected and be sure that the data will not be misused or subject to data security problems. Handley (2023) emphasizes one of the main concerns with data privacy and smart cities is whether the data gathered is going to be used by the government for surveillance and unintended purposes. Smart cities tend to collect a lot of data on their citizens via sensors, cameras, and tracking devices. This is concerning to some people as they believe that it gives the government too much access to people's personal lives with the potential to use the data in a manner in which it was not intended.

Finally, the reliance upon technology and its processes can lead to latent decision-making. This can happen because newer technologies can not only gather data but also be automated to process and make decisions. For example, traffic lights can be automated to adjust based on traffic flow, which makes their process efficient and citizens happier. However, there is still a need for human interaction to maintain the systems, make adjustments, and ensure that the systems are running correctly. Without human interaction, there can be a risk of systems going array.

ARTIFICIAL INTELLIGENCE, GENERATIVE ARTIFICIAL INTELLIGENCE AND SMART CITIES

In recent years, AI has been used in intelligent city studies and practices and is becoming an increasingly significant aspect of smart cities. For smart cities, the power of AI helped cities to achieve many of the benefits discussed above. According to Ullah et al. (2021), AI has become a critical intelligent city technology that helps cities increase efficiencies including automation to deliver urban infrastructures, services, and amenities. AI has resulted in opportunities for cities to increase infrastructural efficiencies, predictive analytic capabilities, and quality of life in cities (Yigitcanlar et al., 2021). AI has been utilized for effective traffic management (Ramírez-Moreno

et al., 2021), traffic monitoring (Englund, 2020), and transportation network services (Englund et al., 2021). AI powered adaptive traffic management can adjust signal timings based on real-time traffic patterns, incidents, and weather conditions, reducing greenhouse gas (GHG) emissions and improving emergency response times (Lockhart, 2024). AI based vehicle traffic prediction, driving, and routing applications have been discussed in articles such as Ge et al. (2020)'s proposal using deep learning algorithms to predict urban traffic speeds.

The IoT started as a vision of all digital objects being connected and acting intelligently and has been evolving since 2000 (Chae, 2019). It was developed to collect data from all areas, as much data must be collected to make cities more efficient, and it allows various objects on the internet to communicate with each other. Real-time problems are tracked through constant communication, and possible solutions are identified (He et al., 2021; Li et al., 2022). Whitmore et al. (2015) reviewed IoT by identifying categories, including technology, applications, challenges, and business models. AI is being used for smart city technologies like the IoT and sensors. IoT uses AI to analyze vast amounts of data generated by these devices. The estimate is that about 30% of smart city applications are now integrating AI to enhance urban sustainability, resilience, social welfare, and vitality, including urban transportation solutions (Alahi, 2023). For example, Syed et al. (2021) highlights that the IoT facilitates collecting data and performing data analysis to extract information for decision and policymaking. However, the large amount of data generated by IoT sensors can be overwhelming for people to analyze and interpret. AI can analyze enormous amounts of data (Kaufmann et al., 2021) and detect patterns and trends that humans might not be able to detect. For example, AI can enhance IoT in smart cities' predictive maintenance by analyzing data from IoT sensors to predict when maintenance is needed for bridges and buildings before a failure occurs (Alahi et al., 2023).

Generative AI is enabling the creation of more efficient and sustainable smart cities. It is a type of machine learning that crafts new data instances reflecting its training set. Generative AI can generate a model of how a city might evolve, such as creating a city layout that prioritizes a city and reducing its carbon footprint. According to Chiancone (2023), GAI could scrutinize data on a city's current energy consumption and transportation patterns and then generate a model of a city layout that minimizes energy use. Amsterdam has used GAI to optimize its public transport routes, while Singapore uses it to simulate various urban scenarios and predict the impact of different planning strategies. Generative AI can also analyze vast amounts of data collected from IoT devices, sensors, and cameras to identify patterns and trends humans cannot easily detect. This information can then optimize city infrastructure, transportation systems, energy consumption, public safety, and other vital areas (Asri, 2023). For example, Generative AI already impacts cities using predictive maintenance for urban infrastructures. Generative AI enables more intelligent energy use, improved air and water quality monitoring, and more efficient waste management (Lockhart, 2024).

Generative AI is shown to have many uses and benefits, but it has some challenges, including data privacy and security and ensuring that Generative AI systems are ethically sound. Skilled professionals will be needed to develop and implement generative AI systems (Asri, 2023), including data governance and coding fluency (Papandeaou, 2024). Generative AI will be increasingly important in the government's ability to personalize government service delivery. It can create compelling summaries of dense data such as city council notes, complaint records, and

policing (Descant, 2023). Cities like Copenhagen and Amsterdam are leveraging AI to optimize building and district energy use, Oslo embraces AI to predict and optimize waste collection routes, and Barcelona, Dubai, and Tel-Aviv utilize AI for sustainable energy management (Papandreou, 2024). Singapore has a comprehensive AI policy for all its services, training, and investments; Tokyo tackles traffic, disasters, and personalized public transport with AI, while Beijing utilizes it for air quality, building energy optimization, and smart city infrastructure. Seoul, Melbourne, Sydney, and Brisbane utilize AI for traffic management, public safety, demand prediction, and route optimization (Papandreou, 2024).

FINDINGS AND CONCLUSIONS

Smart cities are not cities of the future, they are here today. While there are limited numbers of smart cities across the globe, there is a growing trend toward more non-smart cities transitioning into smart cities. Technologies are becoming more accessible and user-friendly. This can help a city's endeavors, as these technologies enable easier connection, data collection, and data processing, which makes transitioning into a smart city more achievable than in the past. Also, advancements in AI and GAI will help drive more adoption in too. However, the advancements in technology do not address or overcome some of the other challenges associated with smart cities. This includes acquiring the necessary resources for transitioning into a smart city, having progressive governance that can garner citizen support for smart city projects, and addressing citizens' concerns regarding data privacy and security. In most cases, cities will still be challenged with accessing the funds necessary for the investment into upgrading operations and infrastructure. Also, now more than ever, there will be a need to ensure adequate coordination and collaboration between the city governance and its citizens. While technology will continue to evolve, the need to ensure that these advancements will work to benefit the citizens and the environment is necessary to ensure a smart city's long-term success.

For many cities, being a smart city or transitioning into one is well worth the effort because the primary beneficiaries of smart cities are its citizens. Smart cities help to provide an upgraded lifestyle for its citizens with things like better connectivity, enhanced public services, and public WI-FI. While these benefits help to make life more enjoyable, it also requires the same citizens to actively engage in generating funds for the investment in technology, ensuring that there is an active and progressive city government, and supporting the coordination between the city government and its citizens to ensure the long-term future of being a smart city.

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