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Article

Inclusive Smart Cities: An Exploratory Study on the London Smart City Strategy

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Abstract: Smart city strategies have been developed in several cities worldwide to improve the well-being of residents, social life and economic welfare through digital transformation and technology-based interventions. The need for cities to supply assistive services and inclusive strategies for all people has also increased with the increasing urban population and smart city applications. Although technology offers several benefits for more inclusive and liveable environments, there are also drawbacks due to difficulties in adapting to digitalization and due to limited accessibility. The present study aims to explore smart city strategies from an inclusiveness perspective by analysing the London smart city strategy as a case study using a qualitative research methodology. Qualitative data analysis was conducted based on secondary data from London smart city strategy documents and semi-structured interviews with domain experts. Although inclusiveness is embedded in the London smart city strategy, there is still room for improvement. The results of this study indicate that spatial inclusion is the major focus of the London smart city policy where inclusive housing, transport and health management systems are promoted with a variety of assistive technologies with some scope on social and economic inclusion. This study proposed ways of boosting inclusiveness by improving citizen engagement through collaborations, increased transparency, and measures for preventing data misuse and misinterpretation. Using London as a case study, potential barriers in implementing inclusive strategies for smart cities in practice are highlighted, which may provide valuable learned lessons for other cities.

Keywords: smart city; inclusiveness; digitalisation; citizen engagement; urban planning; assistive technology

1. Introduction

Challenges with the growing urban population, the emergence of threats such as climate change and pandemics, uncertainty and complexity regarding urban systems force stakeholders to think about the sustainable development of cities and foster innovative strategies for emerging urban problems [1,2]. Governments seek to employ technological innovations to transform cities so that they meet citizens' needs by implementing smart city strategies worldwide. The emergence of the smart city paradigm is a response to creating a future city that ensures high quality of life, government efficiency and citizen rights in terms of industrial development, urban planning, environment and sustainable development [3,4]. Smart cities employ digital technology and data to perform better, increase well-being and respond to local and global challenges [5]. Maximizing the efficient use of limited resources while improving the quality of life is the main objective of designing and managing smart cities and societies [6]. The need for cities to supply assistive and inclusive services for all people has increased with the increasing urban population, and inclusiveness has become an important target to achieve in smart cities. Inclusiveness within the context of smart cities is defined as the improvement in the quality of life for all residents regardless of their background, abilities and socioeconomic status using technology and data-driven solutions.

On the other hand, there have been some criticisms around smart city visions such as the lack of citizens' voices [7], and diverse, vulnerable and unrepresented groups being left behind in society in terms of benefiting from smart applications, raising the question of how inclusive the smart cities are [8–11]. It has been discussed that limited or no access to digital technology is now the same exclusion that slavery and the lack of accessibility to education or to work once were [12]. A lack of digital literacy and access in smart cities can lead to worse health outcomes, a shorter life expectancy, more loneliness and social isolation, and limited access to employment as well as education opportunities. Meanwhile, cities encounter several other problems, such as increasing fierce competition, poverty and inequality [13]. Urban authorities are faced with a major problem about how to plan and administer cities in a way that enables and empowers everyone to fully participate in and contribute to socioeconomic life [14]. Although inclusiveness has recently been receiving growing interest, the impact of technology and smartness on inclusiveness is still vague, requiring further exploration.

In this study, we explore smart city strategies from the perspective of inclusiveness in terms of target groups, inclusive city indicators, applications, challenges, opportunities and citizen engagement by taking London city in the United Kingdom (UK) as a case study. Several cities in the UK such as London, Birmingham, Manchester, Cambridge, Bristol, Glasgow and Edinburgh are known for their ground-breaking initiatives, thriving technology clusters and ecosystems [15]. According to the International Institute for Management Development Smart City Index Report [16], London was ranked 6th in 2023 and 3rd in 2021 and 2019 among the top smart cities in the world. Therefore, the London smart city strategy is taken as a relevant case study to explore how smartness and inclusiveness are conceptualised and implemented in practice. We decided to explore the London smart city vision and applications as these can provide good examples for other cities; on the other hand, shortcomings identified within this context could lead to possible improvements.

The inclusive smart city (ISC) emerged as a concept in the early 2000s and several urban development initiatives aimed to integrate technology for improved inclusiveness. "A Resource Guide for an Inclusive Smart City" [17], published by the University at Buffalo, pointed out that there is no official definition for the ISC but its main feature is the ability to identify and meet the needs of everyone, especially persons with disabilities and older adults. As a concept that emerged from the needs, the ISC has found its place in several guidelines and plans. Based on this fact, in this paper, guidelines and frameworks proposed by various institutions are examined in Section 2, followed by a critical literature review in Section 3.

The research questions that are answered in this study, based on the London smart city strategy, are listed as follows:

(1) How is inclusiveness embedded as a concept within the smart city strategy and implemented in practice?
(2) What are the challenges for boosting inclusiveness in smart cities?
(3) What are the types, purposes and impacts of assistive technologies used to enhance inclusiveness?

2. Inclusive Smart Cities—Definitions, Guidelines and Initiatives

2.1. Definitions

According to de Oliveira Neto and Kofuji [18], the main characteristic of the ISC is "the ability of identifying places and objects (or things) and making this information digitally available". Roy [19] emphasised the importance of adopting a democratic approach and the connectivity of information technology with marginalised groups to improve accessibility to employment, the market, education and health and to help build resilience. Lee et al. [20] argued that the ISC concept is based on equality and liveable cities. According to Lepore et al. [21], the ISC should focus on Industry 4.0 technologies within a quadruple helix model, gathering governments, academia, industry and citizens. Kummitha [22] also

highlighted creating avenues for better interaction between different stakeholders based on the quadruple helix model and citizen-driven interventions. Consequently, most of the ISC definitions address the needs of everyone and provide accessibility to digital technologies for all by ensuring equality and collaboration with a wide range of stakeholders.

2.2. ISC Guidelines and Frameworks

According to the World Bank [23], inclusive cities should involve a complex web of multiple spatial, social and economic factors, which are the key indicators to assess inclusiveness in a city, as follows:

Spatial inclusion: Urban inclusion should enable affordable necessities such as housing, water, and sanitation. Insufficient access to essential infrastructure and services is a daily challenge for many disadvantaged households.

Social inclusion: Ensuring equal rights and participation of all, including the most marginalised, is the basic characteristic of inclusive cities. Recently, the absence of opportunities for the urban poor and the greater demand for a voice from the socially excluded have exacerbated incidents of social upheaval in cities.

Economic inclusion: new job opportunities and giving the urban population the chance to enjoy the benefits of economic growth are a critical part of overall urban inclusion.

Other authorities across the globe also determined indicators and frameworks for the inclusive city paradigm. "A Framework to Support Local Authorities and Communities to Build Inclusive Cities" [24], which aims to support UK municipalities and local authorities in developing their approach to the inclusion of newcomers and longer-standing residents, addresses core principles as follows: (1) local leadership to create change; (2) inclusion as a shared responsibility, delivered in partnership; (3) collaboration with newcomers and longer-standing residents; (4) utilization of available data and evidence to understand the local context to identify core priorities, set goals, monitor impact and update needed strategies; and (5) taking action at the local level, advocacy at the national level and learning from best practice at the international level. The "Inclusive City Framework" [25], published by the National Institute of Urban Affairs, Government of India, categorised inclusive city indicators under six sectors: (a) housing physical and social infrastructure; (b) outdoor environment; (c) urban mobility and public transport; (d) IT connectivity, digitalisation, governance and public participation; (e) livelihood; and (f) recreation and tourism. Thus, the inclusive smart city has been conceptualised mainly based on its basic functions/principles within different frameworks, and these principles are materialised by defining indicators as well as sectors to achieve inclusiveness targets. Several initiatives have been designed as a part of smart city strategic plans, which are discussed in the next section.

2.3. ISC Initiatives

Several initiatives have been designed to realise the inclusive smart city plans, some of which are summarised as follows:

- EIP SCC's Citizen Focus Action Cluster [26]: Within the European Innovation Partnership on Smart Cities and Communities Manifesto on Citizen Engagement and Inclusive Smart Cities, the following main goal was highlighted: "create and foster accessible urban services for citizens in order to improve the quality of life of all citizens and contribute to sustainable cities and a liveable environment". And major commitments were determined based on exchanging experiences, collaboration, citizen engagement, citizen-centric solutions, and connectivity between big and small and between urban and rural communities.
- Smart Cities for All [27]: this initiative was launched to define the state of ICT in smart cities worldwide and to focus on eliminating the digital exclusion of people who are disabled and older people by partnering with leading technology companies and civil society organizations.

- The Assist-Mi Project [28]: this project, which was supported by Innovate UK [29], is an application that assists users who are disabled on the go, to access goods and services by providing real-time GPS location data and two-way communication with service providers, such as shops, museums, city services and leisure facilities, at destinations [30].
- Urban95: Creating cities for the youngest people [31]: The Bernard van Leer Foundation's Urban95 initiative aims to make changes which endure over a long period of time in the landscapes of the city and opportunities which have profound effects on the initial five years of children's lives. This initiative is a specific roadmap for improving inclusiveness considering children.
- Singapore Smart Nation [32]: Digital inclusion is one of the main concerns of this initiative. Resources are offered to help re-skill individuals and businesses. The connectivity of all citizens to smart technology is the aim through specialised programs for disadvantaged people [33].

These initiatives briefly aim to engage more stakeholders with smart implementations, avoid digital exclusion and improve accessibility and connectivity. Although there are various frameworks and initiatives in practice, there has been limited research in this field, which are discussed in the next section.

3. Previous Research on Inclusive Smart Cities

Smart cities offer technology-based solutions towards urban governance and service delivery [34]; thus, how different technological solutions can be used to improve inclusiveness has been the major focus of research in this area. Rashid et al. [35] proposed a system which is an interactive AR application for wheelchair users. The evaluation results of their study displayed promising results towards increasing the independence of wheelchair users, providing an opportunity for equality improvement. Suryotrisongko et al. [36] argued that accessible, safe, problem-solving and flexible technologies with ideal designs will be able to build a city that can enhance quality of life for the people who are disabled, highlighting the importance of flexible technology. Martinez [37] believed that many digital solutions help people with motor disabilities to find their way easily in a city, to benefit from public transportation more efficiently and to fully enjoy their environment. Gilbert and Grey [38] argued that new technologies promise to increase the accessibility of cities with several facilities, such as traffic lights which can identify people with reduced mobility, digital apps which update users in real-time about broken-down elevators and other obstacles on their journey, and extended-reality smart glasses which can help people with visual impairment find their groceries on shop shelves unaided. Hakverdi [39] developed a smart app, which was based on NFC and IoT to help disabled people find their way when travelling. ICT-based solutions decrease the problems with the interaction of migrants with public authority workers and services due to language barriers, differences in cultural approaches and diverging levels of skills and knowledge [40,41]. Thus, the majority of previous work in this area has been oriented towards technological innovations for different groups of users.

Although technology offers several benefits for more inclusive and liveable environments, there are also many drawbacks, which may exclude different groups due to difficulties in adapting to digitalization and due to the lack of accessibility. Insufficient smart city design and implementation, coupled with the digital exclusion of different communities, have the potential to unintentionally leave some groups behind [42]. Some studies explored the current inclusive smart city implementations by exploring problems and shortcomings in practice. Wang et al. [11] investigated current progress towards building an ISC through the 2015 U.S. DOT Smart City Challenge by analysing the range and frequency of inclusive strategies, and they pointed out insufficient attention to underrepresented population groups in the current proposals and the need for more ISC strategies, government policies and universal design practices to meet the underrepresented groups' needs, ensuring their rights. Based on the investigation of the smart city strategy of New Town Kolkata (NTK),

India, Ghosh and Arora [43] found that the smart city vision could not be realised and failed to meet the needs of poor and vulnerable citizens. Malek et al. [44] in their study argued that the social inclusion indicators may not be valued in emerging and developing countries and their acceptance was limited to the realm of democratic developed countries, leaders' perception of citizenship, the delegation of the decision-making mechanism in governance, the participative culture of societies and individuals' self-discipline. These studies are critical of the technological optimism towards inclusiveness and point out differences between countries according to culture, the perception of citizenship and governance.

There have also been some studies that recommend ways to enhance inclusiveness in smart city practices. De Oliveira Neto and Kofuji [18] proposed the ISC approach, based on the experiment held in a 1 km area of downtown São Paulo as follows: a broader information digitalization and the use of the internet of things, pervasive computing, wearable computing, cloud computing and other technologies to enhance the role of assistive technology already available in cities. Lepore et al. [21] identified digital innovation hubs (DIHs) as innovation intermediaries that can ease building inclusive smart cities and revealed that 23 out of 48 DIHs in European and extra-European countries are available in building inclusive smart cities with the main focus of smart environments and government. Based on investigating infrastructure planning practices in Amsterdam, Seoul, Portland and Ho Chi Minh City in Vietnam, Lee et al. [45] pointed out an integrated approach to data and information collection and management, citizen engagement, social capital, hard infrastructure and digital technologies for the sake of inclusive and resilient smart cities. Mercille [34] argued that compelling companies to share data should be considered to make cities more inclusive.

Citizen engagement has been highlighted as a critical success factor for ensuring inclusiveness in smart cities by various researchers. Laenens et al. [46] proposed PAR4P (Participatory Action Research for the development of Policies) as an approach to improve the collective involvement of stakeholders from different groups to develop bottom-up and e-inclusive smart city policies. Annunziata and Garau [47] focused on revealing the relation between a kid-friendly urban space, social inclusiveness and the smart city paradigm, highlighting the importance of engagement. Mancini et al. [48] proposed an iterative model of a just smart city to create cohabitation forms which are more equitable and inclusive for species and individuals.

The above studies mainly focused on the pros and cons of particular smart implementations for inclusiveness as well as how to enhance inclusiveness by technological innovations in smart city implementations, whereas there has been limited research that explores the strategic intent and actual practice considering different inclusive city indicators, target groups and challenges experienced in practice. The research design within this study is based on the major assumption that alternative dimensions/indicators of inclusiveness should be taken into account as well as the needs of alternative target groups. Any action that creates a risk against inclusiveness has been identified as a challenge and that which facilitates inclusiveness is defined as an opportunity. Without delving into the values or ideological stances within the smart city discourse, it is taken for granted that improving inclusiveness is a target and inclusive strategies and technologies will improve quality of life for everyone. The research material and methods utilised are depicted in the next section.

4. Material and Methods

An exploratory research approach was adopted to answer the research questions. The empirical data collection and analysis utilised in this study had five steps, as shown in Figure 1. A literature survey was carried out to define characteristics of inclusive smart cities, as well as initiatives and frameworks about ISCs to understand the strategies, indicators and methods proposed for ISCs. Within the context of secondary data analysis, London smart city strategy documents (that are depicted under the next section) were examined. Based on the findings of the literature review and secondary data analysis,

the questions for semi-structured interviews were determined. Interviews were held with domain experts to receive their opinions on the research questions. Qualitative data obtained from the semi-structured interviews were analysed by content analysis using tools, such as QSR NVivo and QDA Minor Lite. Findings were discussed and further compared with the literature.
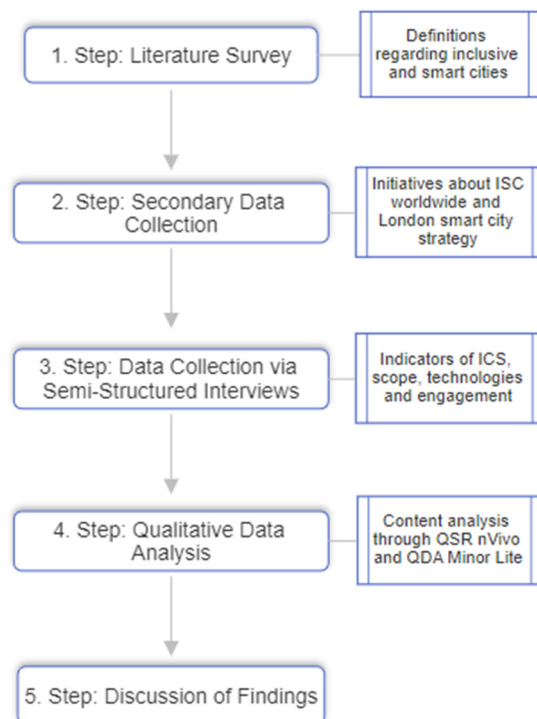

Figure 1. Research design.

4.1. Secondary Data Collection about London Smart City Strategy

Secondary data are the data that have been already collected for another purpose and available using resources like the Internet, libraries or reports [49]. The use of existing data to test new hypotheses or obtain responses to new research questions promises several advantages in terms of time, risks for participants and access to large data sets and longitudinal data [50].

In this study, as secondary data, the London smart city strategy document, namely "Smarter London Together" [51], was taken as a primary resource. The other documents, namely The Future of Smart [52], Mayor's Transport Strategy [53], The London Health Inequalities Strategy [54], London Housing Strategy [55], Culture for all Londoners [56], Economic Development Strategy [57], London Environment Strategy [58] and Digital Health London [59], were also analysed to explore the inclusiveness perspective in the London smart city strategy. The content of smart city strategy documents, which includes the terms regarding inclusiveness and its scope, such as "inclusive" and "inclusion", were extracted and categorised according to inclusive city indicators which were identified by the World Bank [23] and the target group of the mentioned phrases and activities. Table 1 shows the inclusive city indicators and content of the smart city strategy documents attributed to each indicator and their scope.

Table 1. Secondary data analysis of London smart city strategy.

Inclusive City Indicators	Scope of Inclusiveness	Content: Smarter London Together [51], The Future of Smart [52], Mayor's Transport Strategy [53], The London Health Ine-Qualities Strategy [54], London Housing Strategy [55], Culture for All Londoners [56], Economic Development Strategy [57], London Environment Strategy [58] and Digital Health London [59]
Spatial Inclusion		
Housing	Rural disadvantaged, age, LGBT, migrants	"We use housing data to identify sites for small developers, model new school locations and identify brownfield sites (London Datastore)" . . . inclusive neighbourhoods; Neighbourhoods that are inclusive and welcoming, . . ." "These built environments support children in their healthy development, and adults through life challenges and ageing expecting" ". . . all social landlords to ensure their services are LGBT+ inclusive." "making housing provision . . . support the resettlement of Syrian refugees in the capital, . . . support provided for all newly recognised refugees; . . ." "The Mayor expects social landlords to ensure that their services are inclusive of LGBT+ Londoners, . . ."
Water and Sanitation	Other species	". . ., including improvements to the water quality, biodiversity and amenity of the highway network"
Infrastructure	Rural disadvantaged, age, disability, other species	"We are currently mapping the city's cultural infrastructure across all boroughs. This data allows us to benchmark cultural venues and the supporting ecosystem for the first time, . . . identify brownfield sites . . ." ". . . enhanced biodiversity." "Improving existing, and providing new, green infrastructure. . ." ". . .ensure that all children have access to nature". . .". . .to deliver a net gain in biodiversity."". . . demonstrate changes in biodiversity." ". . ., cooling the urban environment and enhancing biodiversity and ecological resilience, as well as providing more attractive places for people." "Enabling active, inclusive and safe travel, . . ." "Ensuring that the space provided for cycling is sufficient for groups, children and people using inclusive cycles" "Accessible and inclusive public realm at transport hubs/spots" "Vehicles, stops, stations and streets should be designed to be as inclusive and accessible as possible, taking account of the needs of all users." ". . . (a) Using Inclusive Design, for example for station and train layout and facilities, including signing, information and seating, giving consideration to those with visible and invisible disabilities. (b) Providing step-free access at selected rail and Underground stations. . . (c) Providing step-free access at further national rail stations in London. (d) Improving the accessibility of taxi ranks, river piers and services, and Victoria Coach Station (and its potential replacement)." "Making bus services more accessible and inclusive" "Deliver wheelchair accessible bus stops, to achieve 95% in all boroughs". . . "Making Tube, rail and other services more accessible and inclusive" "Transport schemes will deliver a net positive impact on biodiversity" "Good performance against each of the ten evidence based Healthy Streets Indicators means that individual streets are fair, inclusive and sustainable environments." ". . . support the growth of the low carbon, Clean Tech and resource efficient sector in London improve biodiversity and ecological resilience." "Good performance against each of the ten evidence based Healthy Streets Indicators means that individual streets are fair, inclusive and sustainable environments."

Inclusive City Indicators	Scope of Inclusiveness	Content: Smarter London Together [51], The Future of Smart [52], Mayor's Transport Strategy [53], The London Health Ine-Qualities Strategy [54], London Housing Strategy [55], Culture for All Londoners [56], Economic Development Strategy [57], London Environment Strategy [58] and Digital Health London [59]
Access to services	Socially disadvantaged, disability, age	"Develop new approaches to digital inclusion to support Londoners' access to public services" "Engaging our citizens—putting Londoners at the core, through wide, inclusive digital engagement, and improving digital skills for all . . . to look at inclusion afresh, including an understanding of users from every background. For example, we want to ensure that there are no barriers that might prevent anyone who is hard of hearing or has visual, cognitive or motor impairments from accessing a digital service." "We use air quality data to inform public health campaigns and notify children and people at most risk" "This will help focus public services and interventions on the people that need them most, such as those most affected by air pollution, fuel poverty or overheating" ". . . serve citizens better and reduce health inequalities." ". . . improve the care and support of people who move between the NHS, council social care and third sector services." "The Mayor already has access to the largest network of air quality monitors of any city, . . ." "In tackling fuel poverty, it is important to identify who is at risk . . . for the provisions of the Digital Economy Act relating to fuel poverty to be extended to local authorities in order that they can target fuel poor households with greater precision. The Mayor will combine data on Energy Performance Certificate data for London that he has already published with area-level indices of vulnerability such as fuel poverty and disability to identify priority areas. Guidance will also be issued to boroughs on how they can legally and responsibly use data to identify fuel poor households." "Having a low income, disability, poor access to facilities and difficulty finding time to build exercise into the day are some of the barriers people face." "allows people who live in London and meet the age criteria, or have an eligible disability, to travel for free on public transport."
Social Inclusion		
Equal rights	Gender, age, disability, diverse groups	"Mayor's Foreword:. . .a fairer, more prosperous and more equal place for all Londoners" "Promote more diversity in tech to address inequality" "In 2018/19, the Challenge is searching for innovative solutions to reduce inequality, . . ." "This has to change—gender equality is the cornerstone of the Mayor's #BehindEveryGreatCity campaign." ". . . to work collaboratively in developing inclusive and sustainable cultural offers for disabled young people."
Participation of all	Gender, Unrepresented groups, disability, age	"Recognise the role of cultural institutions engaging citizens in the digital world" "Initiatives like this to increase the diversity of Talk London will be crucial when we discuss citizen views on the use of their data in public services." "Accessibility and inclusion also means that all members of the public feel safe and secure when travelling." ". . . where London's diversity is celebrated, people are active citizens engaged in their communities and how they are changing, and where all Londoners feel safe."
Economic Inclusion		

Table 1. *Cont.*

Inclusive City Indicators	Scope of Inclusiveness	Content: Smarter London Together [51], The Future of Smart [52], Mayor's Transport Strategy [53], The London Health Ine-Qualities Strategy [54], London Housing Strategy [55], Culture for All Londoners [56], Economic Development Strategy [57], London Environment Strategy [58] and Digital Health London [59]
Employment	Age, gender, socially disadvantaged, disability, ethnicity	"The GLA is evaluating the success of the MiWifi programme in Lewisham for the over 50s and unemployed where from June 2017 to January 2018 Lewisham residents were able to borrow a tablet for up to four weeks and offered six hours of digital skills training." "Digital Talent Programme—The Mayor is delivering a £7m programme to inspire and train more young women and BAME Londoners to enter digital, technology and creative job roles." "The Tech Talent Charter is a commitment by organisations to a set of undertakings that aim to deliver greater gender diversity in the tech workforce of the UK, to support diversity at entry-level jobs for young people, the Mayor's Digital Talent." "Programme increases training in digital technology with new industry-approved courses for 16–24 year olds. It focuses on attracting more young women and Londoners from a range of backgrounds to work in the sector." ". . . the digital skills of young Londoners aged 16–24 will be launched throughout the year." ". . . adopt inclusive employment and workforce development practices to achieve high standards in areas such as working conditions, diversity and inclusion (including the employment of older workers and disabled people)," "There is huge industry appetite to make the creative industries diverse and inclusive." "Lead by example, promoting best practice for providing inclusive and diverse workplaces through schemes like Our Time"
Economic growth	Gender, ethnicity	"Night-time economy". "The Mayor and his Night Czar, Amy Lamé, have published a 24-h vision to create a life at night that works for everyone." "Growth that is socially, spatially and economically inclusive . . ." "The industry must become more inclusive itself, reflecting London's population." "encouraging financial and business services firms to be inclusive workplaces for women and BAME Londoners."

Based on the contents of the London smart city strategy, it can be argued that spatial inclusion had the highest priority. Accessible and inclusive transport hubs and means, cultural infrastructure, biodiversity, safe travel, sufficient space for facilities, and a sustainable and ecological, resilient environment were the main themes of the infrastructure-based inclusive city indicators. The main target groups that were determined were rural disadvantaged people, children and older people, people who are disabled and other species. Inclusive digital engagement, reducing the impacts of air pollution and energy poverty or overheating by public services and interventions, reducing health inequalities, supporting care systems, improving the network of air quality monitors, identifying fuel-poor households and improving access to sport facilities were the highlights attributed to the access to services. Socially disadvantaged, disability and age were the main categories of the scope of inclusiveness. Identifying housing data and brownfield sites, inclusive neighbourhoods, healthy built environments for children, supporting the resettlement of immigrants and inclusive housing for LGBT+ Londoners were listed as the high-priority policies of the housing indicator. Water quality and biodiversity were addressed for the indicator of water and sanitation. In terms of social inclusions, improving fairness, prosperity and equality for all Londoners; innovative solutions for reducing inequality; gender equality; and inclusive and sustainable cultural offers for people who are disabled and young people were identified as major drivers for equal rights. Recognizing unrepresented groups such as cultural institutions, boosting the diversity of Talk London and similar initiatives, and enabling safe and secure travel for those who are anxious about being outside were determined as significant indicators for enabling participation for all. The digital inclusion of unemployed people and those over 50, young people, women and persons who are disabled through training and encouraging industry to offer more opportunities for vulnerable groups were highlighted as indicators of economic inclusion. The night-time economy and encouraging financial services and businesses for women and Black, Asian and minority ethnic (BAME) Londoners were addressed for economic inclusiveness.

Regarding Research Question 3, Table 2 lists assistive and smart technologies mentioned in these documents. Technologies ranged from an app to assist people with learning disabilities in managing their healthcare to AI-enabled autonomous clinical assistants.

Table 2. Assistive and smart technologies (Smarter London Together [51], The London Health Inequalities Strategy [54]).

Categories	Technologies
Audio–video-based technologies	My Health Guide, an app to assist adults with a learning disability in managing their healthcare and sharing information with carers, relatives and healthcare staff by recording info in written, photo, audio and video forms. Digital remote monitoring solutions to help multi-morbid patients attending the cardiology service. The Eirene Project, EIRENE—usE of vIrtual Reality hEadsets iN outpatiEnt manual vacuum aspiration for women who have experienced pregnancy loss.
Sensors	Digital Greenwich—air quality sensor and data standards to measure air pollution. Lampposts including air quality sensors, public WiFi, cameras, electric vehicle charge points, electricity for filming and festivals, and the potential for 5G roll-out.
Mobil devices/applications	Canopie is an evidence-based digital program that hinders and focuses on maternal mental, common complications of pregnancy and childbirth Little Journey is a digital eSupport platform created for reducing periprocedural anxiety in children.
Artificial Intelligence	Ufonia's solution utilises automation to deliver high-volume, low-complexity clinical conversations through Dora—an artificial intelligence-enabled autonomous clinical assistant.

There is a wide range of assistive and smart technologies which mainly focus on improving the health quality of people who are disabled, older people and children. Among these technologies, audio- and video-based assistive technologies, mobile devices/applications and

e-support programs focus on health management through remote and digital information sharing as well as virtual reality and artificial intelligence. For inclusive citizen engagement, digital campaigns, improving digital skills starting from an early age, diversity at entry-level jobs, more young women and citizens with different backgrounds, free training and support for unemployed citizens and socially disadvantaged people were identified as core ideas within the strategic plan of London city.

Citizen engagement emerged as a concept widely highlighted within ISC documents and previous research. Thus, we decided to further explore citizen engagement as an indicator and/or enabler of inclusiveness. Based on the same documents referenced in Table 1, some of the strategies planned for enhancing inclusiveness within the context of citizen engagement that were identified were digital campaigns to increase levels of participation from more diverse audiences through "Talk London", training in digital technology for people aged 16–24 years and adult Londoners who lack basic digital skills.

To summarise, the content including terms regarding inclusiveness indicates that spatial inclusion is the major/dominant focus of the smart city strategy of London city, with some focus on social and economic inclusion. It can be said that infrastructure and access to services are the leading inclusive city indicators prioritised in documents. Social inclusion is targeted through London smart city strategies by addressing unrepresented groups and the participation of all. Digital inclusion and new job opportunities are the highlights of economic inclusion. Although the scope of the London smart city strategy involves a wide range of different groups, people who are disabled, young and elderly people and socially disadvantaged people and women appear to be among the highest-priority target groups. Assistive technologies mainly focus on health management, digital information sharing and boosting accessibility. Semi-structured interviews were conducted with the experts to explore strategic priorities and how these are implemented in practice, and to learn about some example inclusive smart city implementations.

4.2. Data Collection via Semi-Structured Interviews

Collecting empirical data based on interviews is among the most common data collection methods in exploratory studies [60]. Semi-structured interviews, which require adequate preparation of the investigated topic, is a flexible type of interviewing which allows flexibility in discussing emerging topics during the interviews [61]. Within this study, semi-structured interviews were held with six experts that have different roles in terms of inclusiveness. The questions were prepared in accordance with the pre-determined information from secondary analysis. This enabled the interviewer to link the responses given by the interviewees with concepts that are mentioned in the strategy documents.

The following questions were asked during the interviews:

1. Do you think smart cities are inclusive in general? Is inclusiveness a feature that is considered as a part of smart city strategy? In other words, can we say smart cities are also inclusive cities?
2. Considering London, what can you say about scope of inclusiveness? Which groups are considered? Do you think smart city strategies and technologies appeal to all? Are there any left behind?
3. What are the current challenges for inclusive smart cities? (including ethical, legal, and privacy issues)
4. What are your recommendations for the future? About smart cities in general, and then about inclusive cities?
5. Do you think technology, including assistive and smart technologies can be integrated to create more inclusive environments? How and why?
6. How can citizen engagement and user acceptance of technological solutions be increased?
7. Can you please give some examples from technologies and smart applications (including audio- and video based Active and Assisted Living (AAL)?) What do you think about their impact on inclusiveness?

The background information of the interviewees is depicted in Table 3. All of the interviewees have background knowledge on the London smart city strategy, either as a policy maker or implementor and are knowledgeable about practices. The interviewees were identified based on their profiles and reached through e-mail and LinkedIn. The research received ethics permission from the Arel University. The interviews were held between 14 August and 30 September 2023. Each interview lasted around 30–45 min.

Table 3. Background information of interview participants.

No	Interviewees	Years of Experience	Role on Inclusiveness
I1	Access and Inclusive Environments Lead	>15	Inclusive design Leader
I2	Urban researcher and socio-spatial data analyst	>30	Socio-spatial analysis, spatial inequalities, urban health, sustainable mobility
I3	Urban planning scholar and researcher	>10	Strategic spatial planning, circular economy, EU policy and urban governance and politics.
I4	Sustainability and Climate Adaptation Programme Manager	>5	Campaigner for social equity and gender mainstreaming in city planning and policy making
I5	Inclusive Design Consultant	>20	Inclusive design of built environment
I6	Architect, Consultant, Speaker and Writer on Inclusive Design	>30	Consultancy on inclusive design

4.3. Qualitative Data Analysis

Content analysis was conducted to analyse qualitative data collected from interviews. Qualitative content analysis, which is suitable for different types of data, is commonly used in interpreting interview text, which is often rich in words [62]. The main goal of content analysis is to boost the understanding of a core phenomenon by describing it more concisely [63]. The latest versions of QSR NVivo 14 and QDA Miner Lite v3.0 software were utilised for exploring prominent ideas and displaying highlights in a numerical and graphical form. The answers to the first six questions were coded according to different themes, and their frequencies were calculated according to the number of participants who provided a similar view on the specific theme, their number of references and their number of words to highlight the most important themes. The answers to the last two questions were summarised by listing the smart technologies that participants identified, the target group of such technologies and their potential impacts.

5. Findings from Semi-Structured Interviews by Content Analysis

This part of our study aims to indicate findings after content analysis of the interviews. The contents of responses to semi-structured questions were coded and statistically analysed through QSR NVivo software. The social indicators of the content were evaluated and graphically displayed with the help of QDA Minor Lite software.

Table 4 shows the results of content analysis through coding semi-structured interview findings under different themes. Coded themes indicate different themes to which responses were made to specific questions. The number of files shows how many participants talked about the theme. The number of references indicates how many times the participant mentioned the specific themes, the number of words is an indicator of the length of the participants' speech and the number of paragraphs indicates in how many different parts the participant told his/her thoughts on the theme.

Table 4. Content analysis.

Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
1. Do you think smart cities are inclusive in general? Is inclusiveness a feature that is considered as a part of smart city strategy? In other words, can we say smart cities are also inclusive cities?	Inclusiveness is a feature of smartness	2	12	389	20	I1: So one example is if we are collecting data in order to inform these systems to make the city smart, it will be able to make the city and the infrastructure respond to people.
	Undecided	2	4	220	16	I2: . . .but I can't say smart cities are inclusive or not inclusive because it depends a lot on which cities, which smart technologies being used, . . .
	Inclusiveness is not necessarily the focus	2	4	86	7	I3: I wouldn't say that smart cities are inherently inclusive because I don't think that that is necessarily the focus of these strategies. I5: Not always. Inclusion is still intermittent in its consideration and implementation.
2. Considering London, what can you say about scope of inclusiveness? Which groups are considered ? Do you think smart city strategies and technologies appeal to all? Are there any left behind?	Everyone is included	2	5	158	12	I4: I think it just helps boost confidence of a citizen, every citizen, in fact, no matter if it's based on caste, creed, color, ethnicity, every citizen can track their track and monitor the progress of their local authorities and governments, so I think digital enablement has definitely helped cut across the heterogeneity of the population present in London.
Groups that need higher attention (vulnerable groups)	Women	1	2	29	2	I1: And I think a lot of the research that we've discovered that actually there might be things around the perception of safety for women.
	Children	1	2	13	2	I1: . . .because cities aren't designed very well for children. . .
	Socially disadvantaged (low income)	2	2	58	3	I2: There is a lot of types of cards and support for those who have higher needs and can't afford to pay, but still there's a lot to be done as in any other city.

Table 4. *Cont.*

Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
Groups that need higher attention (vulnerable groups)	Ethnic groups/minorities	1	2	89	2	I1: . . . around ethnicity and faith where people feel more vulnerable because of the environment . . .
	Disabled people	3	3	175	6	I1: For disabled people, there's lots of feedback around actually, if I'm a disabled person, then the type of bicycle that I have might be larger and actually the infrastructure doesn't support that. I6: You've got stations that you can't park if you're an accessible vehicle because there's no space park.
	Older people	2	2	89	5	I1: But if we look 20 years in the future, we know that globally the population is aging, so actually people are living for longer, people are working for longer, so what does that mean for our spaces in 20 years time?
	Immigrants	1	2	53	2	I1: So again, what does that mean in terms of the cultural diversity that we have within our city and what sort of things do we need to think about in order to accommodate that?
	People who live in rural regions	1	3	88	4	I1: . . . the barriers that people experience are going to be different across different regions, as you say, in more rural areas.
3. What are the current challenges for inclusive smart cities? (including ethical, legal, and privacy issues)	Challenging process of getting permission from citizen for data collection	1	1	28	1	I1:. . . it's how we get that permission from people in the first place, which I think is always a challenge.
	Interconnectivity problem between smart systems	1	1	179	6	I1: So actually, it's how you connect all the information that different organizations are doing, so that from the user point of view, it's seamless.

Table 4. *Cont.*

Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
3. What are the current challenges for inclusive smart cities? (including ethical, legal, and privacy issues)	Lack of trust due to limited transparency	4	13	1512	94	I1: I think a lot of people are still quite nervous about their data being collected and where it's going to be used and how safe and secure it is. I2: There should be an alternative way of dealing with ethics because no one can read all the terms &references.
4. What are your recommendations for the future? About smart cities in general, and then about inclusive cities?	Collaboration between stakeholders	3	3	205	12	I4: . . . most of the time such partnerships and collaborative data pooling is still not there and that's exactly where we need to build on. I5: . . . which requires stakeholder engagement with seldom heard groups and solutions . . .
	Connectivity between different systems	1	1	67	3	I1: . . . if we're wanting to introduce systems to help people use a city, then those systems have to speak to each other.
	Improving transparency	2	3	89	6	I2: And then the technology, as I said, you know, all the process of collecting data, managing data should be transparent, should be ethical, should be focused on, you know, priorities within our, our society. I5: Privacy laws are in place and any technologies will need to be developed with this adhered to. . .
	Incentives for best practices	1	1	54	4	I4: We need to think about the right set of incentives and penalties for whoever is using the data to encourage good usage of data, good practices in data, I think, yeah, economic incentives.

Table 4. *Cont.*

Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
	Legislative actions	1	1	38	3	I4: So I feel if we get the policies right around data privacy and data sensitivity, especially given the kind of technologies we live in, AI and ML and blockchain, I think we have to get our regulations right.
4. What are your recommendations for the future? About smart cities in general, and then about inclusive cities?	Addressing the cities' needs rather than smartness	2	4	912	59	I2: . . .instead of improving this society and these cities, we're investing in other cities that I'm not sure they will work better to be honest, that's something we need to see.
	Better representation of groups—inclusiveness	1	1	41	1	I1: . . .so making sure that we are actually designing thinking about the diversity of people that will be using the space and not just the people who have been represented historically.
	Connectivity with other systems/technologies	2	3	170	3	I1: . . .making sure again that it ties in with how what other initiatives and what other systems are actually in place. I6: How do they interact with the technology if they're blind?
5. Do you think AAL solutions and other technologies can be integrated to create more inclusive environments? How and why?	These technologies should be accessible for all	3	4	512	35	I3: . . . if they are only available to to certain people or to those who can can afford them then I wouldn't say that it is necessarily an inclusive solution so like they should be widely available preferably publicly owned. . .
	Proper use	2	3	105	6	I2: . . . it's quite interesting and important with these new technologies, if they're used properly. I5: Information is key if technologies help provide the safety, security and information to move around a city.

Table 4. *Cont.*

Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
6. How can citizen engagement and user acceptance of AAL solutions and other technologies be increased?	Better Communication of why these solutions are necessary and being used	1	5	159	14	I2: Maybe there's a different way of doing it knowledge of what they have to be aware when they're using this. But you need to tell people, look, I'm filming you, this has an impact, this is going to be recorded, this is going to be that of that.
	Dedicating more time for engagement part in developing technologies	1	1	321	17	I1: I think part of it is having more time in projects to be able to dedicate to the engagement part, because I think a lot of the time, at the moment, anyway, a lot of the time.
	Training	3	4	584	38	I3: I guess some sort of like education campaigns can be useful to sort of like disseminate and promote certain solutions and sort of like educate people how to use them because… I4: I think here comes the importance of change management and the importance of educating our customers.
	Ensuring access to smart technologies for all	3	3	82	6	I3: … pricing is a big great concern … I5: Barriers need to be addressed to ensure that everyone is genuinely benefiting from the advances and changes.
	Getting feedback from different groups	1	3	118	3	I1: … we knew that we wanted to talk to people from ethnic minority groups as an example for this particular project because we knew that in that particular area there was a big population of people who weren't …

Table 4. *Cont.*

| Questions	Coded Themes	No. of Files	No. of Coding Ref.	No. of Words Coded	No. of Paragraphs Coded	Selected Quotations
6. How can citizen engagement and user acceptance of AAL solutions and other technologies be increased?	Increasing honesty and transparency	2	4	192	14	I2: I think it's about being honest, it's about being collaborative, . . . I3: . . . we make the people convinced to engage more actively use these technologies and be part of this . . .
	Policies, standards, master plans	1	3	77	3	I1: The city scale and the regional, a lot of that work might be more around kind of policies or standards or master planning as well.
	Advertisement and promotion	1	6	271	7	I1: So we made sure that we contacted local press newspapers, social media, making sure that we advertised it, making sure that we also had leaflets that were printed in different formats, different languages so that we could actually hand those out to people as well.

Based on the data depicted in Table 4, it can be argued that there is no consensus on the fact that inclusiveness is one of the main features of smart city strategies. Some experts think that smart cites should respond to all people's needs and reach everyone equitably and responsibly. On the contrary, the others argue that smart cities promote digital services for convenience and do not necessarily focus on inclusiveness. Smart cities can be positive or negative for inclusiveness depending on many factors, such as the type of project, location, target group and smart technologies to be used. Smart technologies have several benefits for vulnerable groups, but they can also marginalise certain groups or increase the gaps between the social status of certain groups. It can be said that the scope of smart city strategies in London is very broad and many different groups are targeted in different ways. However, particular emphasis is needed for socially disadvantaged individuals and older people. Although several projects have been implemented, the infrastructure in some parts of the city is not sufficient for people who are disabled and older people to be able to move and access different opportunities. Also, there is still a security issue and accessibility problem in some regions, especially in rural regions. Although the scope of the inclusiveness that participants mentioned was very diverse, the issues of people with different religions were not mentioned by any interview respondents.

Figure 2 indicates the statistics of encoded words which were grouped into three main inclusive city indicators, namely spatial, social and economic inclusion, and eight subcategories. It clearly shows that spatial inclusion is the most addressed indicator among all of the inclusive city indicators. While the percentage of encoded words attributed to spatial inclusion is 75.5%, the rates for social inclusion and economic inclusion are 20.30% and 4.20%, respectively. Infrastructure (38%) and access to services (29%) are the leading indicators, which have inclusive transport and health systems as the main focus. The participation of all (17%) attributed to social inclusion is ranked third among others. Economic inclusion is in general behind the other indicators in terms of emphasis placed by the interviewees.

Data are one of the most important elements in the adoption of inclusive smart city applications. A lack of trust in data collection is perceived as a major challenge by the interviewees. People fear that the data they provide might be misused and misinterpreted. Another problem is sourced by the transparency of data collection means and the complexity of disclosure statements. Alternative ways of explaining implications of data gathering should be promoted by considering transparency and enabling a clearer understanding of disclosures.

Some experts think that the smart city concept can be referred to as marketing terminology and smart city strategies usually focus on digitalization and trend technologies without considering the real needs of residents. Investment and improvements should be made for the sake of all citizens. Collaboration between data collectors and citizens should be improved to increase awareness towards the importance of data necessity for enhancing inclusive smart city technologies. This can be achieved by ensuring transparency, the explicit explanation of the implications of data use, taking strict measures and penalties against misuse and misinterpretation and promoting best practices. Stakeholder engagement can be improved by involving different parties in smart city strategy implementations. Receiving feedback from different communities is essential for achieving and enriching inclusive targets of city strategies. To create more inclusive environments, everyone's access to smart technologies is a priority. Widening the availability of these technologies through public authorities is essential. Socially disadvantaged people, and students and people who live in rural regions may have difficulties in accessing smart technologies. On the other hand, older people and people who are disabled have problems reaching and using these technologies. Training plays a key role. Education campaigns, digital hubs and other sorts of education encourage people to learn and benefit from smart technologies.

Table 5 shows the assistive and smart technologies based on observations of interview participants, their target groups and impacts.
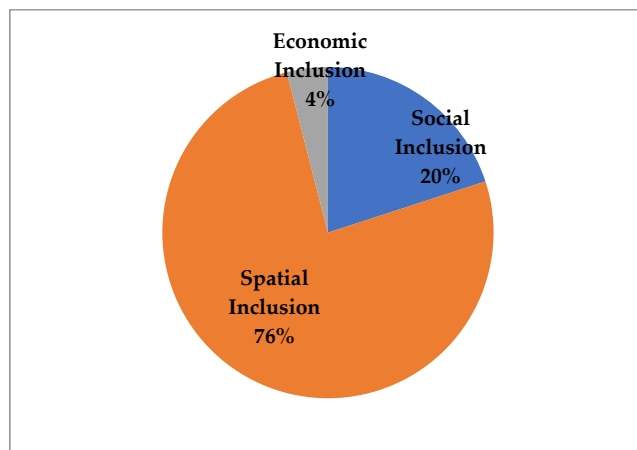
(a)
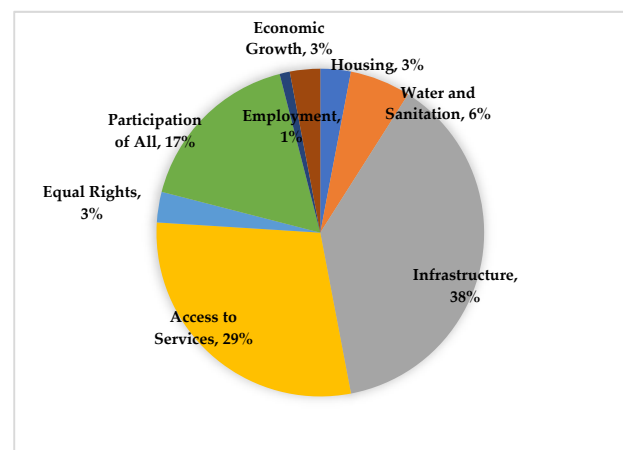
(b)

Inclusive City Indicators		No of Ref. Codes	%
Spatial Inclusion	Housing	5	3.50
Spatial Inclusion	Water and Sanitation	8	5.60
Spatial Inclusion	Infrastructure	54	37.80
Spatial Inclusion	Access to Services	41	28.70
Social Inclusion	Equal Rights	4	2.80
Social Inclusion	Participation of All	25	17.50
Economic Inclusion	Employment	2	1.40
Economic Inclusion	Economic Growth	4	2.80

(c)
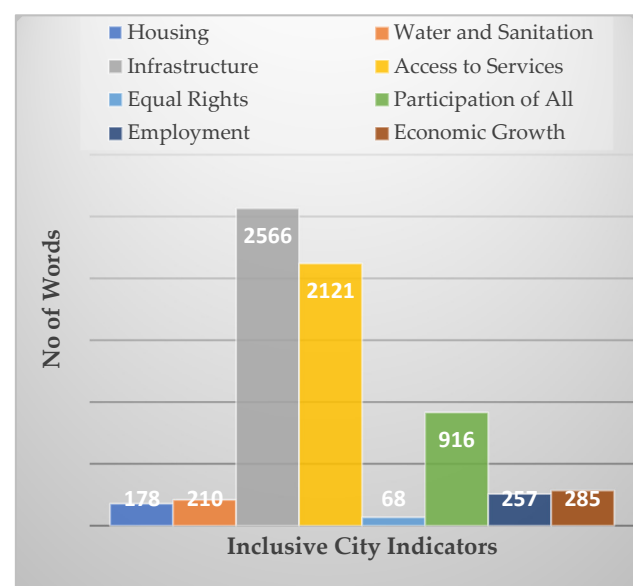
(d)

Figure 2. Content analysis of inclusive city indicators. (**a**) Inclusive city indicators and percentage of encoded words. (**b**) Breakdown of inclusive city indicators—percentage of encoded words. (**c**) Inclusive city indicators and number of referenced codes. (**d**) Inclusive city indicators and number of encoded words.

Table 5. Assistive and smart technologies from the perspective of interviewees.

Technologies	Target Group	Impact
Data collection through sensors and cameras	People who are sensitive to noise, light and temperature (such as autism)	Improving work efficiency
Pedestrian crossing system	People who are disabled and older people	Improving mobility and accessibility
Navigator beacons connected to smart phones	Blind or partially sighted, people who are disabled who lack spoken language	Improving mobility and accessibility
Delivery applications	People who are stuck at homes	Improving accessibility
Sharing platforms for bikes	People who are socially disadvantaged	Improving mobility and socialization
Heart defibrillators at subway stations	People who are at risk of heart attack	Improving mobility and accessibility

Table 5. *Cont.*

Technologies	Target Group	Impact
Digital platform for monitoring citizens' dialogue.	Citizens in complex stakeholder environment	Civil participation in a smart way
Smart tools to monitor employees' own carbon footprint	Employees	Improving health quality
Easy payment alternatives for transport	Older, younger, socially disadvantaged	Improving mobility, accessibility
Applications for sharing live data info on congestion, disruption	People who are disabled	Improving mobility, accessibility, health quality
Increased surveillance and use of CCTV	Women, LGBT, older people and people who are disabled	Improving mobility, accessibility and safety
Apps to help navigation	People who are disabled and older people	Improving mobility and accessibility
Smart tags for tracking	Children and people with disabilities such as dementia	Improving mobility, accessibility, and safety
Fall detection alert systems	People who are disabled and older people	Improving health quality
Calling for assistance systems in public spaces	Women, children, people who are disabled and ethnic minorities, people who feel more vulnerable as soon as it gets dark	Improving mobility, accessibility, and safety
Detecting wheelchair and women with buggies in lifts, buses through CCTV systems	People who are disabled and women with buggies	Improving mobility, accessibility, and safety

Audio–video-based applications, sensors, cameras and detecting technologies are widely used for increasing inclusiveness within smart city strategies. Many assistive and smart technologies were mentioned by the interview participants to increase the mobility, accessibility and health quality of older people, people who are disabled, socially disadvantaged people, women and children. Technologies, such as pedestrian crossing systems which recognise people who are disabled and older people, and systems that detect wheelchairs, navigating tools and buggies, increase safety and security and improve mobility and accessibility. Health management is also ensured through different measures and applications, such as fall detection alert systems and call systems for emergency situations.

6. Discussion of Findings

The trend towards launching smart city initiatives is growing, but there is still a debate on the role of smart cities for inclusiveness. Our findings based on semi-structured interviews also demonstrated that there is no consensus on the role of the smart city concept on inclusiveness. Some of the participants perceive that smart cites should serve to meet all people's needs and reach everyone equitably and responsibly. On the other hand, the others are either undecided or believe that smart cities promote digital services for convenience and do not necessarily address inclusiveness. In the literature, the necessity of being inclusive as part of a smart city has also not been clearly identified but implied in various definitions [64–68], highlighting the importance of more research and development in this domain. In addition, some interviewees argued that the smart city concept is sometimes used for marketing purposes and digitally transformed cities do not necessarily meet the real needs of citizens, which can even marginalise different groups in society. Ramaprasad et al. [69] also believed that "Smart Cities" have been used as a fashion label or a concept that distinguishes or promotes themselves as innovative by the governments and researchers since the 1990s. According to our findings, this perception still exists about smart cities, raising some concerns about whether the plans are realistic and expected benefits are achievable in practice.

This study revealed that the London smart city strategy focuses on a broad scope of target groups. The city aims to engage people who are disabled and disadvantaged people in terms of age, geography, income, employment, women, LGBT+ people and BAME with digital skills and reduce health inequalities by increasing access to health services and improving their environment by enabling enough and comfortable housing, less air pollution and better access to energy. Several actions are particularly taken to make people with disabilities and elders travel easily and meet their health needs either at home or on the go. Most cities have crucial problems with regard to engaging the world's one billion people who are disabled, ranging from enabling accessible infrastructure and user-sensitive facilities to access to necessary public services [70]. According to Disability Right UK [71], there are 14 million people who are disabled in the UK, constituting a fifth of the population. In addition, the aging population is increasing. The World Health Organization [72] estimates that between 2015 and 2050, the proportion of the world's population over 60 years will increase from 12% to 22%. In the UK, in the following 25 years, the number of people over 85 will double to 2.6 million [73]. Therefore, inclusive interventions are of great importance for London city as confirmed in this study. Our research findings demonstrate that despite the wider scope of the London smart city strategy, religious inclusion was not adequately addressed. According to the 2021/2022 UK Home Office's Annual Hate Crime Statistics [74], there were 8730 religious or other faith-based hate crimes, an increase of 37% compared to the last year. Religious discrimination is an important concern in society, which requires deliberate strategies to improve inclusiveness.

The secondary data analysis of London smart city strategy documents and the content analysis of semi-structured interviews pointed out that spatial inclusion is at the centre of inclusiveness within the London smart city strategy. Spatial accessibility to the urban environment is essential for ensuring a large number of people can actively move and contribute to their well-being [75]. Many other prominent smart cities worldwide, such as Auckland [76], Singapore [77] and Zurich [78], also give much importance to spatial inclusion. Boosting infrastructure for achieving more inclusive, accessible and safer transport vehicles and hubs and ensuring access to services are the major goals of the London smart city strategy in terms of spatial inclusion. Nevertheless, findings of the interviews showed that the infrastructure in some parts of the city does not suffice for people who are disabled and older people to move freely and access services. For instance, due to a shortage of trained staff that can fix the lifts in case of being broken, tube station lifts had to be closed more than 500 times last year [79]. Also, there is still a security issue and safety problem in some parts of the city, especially for people who live in rural regions. According to the Rural Crime Report [80] of Countryside Unites Against Rural Crimes, the cost of rural crime increased by 22.1%. Based on the survey of 175 NFU Mutual Agents [81], 80% of participants emphasised that rural crime is disrupting farming activities. Therefore, there is a need for effective measures for better infrastructure and security systems within the smart city strategy to guarantee access to services. Identifying spatial data for housing and new schools for rural disadvantaged people is also important for London city. Spatial inclusion has become more important recently due to the tremendous increase in housing prices worldwide after the pandemic. As inequalities across socioeconomic groups, across generations and across space can be both reflected and reinforced by housing [82], policies of housing in the London smart strategy are crucial for avoiding inequalities among the groups with different socioeconomic status. Immigrants are faced with several problems with housing. Newcomers who suffer from inadequate support networks are especially faced with precarious work and housing situations [83]. Resettlement plans for immigrants aim to handle this problem in London. Housing is also problem for LGBT+ people; thus, London city encourages social landlords for LGBT+ people who may have a higher risk of homelessness [84].

Among inclusive city indicators, social inclusion was placed second in London smart city implementations according to content analysis findings (Figure 2). The participation of all people in society is the main goal of empowering social inclusion in the city. Particular

emphasis was given to equal rights for women, unrepresented groups, young people and persons who are disabled by introducing new jobs and promoting safer and more secure environments where people can walk and travel freely. Recognising cultural institutions and increasing the diversity of "Talk London" [85], which is City Hall's online community, can spur discussion regarding people's thoughts on big issues to shape City Hall's plans and policies.

The content analysis of interviews showed that economic inclusion ranked in last place. Although several measures have been planned in London smart strategy documents, such as engaging people over 50 and unemployed people with digital skills through free training and encouraging industry to offer employment opportunities for vulnerable groups, young people, and women to ensure employment and economic growth in London. Economic inclusion as part of the London smart city strategy was not emphasised by the interview participants.

Smart cities are receiving more interest across the globe, but there are several problems faced during the implementation of smart technologies. This study also revealed several difficulties. The major challenge that was determined was the lack of trust due to limited transparency which hinders data collection, which is of great importance for the future of smart interventions in cities. Another problem that was identified was the interconnectivity problem between smart systems, which negatively affects the success of adopted smart technologies. To decrease the impacts of these barriers and promise more inclusive smart cities, the survey highlighted the importance of addressing the cities' needs rather than focusing on smartness and technology. It is important to boost collaborations between stakeholders who collect data and citizens to make people more aware of why data are crucial for feedback, to ensure transparency and to explain the implications of data use. The issues of user privacy and data standardization and integration have also been addressed in the literature [86]. To avoid ethical, legal and privacy concerns, strict measures and penalties should be taken against misuse and misinterpretation and best practices should be developed as mentioned by our interviewees.

Assistive and smart technologies are fundamental for smart cities. Introducing different applications such as navigating tools, detection and call services in emergency cases, recognition tools, audio- and video-based assistive technologies, mobile devices/applications, e-support programs, sharing digital information platforms, sensors, as well as VR and AI tools can help vulnerable groups feel safer at home or when moving. Sensing and monitoring technologies help employees work more efficiently by enabling a healthier and comfortable environment. Audio–video-based applications, such as pedestrian crossing systems and fall detection alert systems, promise several benefits for the elderly and people who are disabled in terms of well-being and safety. Increased surveillance and the use of CCTV as well as calling for assistance systems in public spaces boost security for women, LGBT+ people, and other people. A digital platform for monitoring citizens' dialogue can also enable the participation of all people in an effective way. These technologies can be integrated into smart cities, leading to increased interconnectivity between smart systems and enhanced accessibility.

Citizen engagement can bring about better governance, citizen empowerment, positive and constructive relations between citizens and the state, improved public service delivery, more effective development and well-being [87]. This study's findings show that training has the highest priority for better engaging people towards smart cities. In that sense, education campaigns, digital hubs and other sorts of training play an important role in enhancing digital capability and benefit more from digital transformation. Especially, digital hubs can be very effective for people who lack digital skills and live in rural parts of the cities. Stojanova et al. [88] also suggested rural digital innovation hubs as an efficient way of enhancing local environments in a more sustainable way, by affecting local businesses, people and local authorities for rural development. Other drivers that are listed are setting the right policy, standards and master plans with the dedication of more time for citizen engagement while developing technologies, getting feedback from diverse groups and ensuring accessibility of smart technologies for all people. Everyone should have

equal rights in accessing digital solutions to enable spatial, social and economic inclusion. Advertising and promoting the smart city benefit by increasing transparency, and the better communication of the potential benefits of these solutions is crucial to improve engagement with smart technologies.

7. Conclusions

This study aimed to investigate the London smart city strategy from the perspective of inclusiveness, which is a growing concern all over the world. The research methodology of the present paper was based on a secondary data analysis of smart city initiatives worldwide; the London smart strategy report, namely Smarter London Together (2018); and other related city strategy documents, followed by a content analysis of semi-structured interviews with six experts to explore how inclusiveness is planned and implemented in London. This study mainly discussed the role of inclusiveness in smart city strategies by exploring London smart city policies in terms inclusive city indicators (spatial, social and economic inclusion), target groups, assistive technologies, barriers, future recommendations and issues of citizen engagement.

The findings point out that London smart city strategies address a broad range of target groups and mainly focus on spatial inclusion by giving more attention to infrastructure and access to services by transforming transport vehicles and hubs to achieve more inclusive, accessible and safer travel in addition to improving health management with a wide range of assistive and smart technologies, sustainable built environments with less air pollution, reduced energy poverty and more inclusive housing opportunities. Although there are several implemented policies, there is still room for improvement in access to services and security for the people who live in rural parts of London city. Some problems exist in transport hubs which may hinder the elderly and people who are disabled. Social inclusion is also one of the most important goals of the London smart city by enabling the participation of all people through new employment opportunities, increased accessibility, as well as providing equal rights for women, unrepresented groups, young people and persons who are disabled. Nevertheless, this study indicated that the economic inclusion aspect is limited to measures against digital exclusion, and there is a necessity for policy makers to better address economic inclusion within smart city strategies. This research also aimed to understand the main challenges during the implementation of smart city strategies. The main barrier that was identified was the lack of trust to limited transparency. The availability of data is essential for enhancing smart technologies. To ensure more inclusive smart cities, this study highlights the importance of transparency for data collection, promoting best practices and legislative actions against misusers.

The smart interventions in London target a wide range of groups, such as socially and rural disadvantaged, LGBT+ and older people, people who are disabled, children, women, other species, minorities and unrepresented groups. Many innovative assistive technologies, such as fall detection alert systems, calling for assistance systems, audio- and video-based solutions, sensors, digital platforms, monitors and mobile devices, aim to increase health quality, mobility, accessibility, security and work efficiency. Citizen-centric approaches should be utilised when transforming cities into smarter environments. Therefore, this research also discussed the role of citizen engagement in smart cities by highlighting the importance of training through digital hubs and other means which could ensure all people regardless of where they live benefit from education programs.

The findings of this study may contribute to a better understanding of inclusiveness within smart cities and the role of technologies. The implications of this study may enable smart city planners to better integrate smart technologies into the city infrastructure by considering the potential threats of technological interventions, reaching everyone equally, and citizen-friendly and transparent data collection for the wider use of smart technologies without digital exclusion. It has to be noted that this study is limited to London smart city strategy documents and interviews. Findings from London, as a city that has a smart city vision with several initiatives and implementations in place, can provide an example for

other cities in the process of developing inclusive smart city plans. However, it should be emphasised that findings from the content analysis cannot be generalised, due to the limited number of interviewees. Discussions depicted in this paper involve some subjectivity and depend on the personal experiences and knowledge of interviewees on the smart city strategy and its applications. This research should be considered as an exploratory study shedding some light on the perception on inclusiveness in smart cities and highlighting some room for improvement. More research is needed to collect empirical data which can be used to test the existence of statistically significant links between smartness, inclusiveness and the role of technologies. Further research may examine different cities at a global scale to identify common trends and make comparisons between smart city visions and implementations from the perspective of inclusiveness to provide more generalisable insights for policy makers.

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Institutional Review Board Statement: All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the ethical rules of Istanbul Arel University and the protocol was approved by the Ethics Committee of Istanbul Arel University (Committee Decision No.: 2023/18, dated on 8 September 2023).

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available as it contains information that could compromise the privacy of research participants.

Conflicts of Interest: The authors declare no conflicts of interest.

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