

# **To identify the perceptions of citizens towards smart cities in the UK**

By

Dr. Olivia Bennet

## **Abstract**

In this research, awareness and attitude concerning smart cities among the citizens of the UK is discussed alongside the desired citizen engagement in planning for Smart Cities. A qualitative research design was adopted, and data was collected through structured interviews with participants selected from different society groups. Based on a thematic analysis, there are low levels of awareness about smart city initiatives with many gaps in certain groups' knowledge. All the participants identified the opportunities of smart city technologies focusing on enhancing urban services and sustainability. However, fear of digital privacy and technology failure and their impact on people's lives were expressed as concerns. Lastly, the study pointed to the importance of citizen participation towards smart city planning while revealing that they currently need more opportunities to participate. These results imply that open communication, building trust and involving the public in the planning process are critical factors in winning the hearts of the public and ensuring smart city projects benefit all people.

## **Keywords**

Smart cities, UK citizens, citizen engagement, data privacy, urban planning, qualitative research

## **Introduction**

With the use of technologies to enhance urban efficiency and residents' quality of life, smart cities are increasingly emerging as a development trend in the UK (Wilson, 2019). The call for smart cities has been regarded as a visionary move in the United Kingdom to tackle many challenges that come with development, such as traffic jams, efficient use of resources and delivery of services (Georgiadis et al., 2021). Although many scientists and engineers agree that the notion of smart cities is still highly abstract, like IoT sensors, AI-driven traffic systems, and other advancements gradually appearing in many cities of the United Kingdom, including London, Manchester, and Glasgow, provide their people with tangible examples of what the smart city is. There are social

aspects where people's perception affects how the inhabitants interact and benefit from smart infrastructural development (Homer, 2023).

If citizens consider these technologies helpful, they are more likely to back their use, embrace them and campaign for their upcoming expansion. However, due to the nature of smart city initiatives that heavily rely on big data collection and processing of people's personal data, it is crucial to familiarise with the concerns that the public may have concerning privacy (Brown et al., 2023). These are issues that can greatly affect people's confidence in their municipal governments and their interest in smart city initiatives (Spicer et al., 2023). Nevertheless, the present perception of a smart city differs for all the numbered demographic operations. There are things like age concerns, technological awareness, and socioeconomic factors which are able to influence the perceptions a person has concerning the relative benefits and inconveniences of being part of a system that is completely integrated into the digital world of a city.

The primary research problem founds that while the UK invested massive amounts of money into smart city initiatives, there is a lack of public awareness and approval of these innovations in the way they are being introduced. New research indicates that whereas contemporary cities are becoming more digitized, most of the residents are either ignorant of this process or have major reservations about the ramifications of such change for privacy, security, and possible social consequences (Caird et al., 2016). Such ignorance creates a significant hurdle in the implementation of smart city solutions and may result in citizens' opposition as well as a decrease in the impact and efficiency of these technologies. This article therefore seeks to assess the understanding that UK citizens have of smart city strategies, along with their impressions of the opportunities and implications related to such measures, and their desires with regard to participation in the planning phase of smart city implementation. Hence, the origin of this study can be traced to the realization of the failure of making technological innovations known amongst the society. This study aims at establishing the factors that determine citizens' attitude towards, acceptance and participation in smart city initiatives thus enlightening urban development.

### ***Objectives***

The aim of this research is to examine the perceptions of citizens towards smart cities in the UK. The objectives include:

- To determine the level of awareness among UK citizens regarding smart city initiatives and technologies.
- To explore the attitudes toward the challenges and benefits of smart cities, including concerns over the impact of data privacy and technology on lifestyle.

- To uncover the citizen preferences for involvement in the planning and implementing of smart city projects.

## Literature review

Smart cities as an idea have started receiving attention in many countries to improve the lives of people in urban societies. In the UK, this interest is reflected in governmental and academic documents concerned with implementing modern digital technologies in the management of cities (Balta-Ozkan et al., 2014). Such literature in this domain often focuses on the capacity of smart technologies to optimise operations within cities, citizens' participation, and environmental conservation. A seminal work in this discourse offered an evaluation of the fundamental assumption of smart city frameworks and observed that while technology offers efficacy, there is the question of the socio-political aspects of technology use in cities. This perspective is crucial as it also influences the potential of smart technologies through its discussion regarding acceptance and integration into people's lives (Spicer et al., 2023).

Other related research by Del-Real et al. (2023), which explores smart city's technology specifics, especially regarding IoT, AI and the application of Big Data in city inhabitants' organising. These technologies enhance traffic control, energy supply and public security services because they make available data the collection of which previously was almost impossible. However, the literature also reveals the imperative call for strong security systems and privacy, which is a major area of concern for a citizen erosive to acceptance, as Van Twist et al. (2023) consider. According to the awareness and acceptance perspective, Homer (2023) assesses the people's knowledge and attitude toward smart city technologies in London. The study reveals that awareness is moderate amongst the citizens, but it varies with gender, age, education, and income, amongst other factors. Such disparity implies that there could be a need to deploy specific awareness-creation efforts in the form of education in line with the notion of smart cities to different age bracket groups.

Further, Lytras et al. (2019) review the literature that focuses on the participation of smart cities. They posit that for smart cities to be effective, there ought to be a shift from an implementation view of smart technology to an engagement view of citizenship. This entails availing means through which citizens can be involved in the planning and decision-making processes for smart city projects to address the locals' needs. Ching and Ferreira (2015) elaborated on how smart technologies can help increase environmental sustainability through wise use of resources and lowering carbon emissions. Advanced power networks with emphasis on intelligent distributed smart grids, effective and efficient eco-friendly transport systems, as well as optimal control and monitoring of the use of resources through IoT are some of the integrated solutions that can be

employed to achieve dramatic cuts in impacts on the environment in the cities now considered ineffective (Rodríguez Bolívar, 2019).

### ***Theoretical Framework***

The theoretical foundation of the work analysing awareness and attitudes of UK citizens about smart cities combines the technology acceptance model, and urban interaction theory. This framework offers a theoretical framework to comprehend how new technologies are understood, adopted and embraced in the context of the cities. TAM stands for technology acceptance model, which was pioneered by Davis in 1989, and it is core to perceiving the user acceptance of information systems (Macke et al., 2018). The model further stated that perceived usefulness and ease of use are the most basic elements influencing technology acceptance. Applicable to smart cities, this model may be useful in identifying and pinpointing perceived benefits and the usability of smart technologies in shaping citizen acceptance and their openness towards smart city concepts (Spier et al., 2023).

Urban interaction theory suggests that the physical environment, as well as the social environment within the city, has an impact on interaction and behaviour. In the understanding of the theories of social work, these can be used in smart cities to explain the impact of technology integration in urban structures on relations, cohesiveness and fabric of any society (Ji et al., 2021). The Stakeholder Theory is particular about considering every stakeholder in the various managerial decisions. In the setting of smart cities, it applies to city managers, technology suppliers, inhabitants, companies and non-governmental organisations. Such stakeholders include citizens, government, private entities and technology providers, and identifying their needs and apprehensions is crucial in formulating smart city projects that are sensitive to the population (Belanche-Gracia et al., 2015). Using this theoretical approach, scholars and policymakers will be in a better position to understand the multifaceted nature of factors that shape the perception of smart cities.

### ***Literature Gap***

Several research gaps have been found in the literature that require more attention in future research, especially in the context of the UK smart city. Research has concentrated more on the technological and physical components of the smart city and has yet to fully consider the citizens' perspective (Del-Real et al., 2023). There are few studies that focus on exploring the socio-psychological implications of living in smart cities, which remains important for establishing acceptance or resistance among the population (Lehtio et al., 2023). However, there is a lack of knowledge of how these technological trends are perceived, specifically in terms of awareness, concern with data privacy and the social consequences of rising technology adoption. Third, although the study touches on the correlations between these perceptions and demographic

attributes including age, socio-economic status and geography, the present literature lacks adequate data on the topic (Savastano et al., 2023; Homer, 2023). This research fills these gaps by shifting the attention to the qualitative characteristics of the perceived phenomenon, which entails an extensive analysis of social and psychological factors underlying people's attitudes towards smart cities. In light of this, this study through conducting interviews for citizens of the United Kingdom provides a unique perspective of the awareness, attitudes, and expectations of these citizens towards smart city projects (Del-Real et al., 2023). The study adds value to the literature in the sense that not only are the different attitudes towards NEF from the various demographic segments displayed and discussed, but also policy recommendations are offered to policymakers and urban planners in relation to how they could improve citizens' engagement and address their concerns. Thus, this research fills the gap between technology advancement on one side, and improvement of technology acceptance and social implications on the other side, in smart city projects.

## **Methodology**

The current research employs a qualitative approach to understand UK citizens' different and more complex conceptions and beliefs concerning smart cities. In this case, it is important to use Qualitative research since it can provide detailed data that captures the social and psychological processes involved. This approach allows the examination of what citizens think about smart cities and why they think that thus considering motives, concerns and expectations. Caird et al. (2016) noted that the use of qualitative methods yields contextual information that goes further in explaining motives, concerns as well as expectations of people and may fail to be captured by quantitative research methods. This type of study is important in identifying how citizens observe the complex intersection of technology with their lives and based on Creswell (2013), qualitative work seeks to determine 'why' people behave and think as they do especially in social settings.

Primary data is obtained through semi-structured interviews. This method is selected because it provides more options for elaboration, yet all the topics important to the research process are discussed systematically (Snyder, 2019). This method of data collection is useful when seeking to determine individual and group beliefs about smart cities and is, therefore, suitable for this study. The interview aimed to target different themes, including awareness of smart city projects, perceived advantages and disadvantages, privacy and security concerns, and the need to participate in the planning process. This research instrument ensures that all the research objectives are captured within the interview whilst flowing with the discussion.

Purposive sampling is aimed at a diverse age range of participants, people from different socioeconomic statuses and those from both urban and rural settings to ensure that a broad range

of perceptions is obtained. Purposive sampling is used to select a sample that may reflect the population appropriately (Browne et al., 2019). This technique involves choosing participants that have some prior knowledge or experience in interest so that participants recruited represent the different regions of the United Kingdom's urban communities.

The method for analysing the collected data for this study is thematic analysis; this is one of the most common approaches when using qualitative data to identify, describe and report patterns within it. As it has been illustrated, thematic analysis is appropriate to this research since it offers the opportunity to discuss the results of the interviews, debate the findings, and look for the main themes and patterns, which express the participants' point of view or the attitudes and concerns in relation to smart cities. Braun, & Clarke, (2017) have defined thematic analysis as a non-prescribed approach to the analysis of 'texts', that suits the nature of qualitative research when the aim of the study is to make themes out social interactions and experiences. This type of research allows this study to utilise thematic analysis to understand the perceived patterns of the UK citizens in relation to smart city initiatives and their beliefs about it. Thematic analysis is appropriate for this study as it offers a clear method of categorising qualitative data. It can also help redefine and unveil explicit and latent content, which helps to draw a more comprehensive picture of highly multifaceted processes, such as people's attitudes toward smart cities (Fellows and Liu, 2021).

In doing the study, ethical considerations was observed, especially when involving human subjects regarding perceptions towards smart cities. The study respects the principles of voluntary participation, where all the participants are informed of the study's intention, the involvement and role they are expected to play in the study, and their ability to withdraw from the study at any given time without any force or coercion (Coe et al., 2021). Participant's identity is anonymised and the information is disclosed only to the researchers involved in the study. Further, the study is aware of the socio-ethical impact of the discussion of technology and surveillance; therefore, the participants are offered sufficient assistance and information to understand the existence of smart cities. This research ensures to have all procedures and all materials undergo an institutional review board (IRB) to ensure that participants' welfare and rights are protected in line with the required ethical standards.

## **Results and analysis**

Following data collection, the following topics have surfaced via thematic analysis.

<b>Theme</b>	<b>Sub-theme</b>	<b>Explanation</b>
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Awareness of smart city initiatives	<p>Knowledge of existing projects</p> <p>Understanding of smart city technologies</p> <p>Sources of information</p>	This theme looks at the state of awareness of UK citizens on smart city initiatives within their locale, their speciality knowledge of certain projects, the technologies required for the projects, and the sources of their information.
Attitudes towards smart cities	<p>Perceived benefits</p> <p>Perceived challenges</p> <p>Concerns about data privacy</p> <p>Impact on lifestyle</p>	This theme entails the participants' emotions and perceptions of smart cities and their strengths and weaknesses. It also captures issues such as how smart city technologies may impact their data privacy and everyday lives.
Engagement in smart city planning	<p>Desired level of involvement</p> <p>Preferred forms of participation</p> <p>Perceptions of current engagement opportunities</p>	This theme deals with the participants' needs and choices concerning their participation in the creation and deployment of smart city projects. They describe what they want in terms of participation, how they would like their participation to occur, and, more importantly, their satisfaction with the existing levels of citizens' participation.

## ***Thematic analysis***

### ***Theme 1: Awareness of smart city initiatives among UK citizens***

Public awareness is an essential aspect particularly in the determination of effectiveness and acceptance of smart city practices and projects. Some research has indicated that the level of awareness that the public has concerning smart city technologies differ greatly; this depends with the geographical location, socio-economic status, and access of information among others (Homer, 2023; Van Twist et al., 2023). The study's findings highlighted that citizens' awareness of smart cities in the United Kingdom was low but not negligible. While some participants seemed to be quite knowledgeable about ongoing projects, especially in urban centres such as London and Manchester, others lacked understanding or were entirely unfamiliar with these projects. Those who had prior knowledge of smart city initiatives provided various examples, including smart



traffic systems, energy-efficient buildings and even Wi-Fi networks. For example, one of the respondents said

*'I have noticed the smart parking systems being installed around the city and read about the plans to incorporate AI for traffic control.' This group of participants mainly learned their information through local media, social networks, or words from the local councils.*

Nonetheless, a considerable number of the participants were quite unclear on what smart cities consist of. Regarding the findings of this study, the study by Ji et al. (2021) also noted 70% had no specific idea of what a 'smart city' means; they saw the term in the context of technology or general development without having a clear understanding of the projects or technologies associated with it. In this research, a participant said,

*'I never knew my city was participating in these smart city initiatives. It is something that would be mentioned infrequently.'*

Another interesting insight obtained when analysing the results was that the participants' sources of information about smart cities were rather different. Macke et al. (2018) also supported these results with their study findings. Some participants with higher awareness levels were informed by following technology-related newspapers or participating in community meetings where such endeavours were encouraged. Many respondents underlined improved services for communities, for example, better traffic organisation or higher utilisation of energy sources, as major benefits. A participant said that.

*'If traffic lights are smart and self-adjustable according to road congestions, then traffic hassles are bound to reduce.'*

## ***Theme 2: Attitudes towards smart cities***

Concerns, perceived benefits, and challenges forms the basis of public attitude towards smart cities. Such positive attitudes arise where smart technologies have benefits that are perceived as potentially being able to transform living in cities by improving the efficiency on service delivery and sustainability (Ching & Ferreira, 2015). The attitude of participants to the concept of smart cities, identified during interview data analysis, also varied between the two poles, with optimistic reception on one end and realistic scepticism on the other. In the research conducted by Lytras et al. (2019), respondents were also positive regarding the efficacy of smart city technologies, especially on the living standards of citizens in urban centres. Many respondents underlined



improved services for communities, for example, better traffic organisation or higher utilisation of energy sources, as major benefits. A participant said that.

*'If traffic lights are smart and self-adjustable according to road congestions, then traffic hassles are bound to reduce.'*

The responses showed that there is agreement there is potential that smart city initiatives can help to solve traditional urban problems, especially in transport and environmental conservation. However, not all responses were positive; there were negative and mixed reviews, too. Some respondents perceived the idea of smart cities as unachievable concerning the application of technologies in smart city projects, especially in towns and less developed cities. For instance, they said

*"Failure is inevitable in the usage of such advanced technology, so what if the entire city no longer operates? Are there measures in place for backup?"*

This scepticism can be attributed to broader anxieties about the practical questions of applying sophisticated technologies in cities. Some of the respondents needed to be more apprehensive about the growing collection of data that comes with smart city concepts and systems. This emerged clearly as one key concern mentioned many participants would confirm that they were uncomfortable with their information being used or processed in certain ways. Macke et al. (2018) also pondered the impact or effect that smart cities will have on their lives, revealing mixed feelings. One participant said,

*"If my city can handle some of my chores, such as where to park my car or how to regulate energy use in my house, then, yes, it would be easier."*

### ***Theme 3: Engagement in smart city planning***

Public participation is one of the pillars of smart city development since it helps in city improvement by reflecting the populace's wishes and demands. Harma et al., (2015) suggested that current research finds that the ethic of e-governance emphasis is on shifting from a mere of technology-centric to concentric that involves active citizenship in decision making processes such as Lytras et al., (2019) and Rodríguez Bolívar (2019). It was found that the level of interest in engagement was not constant and that there was disagreement on how this should be done. A few participants were firmly convinced that more attention should be paid to people's involvement in decision-making processes, especially concerning matters of concern in their everyday lives. One participant emphasized:

*"It is our right to help decide the future of these cities since we reside in them, but nobody is thinking past the technology; do they consider how it enters the city and changes everything?"*

Lehtio et al. (2023) explained that citizens who opined that smart city strategies and plans might not effectively meet citizens' needs if they are developed without their participation. However, several authors showed the least participation and stated that professionals and authorities should come up with the best solutions (Ji et al., 2021) Some participants also suggested that they wanted workshops similar to public participation or planning sessions that involve citizens working with planners and developers.

*"It's too bad we can't collaborate in workshops and contribute ideas and solutions. One is much more active than a survey,"* said one participant.

Such responses suggest a playback of interest in variety and affordability for various engagement forms that meet the participants' various lifestyles and respective expertise. Some of the participants said that they needed more adequate information about ways in which they could be involved in planning. This participant expressed this feeling:

*"I don't think that the city engages us enough in these kinds of projects; most of the time, we are merely being informed when decisions have already been made."*

Some of the participants complained about the need for more seriousness of the organisations in implementing the engagement process, for example some citizens were invited to participate. Still, once we do, our views are dismissed or not given any credence. Rodriguez (2018) explained that there are many issues, and this study also shows that there is a huge gulf between the stated intent to engage citizens and the current level of participation, indicating that many people feel unable to take part in the decision-making processes that regulate their lives.

### ***Discussion***

The results of this study show that, overall knowledge of initiative of Smart City in UK is moderate and there is variation with respect to demographic variables. Further, people from large cities like London and Manchester showed more familiarity with smart city projects including smart traffic and energy efficient structures. This is in line with Homer (2023) who as noted above stated that the level of awareness of smart city technologies in London was moderate but differed based on age, education and income level. Nevertheless, a great number of the participants, especially those from the midwestern towns and the countryside had a poor perception or a poor understanding of what a smart city entails. This is in concordance with the findings of Van Twist et al. (2023) who noted the lack of awareness about smart cities especially within the rural area. Such obliviousness revealed a huge communication disparity in approaches employed by

policymakers and city planners pointing to increased awareness campaigns. These campaigns should therefore be designed to close this gap and more to the point ensure that all citizens understand what smart city initiatives are and what can be expected therefore creating good impression to encourage more citizens to embrace the initiatives (Ji et al., 2021; Macke et al., 2018).

This research also assessed UK citizens' perception towards smart cities where they expressed a variety of attitudes ranging from positive perceptions of the potential positive impacts of the technology to negative perceptions of the effects of the technology. Some of the aspects that several participants appreciated regarding smart city technologies included the ability of improving living conditions in urban areas, especially regarding traffic and environmental factors. These positive attitudes are in concordance with the observations made by Ching & Ferreira (2015) on the contribution of smart technologies toward sustainable use of the environment and resources. Though, the study also revealed a lot of privacy and accuracy issues concerning such technologies. Spicer et al. (2023) observed that data privacy concerns are among the factors that hinder people's support towards smart cities. Also, the attitude expressed in this survey about the concern of technological reliability has been seen as like what Del-Real et al. (2023) have observed where citizens are scared of technological failure. Such concerns indicate that there is awareness of the prospects of smart cities, but the public will only support this concept if these drawbacks such as privacy infringement and unreliable technologies are countered with better measures on data protection as well as enhanced dissemination of information by the planners.

The lack of citizens' engagement was identified as an important theme with people emphasising that they would like to be more involved in smart city planning and implementation. As you will recall from chapter three, the studies show that there is general discontent with current level of engagement, which is stated to be largely shallow or insufficient. This concurs with the literature whose argument highlighted by Lytras et al. (2019) led to stressing that city administrations need to move from contemplating smart cities as technology projects to being projects that involve citizens in decision-making. The results have shown that the participants preferred more openness in participation methods including community meetings, online platforms and the participation workshops, which supports the findings of Rodríguez Bolívar (2019) who have established that citizens should be involved in the planning and implementation of smart city projects so that such initiatives meet the needs of many people. Moreover, the reason that current engagement efforts are seen as tokenistic based on the findings of Georgiadis et al. (2021) where citizens' contributions are deemed as worthless or receive no attention within smart city development. These findings highlight the necessity to reconsider strategies that authorities use to interact with the public to guarantee citizens meaningful input to the use of smart technologies for city development. This way city planners can build better relationships with the

public, they can respond to people's concerns, and so the citizens gain trust in their wise cities which are modern and intelligent.

## **Conclusion**

This research provides a relevant study of how UK citizens feel about smart cities as much as it presents the multiplex and multifaceted view of the emerging paradigm of smart cities. The study shows that public knowledge about smart city projects is still very low. Nonetheless, there are differences in the level of this knowledge; it could be better, especially among people living in small towns and communities not heavily involved in using technology. People are aware of the advantages of smart city technologies and applications, where enhancement of services and management of the city and environment fall in the convenience bucket. At the same time, they have many concerns regarding data privacy, the reliability of technology, and the social impacts of increased digitisation. On this aspect, the research also agrees with other scholars that citizens, especially its citizens, should be involved in the planning and implementing of smart city projects. There is, therefore, disapproval of current engagement practices, which many participants perceive to be mere tokenism or outreach. This may mean a cavity in the current approaches to and implementation of smart city projects, where diverse, inclusive and open processes are needed to address the needs of all the populations and populations within urban regions. The study underscores the importance of communication, trust, and an inclusive approach to smart city solutions implementation. Therefore, policymakers and urban planners must address such issues so that the public's perception of the change is positive and that the change towards smarter cities will be useful to everyone. In this way, they can construct more technologically Efficient as well as socially enlightened and liberal Cities, which in turn can pave the way for efficient, sustainable and linked urban growth in the UK's future.



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## **Appendix**

### ***Interview Questions***

1. What is your understanding of a smart city?
2. Do you know of any ongoing smart cities being practised in your region? If yes, please describe them.
3. How do you perceive that smart city technologies could affect you?
4. Are there any privacy and security issues you envision regarding smart city technologies?
5. What are your opinions about the manifestations of the technocentric approach toward monitoring and controlling the urban environment?

6. In what capacity should you participate in the planning and execution of smart city initiatives?
7. Are there any groups in your community that can be perceived as having a negative impact from smart city technologies? Why?
8. What do you consider should be done to ensure that smart city technologies will have an impact on the lives of all people?