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The Ability of Smart Cities to Promote Decentralisation

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Abstract

This article evaluated the impact of smart cities on decentralisation, using Bristol as a case, attempting to analyse whether smart cities have a positive or negative effect on decentralisation. I conducted a document analysis of literature related to smart cities in Bristol and the UK. In the process of document analysis, I evaluated government level, participation, transparency, and privacy factors and studied the documents accordingly after the document analysis. Through the study, I found that during building smart city facilities in Bristol, decentralisation was promoted through transferring of power within the central agency, the decentralisation of power from the central to the local level, and the cession of power between local government departments. At the same time, decentralisation is facilitated by extensive participation and cooperation from multiple parties during the operation of the smart city. Political participation at the community level and broad citizen participation in urban governance promote decentralisation. In addition, the government promotes decentralisation through the opening up of data and increased transparency. Finally, the thesis considers the impediments to decentralisation in smart cities due to issues such as personal privacy and data authenticity.

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The Ability of Smart Cities to Promote Decentralisation

1 Introduction

The two critical issues of smart cities and decentralisation have both been studied by previous scholars. The majority of research on the issue of smart cities is still focused on the impact of the use of ICT technologies in smart cities (Batty, Axhausen, *et al.* 2012; Mehmood *et al.* 2017), with some scholars arguing that as local governments and public administrations effectively implement smart cities, they can create public value for citizens and can enhance environmental sustainability (Bifulco *et al.* 2016; Monfaredzadeh and Krueger 2015); others have expressed concerns around neoliberal ideology and technocratic governance on smart cities demonstrating the potential for mass There are also concerns around neoliberal ideology and technocratic governance over the potential of smart cities to demonstrate mass surveillance of citizens (Kitchin 2014; Sennett 2012). As for the issue of decentralisation, scholars have focused on the differences in levels of decentralisation across countries and the processes of power transfer in decentralisation (Breuss and Eller 2004; Salmon 1987; Ribot 2003; Bergh 2004); as well as on the impacts of decentralisation (Sumah, Baatiema, and Abimbola 2016; Scott 2009).

No systematic research has been conducted on the relationship between smart cities and decentralisation. Although some scholars have previously analysed the institutional implications of using ICT technologies in smart cities (Chourabi *et al.* 2012; Albino, Berardi, and Dangelico 2015), the focus has been solely on the use of technology.

From the 1990s, when the United States proposed "Digital Earth" (Foresman 2008), to 2002, when the European Union proposed "E Europe" (Kierkegaard 2013), to 2009, when IBM first proposed "Smart Cities" Until today (Söderström, Paasche, and Klauser 2014), smart cities have become a hot concept around the world. From the initial focus on infrastructure (e.g. broadband technology, communication technology) to the current all-around construction (Cimmino *et al.* 2014; Bakıcı, Almirall, and Wareham 2013), the construction of smart cities has gone through different stages of technology accumulation to gradual maturity. The introduction of the smart city concept has provided the possibility to solve the various challenges faced in the current urban development process (Monzon 2015) and changed multiple aspects of urban planning and construction (Su, Li, and Fu 2011).

Many countries around the world are currently developing smart cities, but their development concerns are different. In terms of the world, the focus of smart city construction in countries represented by the United States, the European Union and the United Kingdom is to alleviate the energy crisis and environmental problems caused by

urban development through the construction of information technology platforms that promote sustainable urban development (Dryzek *et al.* 2003; Anttiroiko, Valkama, and Bailey 2014). And the countries represented by India and China, the focus of smart city construction is more on using new rounds of information technology to improve the various problems (Washburn *et al.* 2009) left behind in the process of urban construction and alleviate "urban diseases".

In addition to different development concerns, their focus of smart city development varies from country to country and city to city. Ireland's focus is on multi-participant innovation economy initiatives. In Ireland, Smart Dublin has its roots in Dublinked, a shared open data repository founded in 2011 (Cardullo and Kitchin 2019; Ryazanova *et al.* 2016). It was initially defined as an economic innovation scheme jointly owned by four local authorities and Maynooth University, with IBM providing the technology platform. Each region transfers funds to a central bottom pool to finance Dublinked's activities and core staffing.

In the US, New York's smart city focus is on open data: the Open Data Act was passed on 29 February 2012 and requires that by 2018, data held by New York City's government and affiliates must be open to the public, except for data related to security and privacy. New York City has created the New York City Open Data Platform, which provides thousands of publicly downloadable data types, while Seattle's Smart City project is focused on efficient public transportation networks: advocating for shared mobility, electrification, transportation demand management, transit communications and other initiatives (Dawes, Vidiasova, and Parkhimovich 2016).

The UK is currently at a very high level of smart city development compared to other countries globally and current global research on smart cities is focused on the UK. Many of the UK's larger towns are pursuing smart cities, with Caprotti et al. 2016 finding that nearly a third of UK local authorities with a population of over 100,000 had explicit smart city ambitions or substantially related initiatives underway. The "smart city" discourse appears to be having a widespread impact on their local policy making (Caprotti *et al.* 2016).

The UK's smart cities are characterised by a 'people-centred' approach that promotes citizen engagement. Smart governance emphasises the 'wisdom' of people. While the choice of technologies may be pragmatic in the construction of smart cities, they can only be seen as part of a holistic solution that includes human attributes, as is apparent in the construction of smart cities in the UK. For example, Glasgow proposes 'putting people first' and 'engaging and empowering communities' (Glasgow City Council 2016); London play a crucial role in engaging citizens and promoting decentralisation, while the Smart London programme puts 'Londoners at the heart' (London City Council 2016); Bristol proposes The Open Programmable City vision "gives citizens more ability to

interact, work and play with their city" (Bristol City Council 2009a).

In this article, to examine the impact of smart cities on decentralisation, we have chosen Bristol as the subject of our study. Bristol is one of the best cities in the UK, and indeed the world, for smart city development. In the 2017 UK Smart Cities Index, Bristol overtook London as the 'smartest city' in the UK (Michalec, Hayes, and Longhurst 2019). In 2018, Bristol won the Smart City Award (Judges' Choice) at the GSMA's 2018 Global Mobile Awards (The GLOMOs) (GSMA 2018). Bristol has a very progressive approach to smart cities, encouraging a high level of participation from businesses, communities and citizens in the city and providing the appropriate platforms and digital infrastructure for this (Deakin and Al Waer 2011).

This article seeks to examine the impact of smart cities on decentralisation. There is no unified definition of a smart city and, after taking into account, we adopt Caragliu et al.'s definition of the smart city factor (2011): a city is designated as smart if it strikes a balance between economic, social and environmental development, guided by ICT technology, and linked to democratic processes through participatory government (Caragliu, Del Bo, and Nijkamp 2011).

For studies related to decentralisation, the participation and transparency factors have been important considerations in the study of decentralisation in recent years. To achieve our objectives, we take full account of the three factors that are the subject of decentralisation: the government and the important indicators of decentralisation: participation and transparency, and focus our research on the following three questions.

Q1: What is the impact of the application of smart cities on decentralisation at government level?

Q2: Does the participation factor in smart cities contribute to decentralisation?

Q3: Does the transparency factor in smart cities promote decentralisation?

In order to address the above questions, it is necessary to combine literature and theory to examine each of these three factors: (1) the factors at the governmental level in smart cities; (2) the factors of participation in smart cities; and (3) the factors of transparency in smart cities, and to determine from these three perspectives whether smart cities have played a facilitating or hindering role in decentralisation?

This article provides a literature review on smart cities and decentralisation of rights and constructs a relationship between the two in Chapter 2, introduces the analytical and interpretative methods used in this study in Chapter 3, presents the results and discussion of this study in Chapter 4, and reviews the previous research in the conclusion section of Chapter 5, on the basis of which recommendations for the future development of smart cities are made.

Through my research, I have come up with the result that smart cities promote decentralisation. In the process of building a smart city, the central government devolves

power to the local level; in the process of building a smart city, the government transfers power to enterprises, communities, citizens, etc., promoting multi-party participation in governance; in the process of operating a smart city, the government empowers the people and supports decentralisation through data transparency, etc. In addition, I consider the factors that may hinder decentralisation in the operation of smart cities in the light of relevant literature and theory: in the process of promoting transparency, some data may not be made public due to privacy concerns, which may hinder decentralisation; for open data, the authenticity and quality of the data also have an essential impact on decentralisation; in addition, large-scale technology In addition, the use of large-scale technology for citizen surveillance may be another factor that hinders decentralisation.

2 Literature Review

Currently, many cities and countries are engaged in the construction of smart cities, in which information tools, represented by the Internet of Things and high-speed Internet (Rathore *et al.* 2016; Musa 2016), have shown great potential to promote democratic citizen participation through the opening of data and the construction of political participation platforms (Cardullo and Kitchin 2019; Simonofski *et al.* 2017; Ian Gershberg 1999); however, the collection of large amounts of data during the use of information tools has also raised doubts about the democratic process in cities: will smart Will cities promote bottom-up processes (Townsend 2013; Batty, Axhausen, *et al.* 2012), decentralisation and citizen participation, or will they, on the contrary, lead to top-down, highly centralised models of urban governance?

This chapter reviews the current knowledge of smart cities and decentralisation research from both theoretical and practical perspectives. The first section demonstrates the characteristics of smart cities and what is involved; the second section introduces the measurement of decentralisation and analyses the link between smart cities and decentralisation. The third section states how smart cities can contribute to decentralisation from a theoretical perspective, and the potential barriers involved.

2.1 Smart City

The idea of "smart cities" originated at the end of the 20th century, when a conference on "Smart Cities, Fast Systems, Global Networks" was held in San Fransisco, California, USA, in 1990 (Aslam *et al.* 2018). In October 2007, the European Union (EU) put forward the concept of smart city development in the EU Smart Cities Report (Caragliu, Del Bo, and Nijkamp 2011), elevating the concept of smart cities to the level of national strategy. 2008, the then CEO of IBM, Ming-Sheng Peng, put forward the concept of "Smart Planet" in an effort to combine the concept, connotation and vision of smart

cities with action (Wu *et al.* 2017). Driven by the wave of technology, various countries have responded positively to the needs of the times, competing to carry out relevant planning. The United States, the United Kingdom, Japan, South Korea, Singapore and other countries have "smart planet" "smart country" "smart city" The United States, the United Kingdom, Japan, South Korea, Singapore and other countries have listed the concept of "smart earth", "smart country"and "smart city" as national strategies to create a full range of intelligent construction (Central Policy Unit 2009).

There has not been a uniform definition of the concept of smart cities since research has been conducted, with previous scholars tending to emphasise the use of information technology (Albino, Berardi, and Dangelico 2015). IBM (2009) defines a "smart city" as a city that uses information and communication technologies to IBM (2009) defines a "smart city" as a city that uses information and communication technologies to sense, analyse and integrate critical information from the core systems of urban operations to respond intelligently to a wide range of needs, including people's livelihoods, environmental protection, public safety, urban services, and business and industrial activities (Scuotto, Ferraris, and Bresciani 2016). Caragliu, Del Bo, and Nijkamp (2011) define a smart city as a city that combines hardware facilities with timely and high-quality information, communication and social facilities. While current smart city projects make extensive use of IT as a means of improving the quality of urban life and its social, health, economic and environmental well-being (Aldama-Nalda *et al.* 2012), there is a growing recognition that the 'smarting' of cities is not the same as intelligence or informatization, but is neither a function of the internet, nor of ICTs such as big data. However, there is a growing recognition that 'smart' cities are not the same as intelligent and informative, but are neither a simple overlay of ICTs such as the internet, big data, nor a typical application of emerging technologies in urban construction (Marsal-Llacuna, Colomer-Llinàs, and Meléndez-Frigola 2015).

As this trend has changed, scholars have paid more attention to the relationship between smart cities and society in recent years. Building on the definition of a smart city by Caragalou et al. Michael Batty (2015) suggests that the concept of a smart city also includes the soft power of cities, such as improving the environment and quality of life in communities (Batty, Axhausen, *et al.* 2012; Batty, Hudson-Smith, *et al.* 2015). Shark describes smart cities as 'sustainable, smart, connected, liveable, resilient and innovative' (Toriz Ramos 2019). The Smart Cities Commission (2016) suggests that smart cities need to focus on operability and sustainability based on the use of information and communication technologies (ICT) (Fernandez-Anez 2016), while T. V. Kumar and Dahiya (2017) refers to a 'knowledge-based society' in the context of smart cities.

Although there is no uniform definition of a smart city, some scholars have summarised several vital characteristics. According to Caragliu et al. (2011), a city is designated as a

smart city if it strikes a balance between economic, social and environmental development guided by ICT technologies and linked to democratic processes through participatory government (Caragliu, Del Bo, and Nijkamp 2011). This article adopts this interpretation of a smart city.

The definition of smart cities has been accompanied by researchers' research related to the possible impact of smart cities. At the turn of the century, scholarly research focused on the impact of ICT technologies (McKerral 2003; Odendaal 2003). In addition to examining the effects of the application of ICT technologies on cities - the advantages of gaining increased efficiency and the disadvantages of affecting individual privacy (Sigala 2003; Danziger and Andersen 2002; Levi and Wall 2004) - scholars have conducted corresponding studies on the impact of ICT technologies on the political level. They have concluded that the application of new technologies in cities may enhance decentralisation (Audirac 2005). Although these studies go beyond the purely technical and focus on the institutional, they remain a technological analysis and do not demonstrate a 'people-centred' perspective.

In recent years, there has been an increasing interest in smart cities' have impact on society, going beyond a focus on the technology itself. Among other things, smart cities integrate ICT infrastructure and technologies to improve the functioning of cities. Smart cities have shown some positive impacts on public services, government transformation, open data, and citizen engagement. Based on ICT applications such as transport, environment, and urban safety, smart cities lay the foundation for sustainable socio-economic development and quality of life for citizens(Komninos, Pallot, and Schaffers 2013; Batty, Axhausen, *et al.* 2012); through the provision of e-services, municipal governments change the way they interact with residents and increase their political participation (J. Lee and H. Lee 2014); based on massive databases, the government makes information open and empowers the people (Linders 2012; H. Kumar *et al.* 2020). In addition to the advantages, a number of scholars have researched the problems that smart cities may pose: for example, the security of smart city systems (Su, Li, and Fu 2011); data privacy issues for individual citizens (Van Zoonen 2016); surveillance and control of citizens (Townsend 2013) and concerns about social inequality in accessing the benefits of smart cities (Hollands 2008).

While current scholars have focused on smart cities in society and studied their positive and negative impacts accordingly, few scholars have yet to focus on the link between smart cities and institutionality.

2.2 Decentralization

As part of neoliberal reforms, decentralisation has become a significant strategy for achieving development goals and providing public services in many countries (Agrawal

and Ostrom 2001).

As early as the 1980s and 1990s, scholars provided direction for the definition of decentralisation. They defined decentralisation as transfer of powers and responsibilities for public functions from the central government to affiliated or quasi-independent governmental organisations or to the private sector (Litvack and Seddon 1999). This definition has since been supplemented by scholars who have highlighted various mechanisms for transferring financial, administrative, ownership and/or political power to other institutions. Namely: (1) Administrative decentralisation: the redistribution of powers, responsibilities and financial resources from the central government to local governments. (2) Fiscal decentralisation: the modalities and mechanisms relating to the distribution of fiscal powers, revenues and expenditures between the central and local or local governments. (3) Political decentralisation: includes political decentralisation related to the organisation and procedures for public participation in elections and the formulation of public policies. (4) Economic decentralisation: This includes market liberalisation, deregulation and privatisation of the state. This is the transfer of responsible functions to societies once owned or monopolised by the government, but which can now be done by the private sector and NGOs (Mubyazi *et al.* 2004; Maluka *et al.* 2011; Darmawan 2008).

The key elements of decentralisation have been developed in a continuous process of refinement by scholars and are divided into four prominent forms. 1. decentralisation - transfer of administrative powers to regional or district offices; 2. delegation - transfer of responsibilities to semi-autonomous bodies; 3. devolution - creation or strengthening of local 4. privatisation - transferring responsibility to the voluntary sector or the private sector. This form of decentralisation attempts to replace the apparent rigidity of this top-down system with a more flexible one (Cohen and Peterson 1996; Litvack and Seddon 1999).

The advantages and disadvantages of decentralisation have been studied by previous scholars, and overall decentralisation has been found to be highly advantageous. In terms of advantages, decentralisation can stimulate local government dynamics by delegating key powers to local governments and promoting 'polycentric' cooperation between relevant government and non-government actors at all levels; it can increase efficiency, responsiveness to spatially variable conditions and provide greater opportunities for citizen participation and empowerment (Poteete and Ribot 2011); it can help third-party institutions and agencies to develop with communities; and it can help third-party institutions to develop with communities. Poteete and Ribot 2011); decentralisation can help third-party institutions and communities to develop; it may also be essential for environmental protection, disaster management, etc. However, decentralisation may also have some disadvantages, such as coordination problems between local governments and

local authorities (King, Lenox, and Terlaak 2005; King and Toffel 2009).

Because of the vital advantages of decentralisation, scholars have studied the factors that ensure that decentralisation can be implemented accordingly. The success of the decentralisation process depends to a large extent on the interaction between the different levels of government (Larson 2012). In particular, the decision-making capacity of the government staff involved and the distribution of the delegated powers are important factors influencing the success of decentralisation (Larson and Soto 2008). At the same time, the support of the local government, the private sector, and the public are also vital to ensure that decentralisation is well implemented, given the potential for corruption and inefficiency in government bureaucracies (Prud'Homme 1995).

After the successful implementation of decentralisation, studies have been carried out in order to effectively assess the extent to which decentralisation has been implemented. Early studies focused on the evaluation of the decentralisation process: That is, the extent of decentralisation was judged by analysing whether the reforms were standardised and whether they were implemented as expected. In contrast, recent studies have prioritised the impact of decentralisation, including factors such as governance (inclusive citizen participation, transparency, etc.) and service delivery (efficiency, equity, etc.) (Lockwood 2010; Bwalya 2009; Muriu 2013; Arkorful *et al.* 2021). Of these, openness and transparency enable effective monitoring of government and promote decentralisation, while equity and effectiveness are the main expected outcomes of decentralisation (Véron *et al.* 2006; Litvack and Seddon 1999).

Based on previous researchers' research on smart cities, we are concerned that smart cities show great potential for decentralisation. Smart cities may facilitate decentralisation concerning traditional political power, as they have the potential to enhance the level of non-state governance of the state. Previous research has shown that the development of ICT technologies under smart cities, the opening up of data based on digital platforms, and various ways of participating in governance (Janssen and Estevez 2013; T. V. Kumar and Dahiya 2017), exemplify that smart cities may have a positive impact on decentralisation. Yet on the other hand, the collection of large amounts of data during the construction of smart cities may lead to non-transparency as well as centralisation of power (Marsal-Llacuna, Colomer-Llinàs, and Meléndez-Frigola 2015), it is therefore relevant to assess the impact that smart cities may have on decentralisation.

2.3 The possible impact of smart cities on decentralisation

In this paragraph, we try to analyse the possible impact of smart cities on decentralisation from a theoretical point of view. How, at an academic level, can smart cities enhance decentralisation, or how can they hinder it?

There are often multiple parties involved in the construction of a smart city, which

may promote decentralisation. In the process of building smart cities, government departments may work with other organisations to create partnerships. "Partnerships" advocate the inclusion of people from different sectors, such as businesses, universities, research institutions, NGOs, especially community-based organisations, and community groups, especially marginalised groups, located in the community to address issues such as employment, housing and community services (Hagedoorn, Link, and Vonortas 2000; Hodge and Greve 2007). "Partnerships" are present in all parts of smart city buildings. This approach is considered to be the most effective and socially acceptable tool to facilitate the delivery of public services (Paskaleva 2009; Snow, Håkonsson, and Obel 2016). The process involves a wide range of businesses, communities and decentralisation through government empowerment.

Smart cities may enhance citizens' democratic participation by building political participation platforms, promoting decentralisation. From the perspective of citizen participation, the construction of political participation platforms in smart cities can, to a large extent, facilitate citizen participation, where citizens are empowered and able to exercise their democratic rights in the process of participating in political activities, thus performing the function of participating in decision-making as well as monitoring the government. In the process of participation in decision-making, citizens are able to put forward their own opinions and suggestions, thus improving the efficiency of decision-making; at the same time, citizens can also play the function of monitoring the government, reducing the possibility of government corruption. Smart cities can be built to engage citizens in more innovative, participatory governance in their areas (Kickbusch and Gleicher 2014; Castelnovo, Misuraca, and Savoldelli 2016; Chun and Cho 2012). Furthermore, when citizens are involved in community-level politics, it is not only a process of exercising their rights below, but in the process of citizen engagement, governments are able to gather more data about local community preferences, which can further improve decision-making and thus better assist urban communities in the future to address challenges (Deakin and Al Waer 2011; Cuthill 2002).

Smart cities are likely to increase government transparency and promote decentralisation through information sharing. Under the Open Government (OG) paradigm, transparency in government actions has become an essential concern in a government building Harrison *et al.* 2012; Linders 2012. Citizens expect government information to be open, transparent and accountable, and local authorities, which by default are seen as the primary service providers to citizens, play an important role in opening up information (G. Lee and Kwak 2012). Expanding government data disclosure and transparency is an important issue in the process of building smart cities (Robinson, Yu, and Zeller 2009). The release of government data can increase citizen participation in government, increase transparency and improve decision-making (Bertot, Jaeger, and Grimes 2010;

Dawes 2010), thereby promoting decentralisation.

From the above perspective, smart cities can effectively promote decentralisation, however they can also potentially lead to a concentration of power. The government-led collection of large-scale data in building smart cities can lead to a concentration of power, or even abuse (Gardner and Hespanhol 2018). At the same time, smart cities enable extensive and precise surveillance of society, and this collection is more covert, which may cause an invasion of citizens' privacy (Eckhoff and Wagner 2017; Meijer 2018). Smart cities are built with a strong data technocracy, relying on ubiquitous sensor devices within the city. People are exposed to their privacy all the time and everyone is surrounded by "panoptic openness", thus losing their right to privacy (Klauser, Paasche, and Söderström 2014; Krivỳ 2018). We no longer need a circular prison or tower. Every IoT device in the city is becoming a monitor, and in the process may create a concentration of governmental power, thus preventing decentralisation.

In order to better investigate this issue, this article will examine the impact of smart cities on decentralisation, using Bristol as an example.

3 Research Methodology

The research objective of this article is to explore the relationship between smart cities and decentralisation and to attempt to investigate whether smart cities play a facilitating or hindering role in decentralisation.

This chapter will present the research methodology in eight parts. The first part clarifies the research questions. The second section explains the use of qualitative rather than quantitative methods. The third section describes the reasons for choosing the documentary analysis method for this study and official data as data. The fourth section describes the criteria and process used to collect the data. Section five outlines the steps taken to code the data. Section six discusses the issues of reliability and validity. Part VII provides reflections on the study. Finally, ethical issues are reviewed in Part VIII.

3.1 Research questions

This study aims to examine the impact of smart cities on decentralisation, in which we will consider whether smart cities promote decentralisation in terms of government, multi-participation, and transparency. At the same time, we will further analyse this issue in the context of individual citizen privacy and other perspectives.

To achieve this goal, we will focus our research on three questions.

Q1: What is the impact of the application of smart cities on decentralisation at the government level?

Q2: Does the participation factor in smart cities contribute to decentralisation?

Q3: Does the transparency factor in smart cities promote decentralisation?

Answering these research questions requires a detailed study of the complex processes involved in the implementation of smart city policies and the selection of qualitative methods to analyse the data from this study.

3.2 Qualitative research decisions

Traditionally, social research methods are based on the quantitative paradigm of the natural sciences (Bryman and Cramer 2012). In current social science research, many scholars tend to adopt quantitative research methods due to their multiple advantages such as objectivity and accuracy. However, the desire to conduct a detailed study of a particular social issue does not rely on numbers and statistical measures alone (George, Bennett, *et al.* 2005). The purpose of this study is to aim to determine the relationship between smart cities and decentralisation, as a specific social issue and in the context of studying the correlation between two social phenomena, it is difficult to draw accurate conclusions using quantitative methods. Therefore, it is inappropriate to use quantitative research methods in order to determine the relationship between the two more accurately.

Qualitative research, on the other hand, is often used to explore, reveal, describe and understand the reasons behind any phenomenon that may be little known. Therefore, research that seeks to develop a deeper understanding of social issues can only be achieved through qualitative investigation (Sandelowski 1991; Golafshani 2003).

The tradition of using qualitative methods to study human phenomena is rooted in the social sciences and represents a legitimate mode of inquiry in the social and human sciences (Sandelowski and Barroso 2003). Qualitative research is any type of study that produces results that are not derived through statistical analysis or other quantitative methods (Creswell *et al.* 2007). It takes a naturalistic approach and can perform powerful explanatory functions to understand phenomena about people's lives, stories and behaviours, including those related to health, organisational functioning, social movements or interactions (Borbasi and Jackson 2012). Also, because qualitative research has the important advantage of "exploring the possibilities of relationships that have received little theoretical attention in the past" (Abdullahi *et al.* 2012), I believe it fits well with this study's intention to explore the relationship between smart cities and decentralisation. Therefore, we have adopted a qualitative research approach for all these advantages.

3.3 Data Collection - Document Analysis / Why

Both smart cities and decentralisation require the government to be the key agent in proposing policies, which means that we can find relevant official documents to study

and qualify them. Official documents are seen as objective statements of fact, telling 'institutionalised truths', meaning that they can legitimately express the intentions and ideas of their creators (Wolff 2004, p. 284). At the same time, because official documents can act as proxies for themselves (Prior 2003), they can be a good source of data when relevant to the contextual and interpretative dimensions of the issues we are trying to analyse (Dalglish, Khalid, and McMahon 2020).

Document analysis is one of the most common methods used in policy research. As a stable 'non-reactive' source of data, document analysis can be read and reviewed multiple times and is not influenced by the researcher or the research process (Bowen 2009, p. 31). Document analysis is of great value in research where 'almost all possible sources of information, data and ideas fall into two broad categories: documents and people' (Cairney and Weible 2017). It is almost impossible to conduct policy research without document analysis (Ritchie and Spencer 2002).

Document analysis, as a systematic process for reviewing or evaluating documents, has multiple roles, such as providing context, generating questions, and tracking change (Bowen 2009). While document analysis can include both quantitative and qualitative components, a qualitative approach is better suited to the socially constructed meanings inherent in collaborative activities such as decision-making (Meyers 2007). Indeed, document analysis can be used as a stand-alone method in analysing specific types of policy content as they change over time and vary by geography.

3.4 Sampling and data collection

After collecting data through document analysis, researchers need to carefully consider how to sample the material. Qualitative analysis does not require collecting of a large sample, but rather until a saturation point is reached for all categories or themes being investigated (Creswell 2014). Therefore, in this study, I achieved the objective of testing the relevance of Bristol and UK smart city related policies by sifting through types of documents, ultimately collecting 36 relevant documents.

The process of collecting documents began with a search to identify the key agencies/organisations involved in building a smart city in Bristol, and their key policy documents and activities, Smart City Bristol (2011), Connect Bristol Feasibility Study (2012), Gigabit (2012) and Bristol is Open (2015).

This is followed by several implementation-specific documents and projects that can be used to examine specific aspects of smart city implementation. Some of these are guided by Connecting Bristol (2009): Open Date Bristol (2010); Media Sandbox Competiton (2010); Playable Cities Award (2013); REPLICATE (2016). And with IES: Democratree (2014); MyKW/MyBristol (2015); YouDecide (2015); Healthy Offfice (2016).

In addition under the guidance of bristol is open (2015) there are a series of policy

documents for ICT building such as Data Dome (2015), IoT Mesh (2016), Wireless Mile (2016), and Software Defined Network Control (2016).

As strategies at the central level in the UK have an impact on related local policies, after collecting literature related to smart cities in Bristol, we collected 11 policy documents on smart city building in the UK. They contain records related to smart cities and articles related to digital building. We have summarised all 36 documents in Appendix A.

Taken together, this sample of organisations, including Bristol City Council, Bristol Is Open and other organisations working together to deliver Bristol's smart cities, as well as relevant UK central government departments, is relatively comprehensive and provides a basis for further policy analysis. In order to dispel any doubts the reader may have about the 'impartiality' and 'representativeness' of the research (Wesley 2010, p. 152), in addition to Key Policy, the sample of Bristol Is Open and Connecting The number of policy documents in the Bristol Organisations section was more than two, and the sampling maximised assurance that there were 'at least three pieces of corroborating evidence and detailed interpretations for each key interpretation involving direct quotes' (Wesley 2010, p. 152).

In addition to fairness and representativeness, authenticity, credibility, and meaning are important criteria used to assess the quality of evidence available in documentary sources (Flick 2013). To evaluate the authenticity of documents, we focused on factors such as document source, authorship (personal or official) and accessibility (Flick 2013; Prior 2003). From these considerations, the main documents we selected were official documents, produced by Bristol City Council, the UK government and other relevant organisations; all of these documents are available through `https://www.gov.uk/`, `https://www.bristol.gov.uk/`, `https://innovationsoftheworld.com/` and other government and organisational websites, with "gov.uk" and "bristol.gov.uk" being publicly accessible. "bristol.gov.uk" are two websites that disclose all UK government public documents and Bristol government public documents and are highly accessible.

Credibility refers to "the accuracy of the document, the reliability of the document producer" (Flick 2013). Although the primary data documents selected for this study were obtained through official websites, in order to further determine the credibility of the documents, we should avoid a single source of documents. Therefore, in addition to official policy documents, other relevant documents (policies, statements, news, statistics, etc.) were retrieved as reference data using the keywords 'Bristol' and 'Smart City'. In order to ensure the comprehensibility of the material used in the study, all the data we have selected are written in English in digital form and are digital in nature.

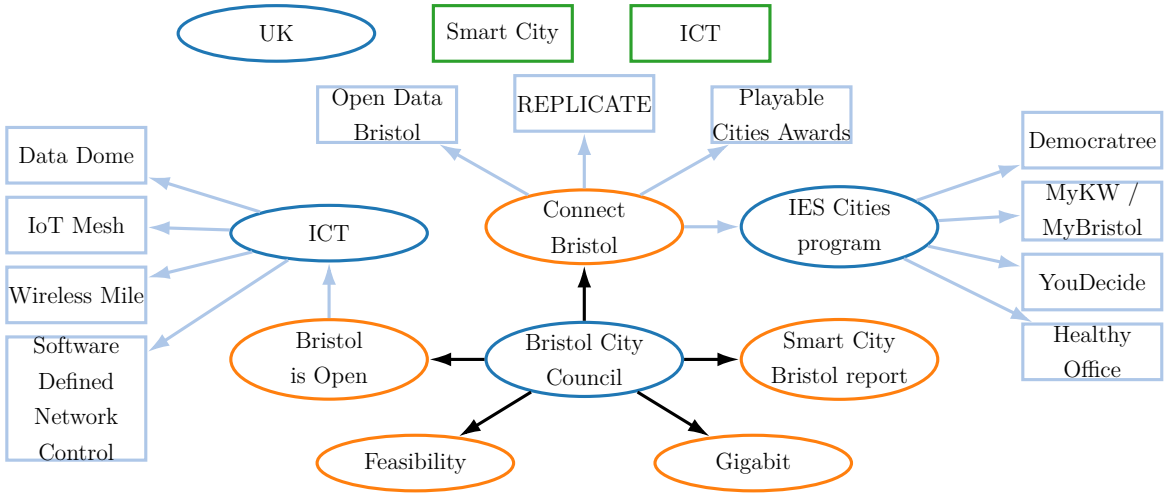

Figure 1: Structure of Smart City

3.5 Encoding the data

This study uses policy documents to investigate the relationship between smart cities and decentralisation, and try to analysis the ability of smart cities to promote decentralization. Therefore, it is appropriate to use thematic analysis to investigate the relationship between them. Firstly, in using thematic analysis, it is possible to identify and describe the 'implicit and explicit ideas in the data' and secondly thematic analysis also helps to capture the full and non-exclusive meanings in the textual dataset (Stewart and Chakraborty 2010).

Thematic analysis is divided into six steps: data organisation, complete reading of the data, theme definition, codebook development, theme discussion and interpretation (Creswell 2014).

First, for data organisation, I used a tabular approach to manual coding.

In the second step, the documents were read twice, line by line, for each type of analysis to help reflect and record ideas about the overall meaning of the documents.

In the third step, for the definition of themes, all documents were reviewed twice line by line and text segments were tagged according to specific pattern categories (Creswell 2014).

Following this process, themes related to the research objectives needed to be established (Guest, MacQueen, and Namey 2012), and in identifying themes attention needed to be paid to the identification of recurring concepts, attention to thematic content transformations, etc (Ryan and Bernard 2003).

In the fourth step, the themes were collected together and compiled based on categories. As the policy was being analysed, I combined multiple sources of information with a timeline during the research process to create a mind map of the coding process to reveal the smart city development process in Bristol, thus creating a narrative of the

policy cycle (Yin 1994; Walt *et al.* 2008).

In steps five and six, the research was analysed, having previously identified a number of interrelated themes, and the process of analysis was a process of expanding these themes into narrative descriptions. The interpretation of the research is given by 'comparing the findings with information gathered from the literature or theory' (Creswell 2014). The findings are then presented along with a discussion to respond to the research questions.

3.6 Objectivity, Reliability and Validity

The results of most qualitative analyses tend to be speculative, non-verifiable and non-cumulative (Cohen, 1974). Therefore, we need to adopt a strategy of credibility and validity to ensure the quality of this study.

In the above, I have provided an initial exploration of the credibility and authenticity of the chosen documents, and in this paragraph, I will verify validity by verifying the consistency of the research analysis across documents (Creswell 2014; Golafshani 2003).

When testing for validity, we used triangulation as the test method. Triangulation, as defined by N. Denzin and Y. Lincon, refers to a research strategy that combines the use of different research materials, researchers, research theories and research methods to analyse the same research question (Denzin 2012). In triangulation, by applying the same code, researchers can verify that the analysis of different documents all point to the same conclusion (Wesley 2010), which allows this research to provide a comprehensive assessment of the impact of smart cities on decentralisation.

Document analysis, as a social research method, is a valuable part of most triangulation programmes and can be used to corroborate other sources (Wesley 2010). Therefore, we will use different sources (including policies, documents, web pages, news, etc.) in our study to improve the validity of the study. In addition, we will further ensure validity by conceptualising different terms in the text and enriching it with descriptions during the study (Creswell *et al.* 2007).

3.7 Reflexivity

In order to ensure as much objectivity as possible and to reduce my own bias and influence. In the course of my research I will take as fair an approach to coding as possible. As my research topic is the impact of smart cities on decentralisation, I have tried to take full account of both the construction and operation of smart cities and the important factors of decentralisation in the coding process as far as possible. Therefore, in the course of my research, I drew on literature related to the operational structure of smart cities and on literature related to the measurement factors of decentralisation research.

3.8 Ethics

The documents analysed in this article are publicly available through the websites mentioned in the table. As this thesis does not analyse any personal data, the subject of the research does not address any of the sensitive issues listed in the ethics form. Therefore, no confidentiality procedures were required to conduct the research. The ethics form has been approved by the convener on behalf of the School of Policy Studies Research Ethics Committee.

4 Analysis

4.1 Decentralisation at government level in smart cities

The following topics will be discussed in this section: (1) Smart City Guidance (2) Digital Guidance

The building of smart cities in the UK reflects a shift in power within the government. To promote smart cities, a new agency, Innovation UK, has been established under the Department for Business, Innovation and Technology (BIS), the central lead agency for smart cities (Department for Business Innovation & Skills 2013; Department for Business, Energy & Industrial Strategy 2013). The new department has established seven open innovation platforms across the UK, including the Future Cities Technology Innovation Centre (FCC) and the Transport Systems Catapult, to promote the translation of science and technology related to smart city development and to facilitate collaboration between cities, businesses and universities to develop commercialised and integrated system solutions to meet the needs of future cities. These seven open innovation platforms, which can be seen as comprehensive service platforms for smart city projects directly under the UK central government, play the function of leading technological innovation support, supporting the development of SMEs, broadening access to finance and acting as a booster for the development of innovation in UK cities (Hauser 2014; Department for Business, Energy & Industrial Strategy 2017a). The establishment of this series of departments and platforms reflects the decentralisation of power within the central government in the process of building the UK's smart cities.

The building of the Bristol Smart City also reflects a transfer of power from central to local level. Bristol Smart City is built with a high degree of autonomy, from planning to construction, and is entirely coordinated by Bristol City Council.

"Local authorities at county and unitary level in England have the responsibility for the Phase 1 and 2 projects in their areas, with each area's programme set out in a local broadband plan." (Department for Digital, Culture, Media & Sport 2015a)

The UK government does not directly plan the development of local smart cities, but

rather promotes them by devolving powers to the local level. The Bristol Smart City is guided by the UK Government's Smart Cities Policy and ICT Technology Development Policy, and is supported by funding from Innovation UK, a dedicated government department (Hauser 2014).

"Innovate UK challenged 30 cities to improve urban living and working using new technologies. They needed to show how they could achieve this by working with businesses and partners. Each city received £50,000 to investigate ideas for solving urban living problems. These included challenges in transport, housing, health, energy and pollution." (Innovate UK 2015a)

The building of Bristol's smart city reflects a transfer of power between local government departments. In implementing the Smart City, Bristol has created new departments, either on its own or in partnership with other organisations, to devolve power between departments and promote decentralisation. In particular, based on the Connecting Bristol policy, the Bristol Smart City has established a partnership with the EU's IES project and five new organisations based on the EU's "IES" project: the "Bristol Health Office", which aims to address the emotional issues of citizens, and My Knowle West, which has created a local social network at a community level to help citizens understand what is happening in their community. The creation of the new departments has gone some way to achieving a decentralisation of power and promoting decentralisation (Bristol City Council City 2009; Knowle West Media Centre 2012; Knowle West Media Centre 2016).

4.2 The impact of participatory factors on decentralisation in smart cities

This section will discuss the following themes identified in the literature (1) Multi-party engagement (2) Community engagement (3) Citizen engagement

4.2.1 Multi-stakeholder engagement for decentralisation

The process of building and operating Bristol's smart city reflects extensive multiparty participation, which has a positive effect on decentralisation. As the government does not have the resources, capacity or technical capability required to implement a smart city autonomously; it therefore needs to partner with the private sector (Mayangsari and Novani 2015).

In Bristol's multi-party engagement, Bristol is working with telecoms providers to enable residents and businesses to unlock the full potential of the internet. The building of high-speed networks and broadband will benefit citizens and businesses, increase Bristol's digital inclusion, reduce Bristol's digital divide and bring broad social benefits. This

multi-participant model is a sustainable dissemination and development programme that creates innovative ecosystems with realistic, win-win business models, as mentioned in Bristol's BigClout project with Japan and the EU. win-win business models (Bristol City Council 2009b).

In addition to working with businesses, Bristol City Council and the University of Bristol have partnered to create a joint venture, Bristol Open (BiO), which provides a number of services to technology companies, businesses, research institutions and others working to create smart cities, allowing innovators to develop, test and demonstrate their applications and services in a real-world, citywide network in a real-time environment. It allows innovators to develop, test and demonstrate their applications and services in a real-world, city-wide networked, real-time environment (Bristol City Council 2009a).

At the same time, the Smart Internet Lab at Bristol University, one of the UK's most prestigious ICT research centres, has enabled Bristol to develop ICT technologies in the context of building a smart city. The current research centre is building on the development of 5G with the construction of a research and development centre for 6G Futures (University Of Bristol 2021). In addition to research centres, there are a large number of industrial incubators established in the UK with the support of central or local government and universities, who also play an important role in spawning new technologies and applications. These institutions are often vehicles for cross-border combinations, connecting government, universities, entrepreneurs, investors and the general public. The local Engine shed & SETsquared incubator in Bristol is a partnership between five top UK universities, including the University of Bristol and the University of Bath, and is dedicated to providing more enterprise activity and creating new business opportunities for the five universities, helping qualified entrepreneurs to turn an innovative idea into a business model and accelerate its marketisation (West of England Combined Authority 2017).

In its platform for building smart cities, Bristol proposes that

"We want to foster a city-wide approach to developing a smart Bristol, which will encourage digital innovation and city-led initiatives across a diverse and inclusive network of institutions, communities and individual entrepreneurs." (Bristol City Council City 2009)

In this process, government agencies cede control to the private sector, and businesses, universities, communities, citizens and others can participate in the planning and operation of Bristol's Smart City, which will ensure that smart city innovation is delivered by the city, reflecting top-down empowerment and bottom-up participation.

The participation of multiple parties in the construction of smart cities demonstrates the empowerment of the government to the people. Unlike the traditional centralised government approach to governance, participatory governance is a form of 'devolved'

governance (Maurya and Biswas 2020). In the design and implementation of a smart city, the government delegates power to relevant businesses, citizens or organisations that have a stake in the policy, and then works with these organisations and individuals to make public decisions, allocate resources and collaborate on governance (Corfee-Morlot *et al.* 2009; Flinders 2008). Bristol itself has a relatively good tradition of sectoral collaboration, which, combined with the promotion of smart city policy, has resulted in a very high level of cross-sectoral collaboration in Bristol.

Take, the City of Bristol's first Smart City Strategy for example:

Bringing together existing Smart City functions such as the Bristol Operations Centre, the Open City Innovation Team and the Connected City Programme, the strategy outlines a responsible and innovative approach to tackling the issues and problems facing the city. The strategy, which will be updated regularly in collaboration with stakeholders, the City Office and other partners across the city, aims to ensure that smart city projects provide opportunities for more people and communities, help the city achieve inclusive growth and help tackle issues such as public safety, traffic congestion, energy poverty and health and social care (Bristol City Council 2011).

The government encourages bottom-up public participation in the process of multi-party engagement in smart cities. The participatory approach to governance remedies the shortcomings of electoral democracy by devolving power to citizens and social organisations in terms of governance and accountability mechanisms, allowing the public to participate in political management and enhancing the effectiveness of state governance (Brinkerhoff and Wetterberg 2016). In the Bristol Smart City, the "You Decide" political participation platform was created to encourage people to participate in political activities (Knowle West Media Centre 2015). "Participation" is the key to participatory governance, which emphasises the active participation of a wide range of stakeholders in public affairs and government decisions that concern them, including individuals and organisations such as citizens, social organisations, enterprises and institutions, and community bodies (Bingham, Nabatchi, and O'Leary 2005).

In contrast to top-down hierarchical planning, participatory governance in building smart cities focuses more on cooperation between different stakeholders. In the construction of a smart city, there is a power dependency between the various actors involved in governance, with organisations committed to collective action having to rely on other organisations; to achieve their aims, organisations must exchange resources, negotiate common goals, work together to define problem boundaries and key points, and make the most of their respective strengths in order to develop solutions that are universally recognised and implementable (Carlsson 2000). The need for sustainable dissemination and development plans to create an ecosystem of innovators (SMEs, start-ups, citizens, etc.) with realistic win-win business models (BigClouT 2020) is also raised in the context

of Bristol's Smart City. In a process of multi-stakeholder participation and interaction, stakeholders influence each other, share and jointly control development plans, decisions and corresponding resources, thus leveraging the role of each party in the policy process and improving the efficiency of policy implementation (Hilhorst and Guijt 2006).

4.2.2 Community involvement to promote decentralisation

In building a smart city, Bristol encourages the active participation of people in community governance. In the construction of Bristol's smart city, the community acts as an important 'governance node', assuming the reality of integrating all social, economic and other attributes at a specific organisational level. In order to promote broad participation at the community level, Bristol has developed the 'Bristol Approach', a six-stage approach designed to ensure that community technology programmes are driven by issues related to local needs and are carried out at the community level (Knowle West Media Centre 2020).

Smart cities promote decentralisation by encouraging the active participation of people at the community level. Bristol's Smart City project has created 'your decide', a political engagement application where citizens can choose to participate in community governance by speaking up and making decisions that affect their own communities, from practical matters to funding decisions (Knowle West Media Centre 2015). Smart city-driven community participatory governance takes the form of community networking, a combination of the internet and neighbourhood communities. This form of 'internet + community' facilitates the sharing of information and communication between community residents through cyberspace (Kavanaugh *et al.* 2005; Shah, McLeod, and Yoon 2001). Geospatially based online networks have significantly reduced communication costs and increased opportunities for neighbourhoods to exchange ideas, thereby facilitating community development and renewal and promoting community governance (Carroll and Rosson 2003).

At the heart of Bristol's smart city innovations, communities also take on the role of increasing the level of political participation of citizens. Bristol has undertaken the construction of an open data community as part of its smart city (Bristol City Council 2010a). Citizens can join data communities, follow and get involved. Through the Open Community node, the government brings together local individuals and organisations interested in open innovation, organises local events and workshops, raises awareness of the economic, social and environmental benefits of data, and increases citizen participation in politics (Bristol City Council 2010b). Increased levels of citizen participation in politics can help them to better exercise their power below.

At the same time, the government is encouraging collaboration between organisations at a community level, which can enhance the social and economic benefits of digital

technology for the city by connecting them through the community (Bristol City Council 2010c). For example, the design company worked with the community to create My Knowle West, Bristol's 'local social network', an online space for community platforms designed to reduce the isolation of community residents. Through this platform, residents can easily share what they are doing with an online network of other local people, and through the network, the community can become more connected to each other, allowing for a better understanding of community life and an increased level of civic engagement in community governance (Knowle West Media Centre 2012).

4.2.3 Citizen participation drives decentralisation

The participatory governance process in Bristol's smart city is characterised by extensive citizen participation. Unlike the traditional triple helix structure of the public sector, universities and enterprises, the participatory subject model of Bristol's smart city construction is an improved triple helix structure focusing on public participation, which divides the participating subjects into managers (government, other public service organisations or units), implementers (relevant units, enterprises and individuals, etc.) and users (social collectives and individual users) (Hoggett 1996; Etzkowitz and Leydesdorff 1998; Deakin and Leydesdorff 2013). Among these, emphasis is placed on public participation in the governance process, power sharing in the process of public participation and interactive cooperation between the government and the public.

Bristol's decentralisation of participation in the construction of smart cities to the individual has positive implications for the realisation of democratic politics. As a free digital tool, "You decide" (Knowle West Media Centre 2015) decentralises power in terms of management and accountability mechanisms. As a free digital tool, "your decide" decentralises power to citizens and social organisations in terms of governance and accountability, allowing the public to participate in political management and enhancing the effectiveness of state governance. "Your decide" aims to give people a say in the decisions that affect them. People can share their ideas and preferences for neighbourhood decisions, create their own polls, share their ideas with others and provide feedback to councils and local organisations (Knowle West Media Centre 2015). At the same time, citizen participation can also play a role of civil society in participatory governance, no longer agreeing that government is the only source of legitimacy, but that civil society is also a source of legitimacy and its process of governance, a new form of realisation of democratic administration. (Sieber 2006)

4.3 The impact of transparency factors on decentralisation in smart cities

This section discusses the following themes identified in the document analysis: (1) Networking (2) IoT (3) Big Data

Transparency is an important consideration for decentralisation. Greater transparency will make it harder for governments and politicians to act in contempt of the interests of the population as a whole, and will lead to greater participation in national politics and greater competition between political parties (Sheng 2010). If the virtuous circle of greater governmental restraint leading to greater transparency can be created, 'greater transparency' can be expected to be the driving force behind changing the 'shape' of the state. The legislation passed in most democracies over the last few decades demonstrates the growing importance of government transparency. (Zafarullah and Huque 2001; Marquardt 2016) The only decisive and important condition for the effective activation of governance mechanisms that can exercise checks on government is "greater transparency".

In a smart city, the data processing process can support transparency by providing data, real-time transmission and data disclosure in a variety of ways. The data processing process, with information and communication technology (ICT) technology at its core, is a very important part of smart city construction (Hashem *et al.* 2016). In terms of the structure of a smart city, data processing can be divided into three steps (1) data collection (2) data transmission (3) data openness, so we discuss the impact of data processing on transparency from each of these three perspectives.

4.4 The impact of transparency factors on decentralisation in smart cities

4.4.1 Data collection to provide data to support transparency

The process of data collection can provide the data to support greater transparency. Smart cities collect information that residents want to know through a variety of sensors, and Bristol is currently working to create an 'urban laboratory' through the construction of an IoT facility. They are placing large sensors, sensors and other IoT facilities across the city and combining them with smaller sensors from residents (including smartphones from people who have volunteered for the programme and GPS devices that will be introduced in the future) to collect large amounts of data from the city. The ubiquitous sensors collect a large amount of data from the city, such as energy consumption, air quality and traffic flow, to gather information relevant to the lives of residents. The City of Bristol has invested £75 million in building a fibre optic network and various types of sensors across the city. These sensors collect information on all aspects of city life, including energy consumption, air quality and traffic flow, and are available to the public

through the Bristol is Open website (Bristol City Council 2009a; Bristol City Council City 2009).

In addition to collecting information, small sensors empower citizens to a certain extent. Bristol has come up with a citizen-sensing approach in building a smart city. "Citizen sensing" is a process where people build, use or act as sensors, for example, to identify and collect information (or "data") to help solve problems. This sensing process may involve creating custom temperature sensors from scratch, or using technology that already has built-in sensors (such as smartphones). No matter how simple or complex the technology, and no matter what data is collected, citizen sensing can empower people to use technology for social good (Knowle West Media Centre 2020).

4.4.2 Data transmission drives transparency

In addition to the collection of data, the process of data transmission is also the process of promoting the transparency of information. With the development of broadband networks in smart cities, the government is able to use the internet to disseminate information more quickly and easily, and the public is able to access public information as soon as they have an electronic device. Under the guidance and funding of the UK government, Bristol is developing a high speed internet and broadband network, with public spending on a 'digital hub' to provide fibre optic internet access (Department for Digital, Culture, Media & Sport 2010). At the same time, Bristol launched an open data website to provide citizens with easy access to relevant information (Bristol City Council 2010b). The construction of a broadband network has, to some extent, facilitated access to decentralisation. Residents have access to the internet and can access government data from anywhere, anytime.

The development of data transmission technology has promoted transparency, but it has also meant that the 'digital divide' has had a greater impact on residents' access to publicly available government information (Shirazi, Ngwenyama, and Morawczynski 2010). In fact, before the smart city, Bristol had a widespread digital divide. Eighty per cent of Bristol's young people and over 85s often lived in areas that lacked high-speed internet access, making it difficult for them to access information (Stone 2013). In order to bridge the digital divide and increase digital inclusion, Bristol's Connecting Bristol strategy sets out to build fibre and mobile networks in.

Bristol's priority is to ensure that digital infrastructure is accessible to all, no matter where they live, study, play or work in the city (Bristol City Council City 2009).

Currently, Bristol is covered by a gigabit network with broadband construction throughout the city. In addition to the lack of broadband internet, there are also people in poverty who lack the equipment to access broadband Internet (CityFibre 2016). To reduce digital poverty, Bristol City Council recycled and redistributed laptops and over 3,000 laptops

were distributed through a computer reuse scheme (Bristol City Council 2010c).

In addition, data transmission can be used by governments to improve public services. The government is able to use a network of sensors transmitting in real time and an always-on stream of data for computing to support new service models for the city and generate analysis to facilitate more scientific decision making. In building a smart city, Bristol City Council has promoted ICT infrastructure projects for public services, broadband networks and the ability to improve the connectivity of public services such as traffic lights and CCTV, thus keeping the city mobile and safe (Bristol City Council 2009c).

4.4.3 Open data drives transparency

At the heart of the drive for transparency in data processing is open data. Based on the vast amount of data collected by sensors and a network that can transmit data at high speed, Bristol has established the Open Data Project. The UK government believes that the core value of a smart city is to provide a better quality of life for its citizen (Department for Business Innovation & Skills 2013), so Bristol is focusing on open data in areas such as transport, energy, crime rates and health indicators. There are currently over 140 open data sets published on Bristol's open data website (opendata.bristol.gov.uk) and the number is growing. The database will allow people to 'interact with the city they live in' and the public will have easy access to a huge collection of census and statistical data in the city's underlying database (Bristol City Council 2010b).

For citizens, open data enables citizens to access or be better able to exercise their power. In the process, increased transparency of information can stimulate participation in government actions, and citizens can access devolved powers through data openness, advancing the process of democratisation and thus enabling the goal of greater and more openness (Fischer 2006). Data openness is an important part of the drive for open, transparent and accessible government, where it can improve public services, provide citizens with more choice and ensure their right to data access. However, due to the complexity of data structures, even when data is made public it can be difficult for citizens to understand. To make it easier for citizens to view and understand data, Bristol has created the Bristol Data Dome at the city's Planetarium. The Dome is designed to visualise data and present complex experiments to citizens through interactive virtual reality technology, while the Dome can be used for real-time data such as traffic and environmental conditions. The dome can also be used for the presentation of real-time data on traffic and environmental conditions (Bristol City Council 2009a; Bristol City Council 2015).

Citizens are able to exercise their right to information through open access to information. To a large extent, open data can increase the accessibility and transparency of

government information and keep citizens up to date on the state of government. This process of open data improves the traditional separation between public organisations and users, creating a new situation where the public can use and create information through collaborative networks (Chun, Shulman, *et al.* 2010). Informed citizens can make a stronger contribution to local democracy and can offer more possibilities for participation in the work of government.

On top of the right to be informed, open data allows the public to gain the right to scrutinise their government as well. Open data means that the work of the government is opened up and subject to public scrutiny, and the public can more easily learn about the day-to-day operations of the government as well as the latest information, and can see exactly what their government has achieved and what it has failed to achieve. This open data provides citizens with the raw material they need to interact with government, empowers them to monitor and, to some extent, has the effect of improving public services. At the same time, citizen participation enables better monitoring and understanding of the policies being implemented by the government. In the case of Bristol's smart city, people are allowed to track progress and details of planned initiatives, ongoing projects and outcomes are published on a specific website (Bristol City Council 2009a). At the same time Bristol organises and attends events and shares information on social media to engage citizens and provide more opportunities for people to get involved and learn about the smart city (Watershed 2010).

By giving people the right to monitor data, openness can also address the lack of transparency that leads to information inequality. In the principal agent relationship between citizens and government, where the government (politicians) is the 'agent' and the citizens (voters) are the 'principals', the most important issue is that of asymmetric information. The most important issue in this relationship is the problem of asymmetric information. Information asymmetry is the result of "lack of transparency", "opaqueness" and "lack of transparency" (Geraats 2002) and information asymmetry can lead to agency problems (Sufi 2007). Therefore, information asymmetry can be improved by increasing transparency, and government and politicians can increase the transparency of government activities by making information open to the nation.

In addition to oversight, the process of opening up data is an expression of the government's ability to empower citizens with access to public data. Open data offers new opportunities for governments to work with citizens, businesses, to be able to access the data and use it to create value at the same time. In building smart cities, the most ambitious and innovative partners from around the world join the smart city ecosystem to enhance the user experience and deliver better services. (Connecting Bristol is a new way for citizens and businesses to add value and create innovative applications of data for social production, life and economic activity, creating public value (Bristol City Council

City 2009). These initiatives in turn drive innovative applications and technologies in the public and private sectors, which can help create a sustainable economy and even feed back into smart cities, empowering innovation for democracy and smarter government.

With open data, more and more citizens are involved in government decision-making and are able to exercise their right to monitor and use it to improve decisions indirectly or directly. For example, citizens can provide feedback to government departments on the quality of government services, or use open data to contribute to urban planning. To facilitate more direct participation in government decision-making, Bristol has created a free app called 'Your decide'. Through the app, citizens can give their views on Bristol Council's survey questions and tell the council what they think of their latest survey; they can also submit their own ideas and vote on suggestions made by others, and submissions through the app are passed on to the relevant decision-making bodies and considered alongside feedback received through other means such as questionnaires and consultation exercises (Knowle West Media Centre 2015).

As well as facilitating decentralisation and improving government decision-making, data disclosure can also enhance citizens' trust in government. Bristol's Smart City approach states that "The smart Bristol of the future may be enabled by technology and data, but it can only be sustained through trust." (Bristol City Council City 2009, Sec. 3.4) There is a significant relationship between decentralisation and trust, with people's trust in government promoting decentralisation. In essence, trust promotes political participation among the population, and the level of trust between citizens and state institutions coincides with the type of interaction that determines the relationship between these two entities.

Taken together, the data processing aspect of the Bristol Smart City promotes transparency and has a significant positive effect on decentralisation. As smart cities can have a positive impact in promoting transparency and trust, open data also has the potential to make key public services such as health, education and environmental management more effective and inclusive, thus contributing to poverty eradication and inequality reduction (Niaros 2016; Douglass 1992). In the future, therefore, there is a need to examine the potential of smart cities as 'democratic ecologies' for citizen empowerment and user-driven innovation in more ways than just transport networks and urban sustainability-related issues.

4.4.4 Problems and solutions that may arise in the data disclosure process

Promoting data disclosure has an important role to play in promoting decentralisation. In the process of building a smart city, data disclosure must be a cross-sector and cross-discipline data sharing, based on which software is used to support the intelligent operation (Liu, Heller, and Nielsen 2017), management and services of the city, in order to truly

promote the democratisation process. To promote data disclosure, Bristol has brought together a consortium of interested parties to promote the development of smart data applications and dashboards (Department for Business, Energy & Industrial Strategy 2017b).

However, there can be a range of obstacles in the process of promoting data openness. From the perspective of data, different sources of data and scattered data storage can become obstacles to data opening. The problem of "information silos" also has a serious impact on data sharing: different data calibres, different formats and closed systems create separate islands of information that cannot be shared with each other (Miller and Tucker 2014). From the government's perspective, due to the influence of the traditional management system, some government departments regard information as their private property and monopolise it; at the same time, there is a lack of cooperation between government departments and data cannot be shared (Kettl 2011).

To address these barriers to data disclosure, Bristol has implemented a 'smart data' programme. To address the issue of data sources, Bristol worked with utility providers (electricity, gas and water) to identify as many data sources as possible with additional data streams and to create more real-time data on the Bristol Open Data Portal, blocking traditional data source issues. To solve the problem of decentralised data storage, data collected by sensors is stored uniformly in a newly created database (Woods 2017). To address the issue of "information silos" that can arise during the construction of a smart city, Bristol uses a unified smart city standard. At government level, Bristol has established a regulatory framework that supports connectivity technologies across multiple government departments and enterprises, breaking down data barriers between departments, while the government uses data in its decision-making process and promotes open data. (Bristol City Council City 2009; Bristol City Council 2009a; Bristol City Council 2010b)

4.5 Issues in smart cities that may hinder decentralisation

Through our discussion of the themes in the literature, we can see that smart cities have contributed to decentralisation at the governmental level, in terms of participation in governance, and in terms of data openness, yet there may also be issues that can hinder decentralisation, focusing on both excessive governmental surveillance and problems arising from the process of data openness.

4.5.1 Government over-surveillance

The massive collection of data by governments has raised public concerns about excessive government surveillance. Smart cities use a vast array of sensors to collect data on citizens, which can lead to excessive government surveillance and intervention (Townsend

2013). As Foucault describes the 'panoptic open prison': "There is a real risk that smart cities could become electronic panoramic cameras where everyone is constantly watched, rather than standing as 'paragons of democracy'." (Dupont 2008) Mass government surveillance of data could lead to the centralisation of government and thus act as a barrier to decentralisation.

For this issue, it would be helpful for the government to disclose the data collection process, and public monitoring of the government's data collection process could be an effective safeguard against centralisation of government power.

4.5.2 Issues in Open Data

The process of opening up smart city data, the non-disclosure of key data, as well as issues of data authenticity, quality, etc., may hinder decentralisation.

1. Open data is limited, and some critical data may not be opened up. As the government's use of smart city technology to collect large amounts of data has raised public concerns about the privacy of individuals, the government has also stated that it takes personal privacy seriously. The Bristol Smart City construction project mentions that smart city services and applications need to take into account the protection of personal data (BigClouT 2020). In the process of opening up data, the issue of privacy must also be fully considered. But the focus on individual privacy may result in some important data not being made available. Some data that can be traced back to individuals may not be made public due to privacy legislation, which may contain certain important data. Where such critical data is not made public, it may be difficult for citizens to understand the true state of affairs and may make poor decisions as a result. It is therefore important to explore the balance between individual privacy and data openness in the context of data openness (Bannister and Connolly 2011). Apart from data relating to personal privacy, the inability of some open data to generate revenue may also be another reason for the government not to disclose data. The non-disclosure of these key data can have a negative effect on citizens' participation in democratic politics, and thus on decentralisation. In addition, opening up certain data may hinder the interests of some commercial companies. Data sets generate revenue for some public organisations, and in the Netherlands, some organisations base their revenue model on income generated through access fees charged to users. Indiscriminate disclosure of all data would harm this business model (Janssen, Charalabidis, and Zuiderwijk 2012).
2. Open data may be biased or even false, which would largely interfere with democratic politics. As the government is responsible for controlling most of the data in the city, it could create a monopoly on the data. The government may provide biased data or may even hide important data that is important or detrimental to the government.

Biased data can interfere with citizens' decisions. If data from only one point of view is made available, the wrong conclusions may be drawn. We need perspectives from different fields to make a comprehensive consideration, while the government chooses to hide data from the opposite point of view or data that could be used to complement that point of view, in which case the population is simply unable to make a correct judgement, thus negatively affecting decentralisation (Helbig, Gil-García, and Ferro 2009).

3. In addition, the issue of data quality can also affect decentralisation, as opening up data that is not of sufficient information quality can lead to discussion, confusion, reduced transparency and even less trust in government, thus negatively affecting decentralisation. To address the potential negative impact of open data on decentralisation, it is also important to increase public scrutiny of the government's data disclosure process, so that people have the right to know what data is being disclosed and what is not. At the same time, the government should be held accountable for the content and quality of the data made public, which would also help to ameliorate any problems that may arise that affect decentralisation.

5 Conclusion

The overall objective of this study was to better understand the impact of smart cities on decentralisation and to try to analyse whether smart cities have been a facilitator or a hindrance to decentralisation. The research questions were

Q1: What is the impact of smart cities on decentralisation at government level?

Q2: Does the participation factor in smart cities promote decentralisation?

Q3: Does the transparency factor in smart cities promote decentralisation?

This section will revisit the above research objectives, summarise the findings of the previous section and provide conclusions. It will discuss and clarify the study's contribution to the relationship between smart cities in relation to decentralisation and provide recommendations for further research on the topic. The structure of the conclusion is intended to elicit reflection on whether the study has achieved its stated objectives, leaving room for the value of the study and the future development of the research.

Firstly, this article examines the impact of smart cities on decentralisation at government level accordingly. The process of building smart cities has been characterised by a transfer of power within institutions in the UK central government. The transfer of power is characterised by the creation of a new subdivision of the UK government, Innovation UK, and the establishment of seven open innovation platforms across the UK by this new department. The creation of this series of departments and platforms reflects the decentralisation of power within the centralised process of building smart cities in

the UK. The building of the Bristol Smart City also reflects a transfer of power from the central to the local level. The UK government does not directly plan the construction of local smart cities, but promotes them by devolving power to the local level, so that the construction of Bristol Smart City has a high degree of autonomy, from planning to construction, which is entirely coordinated by Bristol City Council. At a local level, Bristol's smart city reflects a ceding of power between local government departments. In implementing the smart city, Bristol has created new departments, enabling a transfer of power between departments and promoting decentralisation.

Secondly, this article examines the impact of the factors involved in smart cities on decentralisation accordingly. In the process of building and operating the Bristol Smart City, a wide range of participatory factors were involved, with government agencies ceding control to the private sector, and businesses, universities, communities, citizens and other parties being able to participate in the planning and operation of the Bristol Smart City, which had a positive effect on decentralisation. At the same time, Bristol encourages active participation in community governance in the process of building a smart city. Smart city participation at the community level can drive decentralisation. In addition, the participatory governance process in the smart city of Bristol is characterised by citizen participation, and extensive citizen involvement has a positive effect on decentralisation.

Thirdly, this article examines the impact of transparency factors on decentralisation in smart cities accordingly. Based on the large amount of data collected by sensors, and a network capable of transmitting data at high speed, Bristol has implemented data disclosure. Citizens are able to access decentralised power through data openness and are better able to exercise their rights to information, monitoring and access to public data and to participate in governance. Data openness is an important part of the drive for open, transparent and accessible government and increases citizens' trust in government. Along with the process of data openness, more and more citizens are involved in government decision-making, promoting decentralisation.

Finally, there are a number of factors in smart cities that may hinder decentralisation. In the process of building a smart city, the government's large-scale collection of data may compromise citizens' privacy rights and may, to some extent, result in a concentration of power. In addition, the disclosure of data is limited and some key data may not be made public. Also the authenticity as well as the quality of data can affect decentralisation. For these three aspects, firstly, the government needs to disclose the process of data collection, so that citizens can clearly understand what data has been collected, what has been disclosed and what has not been disclosed, and to ensure citizens' right to know to the greatest extent possible; secondly, in the process of disclosing data sets, the government needs to consider the balance between privacy and data disclosure, and needs to ensure both citizens' right to know and Finally, the government should ensure

the authenticity and quality of the data disclosed.

In summary, this study uses Bristol as an example, analyses the possible impact of smart cities on decentralisation through a literature review, and contributes to the impact of smart cities in terms of government organisation through a study of policies and documents related to smart cities in Bristol and the UK. However, this study also has some limitations, in the current study we have selected countries with a relatively high level of decentralisation, in the future, we can consider assessing the impact of smart cities on decentralisation in countries with a relatively low level of decentralisation development and compare it with this study to explore what the differences are.

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A Distribution of Codes in the Board Categories of Analysis

Policy Element	Actor	Year	Reference
UK Digital Strategy	UK Government	2017	Department for Digital, Culture, Media & Sport 2010
Building Digital UK	UK Government	2013	Department for Digital, Culture, Media & Sport 2013
Transport benefits from big data and the 'internet of things' in smart cities	UK Government	2017	Department for Transport 2017
The digital communications infrastructure strategy	UK Government	2015	Department for Digital, Culture, Media & Sport 2015b
hline 2010 to 2015 government policy: broadband investment	UK Government	2015	Department for Digital, Culture, Media & Sport 2015a
Smart meters: unlocking the future	UK Government	2018	Department for Business, Energy & Industrial Strategy 2018
Smart cities background paper	UK Government	2013	Department for Business Innovation & Skills 2013
Future cities UK: investing in better places to live, work and play	UK Government	2015	Innovate UK 2015a

Global Innovators: International case studies on smart cities	UK Government	2013	Department for Business, Innovation & Skills 2013
Smart funding: assessment of impact and evaluation of processes	UK Government	2015	Innovate UK 2015b
Bristol is Open	Joint venture between Bristol City Council and University of Bristol	2015	Bristol City Council 2009a
Connecting Bristol strategy	Bristol City Council	2009	Bristol City Council City 2009
Bristol Data Dome – Immersive Media Installation	Bristol City Council	2015	Bristol City Council 2015
Bristol Future City Demonstrator	Bristol City Council	2013	Hudson 2013
REPLICATE	Bristol City Council	2016	Bristol City Council 2016
Connecting Bristol	Bristol City Council	2009 or ealier	Bristol City Council City 2009
The Bristol Approach	Knowle West Media Centre	2020	Knowle West Media Centre 2020
World-class connectivity	Bristol City Council	2009	Bristol City Council 2009c
Responsible innovation	Bristol City Council	2010	Bristol City Council 2010c

Open Data Bristol	Bristol City Council	2010	Bristol City Council 2010b
Bristol's Open Data programme	Bristol City Council	2010	Bristol City Council 2010a
Media Sandbox	Annual competition organised by Watershed This strand made use of Open Data	2010	Watershed 2010
Playable City	CityFibre	2016	CityFibre 2016
Democratree	Knowle West Media Centre	2014	Bristol City Council 2014
Gigabit Bristol	Bristol City Council	2009	Bristol City Council 2009b
My Knowle West	Knowle West Media Centre	2014	Knowle West Media Centre 2012
You Decide	Knowle West Media Centre	2015	Knowle West Media Centre 2015
Data Dome	Bristol is Open	2015	Bristol City Council 2015
Bristol Healthy Office	Knowle West Media Centre	2016	Knowle West Media Centre 2016

B Codebook of the Thematic Analysis

Categories of analysis	Coding	
Central government guidance	1	Smart City Guidance
	2	Digital Guidance
Engagement	3	Multi-Party Engagement
	4	Community Engagement
	5	Civic Engagement
Transparency	6	Data Support
	7	Data Transfer
	8	Open Data
Impediments to decentralisation	9	Data privacy

Q#	**Structural Code Name**	**Structural Code Definition**
		Brief description: Central government support and guidance for local smart city construction
		Full description: The UK central government provides a vision for the future development of smart cities and has set up a dedicated department, Innovate UK, to fund local authorities to build smart cities, conduct assessments and provide support such as case guidance.
		Where to Find: • smart-cities-background-paper-digital • Future cities UK: investing in better places to live, work and play • Global Innovators: International Case Studies on Smart Cities Smart smart-city-market-uk-opportunities • smart-funding-assessment-of-impact-and-evaluation-of-processes • Evaluation of Smart Impact and Process Evaluation • smart-cities-international-case-studies-global-innovators

1	**Smart City Guidance**	**Examples:** 1. Innovate UK challenged 30 cities to improve urban living and working using new technologies. They needed to show how they could achieve this by working with businesses and partners. Each city received £50,000 to investigate ideas for solving urban living problems. These included challenges in transport, housing, health, energy and pollution. (Future cities UK: investing in better places to live, work and play) 2. Smart operates within a broad landscape of innovation support delivered by Innovate UK and others at national, sub-national and local levels. (Evaluation of Smart Impact and Process Evaluation Smart logic model, position and profile page 20) 3. Between 2013 and 2014, we received funding from the UK Digital Buildings Super Connected Cities programme. (Bristol is open)
		Brief description: Central government supports local leadership in providing digital connectivity.
		Full description: The UK government encourages local authorities to undertake digitisation and allows them to plan their own digitisation programmes through decentralisation.
		Where to Find: • UK Digital Strategy • Guidance Building Digital UK • Transport benefits from big data and the 'internet of things' in smart cities • The digital communications infrastructure strategy • 2010 to 2015 government policy broadband investment • Smart meters unlocking the future

2	**Digital Guidance**	**Examples:** 1. Support local leadership in providing digital connectivity. The Government is calling on all local authorities to support telcos with applications that will improve digital connectivity in their areas. We also call on all Local Enterprise Partners (LEPs) to ensure that the broadband needs of their local small and medium-sized enterprises (SMEs) are reflected in their future strategic planning. (The digital communications infrastructure strategy) 2. Through 47 local projects the Government and Local Authorities are investing over £1.7 billion in improving broadband. ……Local authorities at county and unitary level in England have the responsibility for the Phase 1 and 2 projects in their areas, with each area's programme set out in a local broadband plan. (2010-to-2015-government-policy-broadband-investment)
		Brief description: Multi-partnership in building Bristol's smart city.
		Full description: The smart city process in Bristol is characterised by the involvement of a wide range of institutions such as businesses, universities and organisations. In addition, a number of smart city projects have been completed with the support of the European Union's IES, which also demonstrates the multi-stakeholder collaboration that characterises smart cities.
		Where to Find: • Bristol is open • Bristol Smart City Strategy • World-class connectivity • BigClouT • City wide innovation ecosystem • REPLICATE • Democratree • Bristol Healthy Office

3	**Engagement**	**Examples:** 1. Bristol Open (BiO) is a joint venture between the University of Bristol and Bristol City Council, offering a number of services to technology companies, businesses, research institutes and others working to create smart cities, allowing innovators to develop, test and demonstrate their applications and services in a real-world, real-time environment on a city-wide network. (Bristol is open) 2. Propose sustainable dissemination and development plans to create an ecosystem of innovators (SMEs, start-ups, citizens, etc.) with realistic win-win business models (BigClouT) 3. The City of Bristol's first Smart City Strategy combines existing Smart City functions such as the Bristol Operations Centre, the Open City Innovation Team and the Connected City Programme to outline a responsible and innovative approach to the issues and problems facing the city. (Bristol Smart City Strategy) 4. We want to foster a city-wide approach to developing a smart Bristol, which will encourage digital innovation and city-led initiatives across a diverse and inclusive network of institutions, communities and individual entrepreneurs. (City wide innovation ecosystem) 5. IES Cities ran from 2013-2016, working in four cities in Italy, Spain and the UK, exploring how people can use digital technologies and apps to identify and solve problems in their areas. (Democratree) 6. The Wellness Office was created through the EU partnership project IES Cities, which enables people to record their mood and stress levels while at work. (Bristol Healthy Office)
		Brief description: Extensive community involvement is reflected in the building of Bristol's Smart City.

Full description:
Enhancing democratic innovation at the community level by encouraging active participation of people in community governance and increasing digital capacity.

Where to Find:

- The Bristol Approach
- Responsible innovation
- Bristol's Open Data programme
- My Knowle West
- Your decide

4	**Community Engagement**	**Examples:** 1. In partnership with Ideas for Change and Bristol City Council, we have developed the Bristol Approach: a way of working that aims to understand the issues that people care about. Rather than 'pushing' technology or predefined 'solutions' onto people, the Bristol Method focuses on supporting people to work together to 'attract' the knowledge, skills and resources needed to solve problems. The Bristol Methodology Framework consists of six stages. It is structured to ensure that community technology programmes are driven by issues related to local needs and are carried out at the community level, with local people actively involved in the design, testing and evaluation. (The Bristol Approach) 2. We want communities to influence the way technology is used in cities, to enhance connectivity and to incorporate the social and economic benefits that digital technology brings to cities. (Responsible innovation) 3. As a community node, we bring together local individuals and organisations interested in open innovation to host local events and workshops. We work with partners to raise awareness of the economic, social and environmental benefits of data, encourage local collaboration, and build connections through the ODI community. Citizens can join the ODI community to follow and get involved in this work. (Bristol's Open Data programme) 4. Research conducted with RSA in 2012 showed that some of our local people felt connected to the community and knew what was going on, while others were isolated and didn't know where to find local information. After talking to local people, we worked with design companies and local community groups to create a 'local social network' to try and bridge some of these gaps. In 2014 we tested My Knowle West - also known as MyKW - an online space where you can easily share what you're doing with an online network of other local people. Whatever your job, activity or hobby, you can share tips, photos and inspiration with others. You can also join groups to find out what like-minded people are creating. (My Knowle West)

		Brief description: The process of building a smart city demonstrates the individual participation of citizens.
		Full description: Citizens are able to use the city's infrastructure settings to enhance innovation in urban governance, while citizens are able to participate in political activities and put forward their opinions and suggestions in the process of building a smart city.
		Where to Find: • PLAYABLE CITY • You Decide

5	**Individual Engagement**	**Examples:** 1. People are actively engaging citizens in the development of the city. This is a perfect moment to launch Playable Cities. Playable Cities puts people and people at the heart of the city of the future, repurposing urban infrastructure and repurposing smart city technology to build connections between people and people and people and cities. (PLAYABLE CITY) 2. You Decide is a free digital tool designed to give people a say in the decisions that affect them. People who use the app for testing: share ideas and preferences for neighbourhood decisions. Create their own polls and share ideas with others. Provide feedback to councils and local organisations. There are four main categories in the app: Council polls: share your views on issues that affect the whole Bristol Council survey: tell the council what you think in their latest survey; People's ideas: submit your own ideas for change and vote on proposals made by others Neighbourhood choices: have your say on decisions that affect your community, from practical matters to funding decisions (you can only do this for decisions affecting your neighbourhood partnership area); submissions via the app are passed on to the relevant decision-making bodies and considered alongside feedback received in other ways (such as questionnaires and consultation events). (You Decide)
		Brief description: Large or small sensors in cities in the construction of smart cities can collect large amounts of data to support data platforms.
		Full description: In the construction of the Bristol Smart City ICT, in addition to the large amount of information that the city can collect through large sensors, citizens can also use their own devices with built-in sensors (e.g. smartphones) to collect data to support the construction of the Smart City Big Data platform.

6	**Data support**	**Where to Find:** • The Bristol Approach • BigClouT
		Examples: 1. The Bristol Citizen Sense approach is the application of the process and spirit of the Bristol Method framework to sensing, 'smart cities' and technology projects." Citizen sensing" is a process where people build, use or act as sensors, for example, to identify and collect information (or "data") to help them solve problems that are important to them. This sensing process may involve creating custom temperature sensors from scratch, or using technology that already has built-in sensors (such as smartphones). No matter how simple or complex the technology, and no matter what data is collected, citizen sensing is about empowering people to use technology for social good. (The Bristol Approach) 2.BigClouT will create distributed intelligence that will be embedded throughout the city network for use in large or small urban areas to provide analytical thinking for the city. (BigClouT)
		Brief description: The construction of data transmission infrastructure in smart cities enables faster and better delivery of information.
		Full description: Smart cities are vigorously developing gigabit broadband in the construction process, and the construction of infrastructure such as 5G can benefit the people with faster and better data transmission and connectivity.
		Where to Find: • World-class connectivity • Responsible innovation

7	**Data transmission**	**Examples:** 1. Bristol is developing a gigabit broadband infrastructure to help our economy grow and benefit our citizens. We are working with telecommunications providers to achieve faster, more reliable and better connectivity, enabling residents and businesses to unlock the full potential of the internet. (World-class connectivity) 2. Bristol City Council recycles and redistributes laptops to reduce digital poverty across the city. Over 3,000 laptops will be distributed through the Computer Reuse Scheme, which represents the Council's key commitment to digital inclusion. (Responsible innovation)
		Brief description: Database creation and data opening in the construction of Bristol's smart city.
		Full description: Bristol is building a smart city by opening up a large amount of data through the Open Data Bristol platform and by creating a digital dome in order to make it more visible and accessible to citizens.
		Where to Find: • Bristol Data Dome • City-wide innovation ecosystem • Open Data Bristol

8	**Open Data**	**Examples:** 1. The Bristol Data Dome is the first full dome planetarium in the UK to accommodate media and real-time data presentations. As part of the Bristol Open project, the dome is designed to be used to visualise complex experiments, create interactive virtual reality environments and provide individual viewers with their own unique perspective. (Bristol Data Dome) 2. The publicly available data covers:Transport and Streets; Health and Social Care; Geography and Regions; Councils and Democracy; Environment; Communities and Housing; Planning and Land Use; Population; Energy; Leisure and Tourism; Business and Economy; Education; Connectivity and Internet; and Safety. Opendata.bristol.gov.uk is where we currently publish our open datasets (over 140 datasets and growing). Our work includes raising the profile of open data within the Council and working with data owners to identify and prepare datasets for publication. (Open Data Bristol)
9	**Data privacy**	**Brief description:** The issue of personal data privacy needs to be taken into account in the construction of smart cities. **Full description:** The process of collecting and disclosing data should take full account of concerns about the privacy of individuals. **Where to Find:** • bigclout **Examples:** 1. Attractive smart city services and applications take into account personal data protection concerns. (bigclout)

University of BRISTOL

School for Policy Studies

SPS RESEARCH ETHICS
APPLICATION FORM: U/G and TAUGHT POSTGRADUATE STUDENTS

This form must be completed for each piece of research carried out by all undergraduate and taught post-graduate students in the School for Policy Studies.

Students should discuss their proposed research with their supervisors who will then approve and sign this form before forwarding to the relevant dissertation convenor, unit convenor or programme director.

Failure to get approval prior to conducting any fieldwork (virtual for 2020/21 only) may result in the University taking action for research misconduct – the outcome of such action may be that you are unable to submit your fieldwork findings for assessment and your **degree may not be awarded.**

Once your study is approved, you must follow the plan described in this form. You should remember that ethics is an on-going process, ie your ethical thinking is not 'done' when your form is signed. It is about how you act as a researcher. You should remain reflexive throughout the research process and think about how the research is impacting on your participants and yourself. You should refer to this completed form throughout your research process to make sure you are remaining within your ethical approval. If you wish to change your research plan, then you must discuss this with your supervisor. If the change is very small your supervisor can approve the change. However, if the change is more significant, you will need to ask for an amendment to your ethical approval. Your supervisor and dissertation convenor must approve this change in writing. If you do not get approval for changes, then you won't have ethical approval for the change, and it may result in the University taking action for research misconduct.

This signed form or a copy **must** be submitted as an appendix to your dissertation. If appropriate, a copy of approval from the SPS Research Ethics Committee (REC) or other REC committee should also be in the appendix to your dissertation.

Who needs to provide Ethics approval for your project?

The School will only consider those projects which do not require ethical approval from elsewhere. As such, you should make sure that your proposed research does not fall within the jurisdiction of HMPPS (Her Majesty's Prison and Probation Service) or the NRES system. e.g. does it involve staff or offenders – see https://www.gov.uk/government/organisations/her-majestys-prison-and-probation-service/about/research or does it involve NHS patients, staff or facilities – see http://www.hra-decisiontools.org.uk/ethics/.

Social care research projects which involve NHS patients, people who use services or people who lack capacity as research participants need to be reviewed by a Social Care Research Ethics Committee (see https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/social-care-research/). Similarly, research which accesses unanonymised patient records (without informed consent) must be reviewed by a REC and the National Information Governance Board for Health and Social Care (NIGB).

Any application to an external body should be discussed with your supervisor.

Terminology used in this form:
Primary research includes any research that collects new data such as interviews, focus groups, observations, online surveys, new data collected via a social media post etc. **Due to the COVID 19 situation, fieldwork (collection of data in person) is not permitted. All primary research must take place online, over the telephone or using methods that allow sharing of information without meeting in person.**

Secondary analysis relates to the re-analysis of data that already exists such as analysis of publicly available documents or tv programmes, analysis of existing social media posts, reviews systematic or otherwise, or statistical analysis of analysis of publicly available datasets etc.

Which sections of the form do I complete?

All students must complete **section 1.**

If your research includes **primary research**, please go to **section 4** and complete **all** of the following questions and sections of the form. You should also read **section 2** if your research involves **children or vulnerable adults.**

If your research only involves **secondary analysis** of data, please go to **section 3** and then **complete section 5.**

All students must also complete the section on Data Management (**section 5**)**.** When your supervisor is happy with your form, complete **part A of Section 6** and send it to this final version of your form to your supervisor.

SECTION ONE: STUDENT, ADVISOR/SUPERVISOR

Please complete:

Requested information	**Details**
Student's name:	Yaping Ma
Student's email:	jo20437@bristol.ac.uk
Programme:	Dissertation
Project advisor/supervisor:	Sarah Ayres
Date dissertation is to be submitted:	13 September
Project working title:	Decentralisation under smart cities: Take Bristol as a prime example

SECTION TWO: WORKING WITH CHILDREN AND VULNERABLE PEOPLE

We have removed the information regarding the DISCLOSURE AND BARRING SERVICE CHECK from this form as no face-to-face fieldwork is permitted this academic year (20/21). (This is the check that you need if you are going to meet with children or vulnerable adults).

However, any research which includes children or vulnerable adults is considered 'sensitive' and your research plans should be extremely well thought through and all of the potential ethical issues on considered on this form. You must discuss your plans in detail with your supervisor.

When engaging with young children (under 13), you must contact them through their parents/carers/teachers. The responsible adults should be given an information sheet providing full details about the research. Children and young people should also be given appropriately written information about the project. Young children under 13 should be asked for their 'informed assent' to take part - ie that understand at an age appropriate level about the project and they are happy to be involved. Children between 13 and 17 should be asked for their informed consent to take part. In some cases, it will be appropriate to only seek the 13–17-year old's, ie not their parent's, consent to take part in the research. This should be discussed with your supervisor and approved on a case-by-case basis. When researching with children/young people face to face online, you should ensure that parents/carers/ teachers are nearby and able to support children's participation and wellbeing.

If you are engaging with children/young people (under 18) face to face online, then no more than 2 contacts are allowed. If you wish to do longer term work with children/young people, please discuss this with your supervisor.

You should only use your University email address and never give out your personal phone number. You must keep a record of all email contacts to and from young people or vulnerable adults.

For further guidance see:

https://learning.nspcc.org.uk/research-resources/briefings/research-with-children-ethics-safety-avoiding-harm#article-top

SECTION 3: SECONDARY RESEARCH

For those intending to carry out secondary analysis of data:

Please provide details of where you are getting your data set from and how you will use. Data sets must be stored on the University of Bristol server.

Questions	**Details**
What sources/ secondary datasets you will use?	**Journals, papers, books, policy reports, news, etc.**
Where will you get these data from (e.g. ESRC Data Archive, systematic literature review, document archive). Please describe your selection criteria and how you will locate/access the data?	**systematic literature review** **I will use smart city, Bristol, decentralisation etc. as keywords for relevant searches on the school library, Google Scholar, Google and other web pages.**
If necessary, how will you obtain permission to use these data? This would apply to data sets where it is usual for the researcher to sign an end user licence.	**If necessary, I will contact the author/government authorities to obtain permission to use the data**
How will you analyse the data?	**I will perform a secondary analysis**
What ethical issues will you consider? i.e. will you consider the quality of the papers/programmes etc reviewed?	**I will consider the quality of the literature and the need to obtain permission from the author/government authorities if necessary**

If you are only using secondary data, please go to Section 5.

If you are using 'mixed methods' (i.e., collecting primary data as well), complete the rest of this form.

SECTION FOUR: PRIMARY RESEARCH

1) For those intending to carry out primary research:

a) Who are your potential participants?

Who are you going to invite to take part in your research – i.e. Who will be in your sample? (e.g. general population, lone parents with children under 5, primary-school teachers etc.).

Type of participant	How many of these participants are you aiming to include in your sample?

b) Recruiting your participants

It is usually not appropriate for researchers to contact individual potential participants directly unless their contact details are publicly available – such as work emails on an organization's website or twitter handles. If you wish to conduct research with other students or in organisations where you are known, you will need to discuss this with your supervisor.

In many cases, potential participants should be informed of any research on your behalf by a 'gatekeeper' – an organisation or service such as a school, charity, etc. When asking the gatekeeper to support your research, you will need to provide them with information about your research which they can forward on to potential participants. This may be an email or a letter. Potential participants can then contact you directly using the contact details you provide or through the 'gatekeeper'. (You should be aware if you expect participants to respond through the gatekeeper, that this could be burdensome for the organisation and would also mean that the organisation will know who has responded to your invitation to take part in the research.)

If you are using social media to recruit participants, you must read the guidance on the SPS webpage (https://www.bristol.ac.uk/sps/research/ethics/) and be very clear that you are joining the group/posting for research purposes. If you are using Facebook, you must contact the group administrator and gain permission to use the group for recruitment **before** any recruitment can take place.

Questions on recruitment of participants	Yes	No or Not applicable
I am using publicly available contact details		
I am using a 'gatekeeper' to contact participants		
I confirm that I am attaching the information I will provide the gatekeeper about the research		
If you are using Facebook, Twitter or other social media platform, please confirm that you have read the guidance on the SPS website		

(https://www.gla.ac.uk/media/Media_487729_smxx.pdf)		
If the 'gatekeeper' is a Facebook group/other administered platform, please confirm that you will approach the administrator of the group for permission to use the group to post information about your study.		

If applicable, please provide the details of the 'gatekeeper' being used:	

c) Anonymity and Confidentiality

In general, all the information you collect must be anonymised - the participants' names and details that could identify them - must be changed. You should describe them using terms such as Teacher 1.

There are 2 situations where you may **with the participant's specific consent,** use their name or specific professional title. The reason for their identification and the risks of this must be made clear in your information sheet:

- They are a public figure, and this is relevant to the findings so you are asking consent to use their name.
- They are identifiable by their role – such as Director of a charity that is not easy to anonymise, so you are asking consent to use their professional title/role.

You should only use participants' names/title if it is impossible to anonymise them. The use of names/titles must be discussed, in detail, with your supervisor.

You should ask participants not to use real names of people they talk about in their responses. You should change details that will identify the participant and those they discuss, such as school names/locations etc. It you are using social media to collect information you should edit quotes so that they cannot be searched for and the participant found. The information should be anonymised as soon as possible, i.e. during transcription or as soon as the information is received.

All the information should be kept confidential unless there is a significant risk of harm to the participant or someone who is identifiable during their responses. If there is a significant risk of harm to the participant, then this will need to be reported to the appropriate authority. You must discuss this with your supervisor immediately. This limit to confidentiality must be made clear on your information about the project and consent document.

Declaration	**Yes or No**
I confirm that I will anonymise the information collected and keep it confidential unless there is a risk of significant harm. I will make this limit to confidentiality clear to participants.	
Only complete this line, if participants cannot be fully anonymised and you have discussed the need to use names/titles with you supervisor. I will need to ask participants for specific consent to use their role/name. This will be included on the information sheet and consent	

Declaration	Yes or No
form.	
I will anonymise the information as soon as possible.	

d) What materials are you using to recruit participants?

You may need different types of information to make your participants aware of your research. You will need to provide a draft of an email or letter that the gatekeeper can forward on for you. You may need a Facebook post, tweet or poster that will be put up in a public place. All these need to be included with this form. These documents are usually quite brief, just giving an overview of the project and details about how to get involved. Potential participants who contact you, would then be sent the full information about your research – see the next question. Please confirm that you are attaching your recruitment information.

Details of recruitment materials (please add a row for each document)	Confirm submission with application (Yes or No)

e) Data collection methods

Please tell us what data collection methods you are using. Please tick the ones you are using and confirm that you are attaching your interview or focus group schedule/topic guide/observation schedule/height/weight recording form or online survey etc. Please tell us how long the activity will take and, if appropriate, where you will meet the participants – i.e. a school or community venue, office in a charity, quiet room in a library etc. **You must not go to participants' homes.**

You should use an encrypted recording device. You can use your phone, but the recording **must not be saved to any form of Cloud storage other than your personal University one-drive files.**

i) In person

Type of method	Yes or No	How long will the involvement take the participant?	How are you meeting the participant/s? (No in person meetings in year 20/21) Please include platform for online interviews etc.	Document attached: Yes or No
Face to face interviews				
Focus group interviews				

Type of method	Yes or No	How long will the involvement take the participant?	How are you meeting the participant/s? (No in person meetings in year 20/21) Please include platform for online interviews etc.	Document attached: Yes or No
Observations (please describe the type of observation)				

ii) Online methods

If you are doing an online survey - you must use onlinesurveys.ac.uk (https://www.onlinesurveys.ac.uk/) as this is based at Bristol and follows the appropriate data protection rules. Contact zaheda.anwar@bristol.ac.uk for an account.

Type of method	Yes or No	How long will the involvement take the participant?	Document attached: Yes or No
Online survey			
Online live in-person interviews			
Online interviews by email or messaging etc.			
Telephone interview			
Data collection using social media			

iii) Other methods

Other method - e.g. the researcher taking height and weight measurements. This is just an example and not suitable in 20/21	What do the participants need to do? (eg stand with clothes on to be measured).	How long will their involvement take the participant?	Where are you meet participants?	Document attached: Yes or No

f) Providing information about your research to participants

Participants must be provided with detailed information about your research so that they can provide 'informed consent'. This information is usually provided in an information sheet or at the start of an online survey. When using social media, the post or tweet would link to an online information sheet. This information needs to:

- Clearly describe the research, what participation involves and how the information shared will be used.
- Explain that participation is voluntary and that they can ask to withdraw their data at any time, but this may not be possible once the data has been anonymised.
- Explain that the information will be kept confidential unless there is a significant risk of harm to someone and will be anonymized (unless you are asking for specific consent to use of name/role).
- Explain that the information shared will be stored on the University of Bristol server until you receive your degree.
- Explain that the information they provide will be used in your dissertation and, if appropriate, used to feedback to relevant organisations/participants etc. If you plan to publish a paper from your study, you should mention this too.
- Explain how participants can contact you – this should be your University email address. You must not use your personal mobile number. If necessary, you should use a cheap phone or alternative sim that is just for the research.

You should adapt the format for the information sheet provided. You should be available to discuss the information provided and if answer any questions potential participants may have.

Declaration	**Yes or No**
I confirm I have attached an information sheet/my online survey that includes all the information about the research	

g) Informed consent

It is usual to get written informed consent usually on a consent form of some kind. This can be on paper, at the start of an online survey or using an online consent document (using an online form or an online survey that just contains the questions that need to be agreed to provide consent perhaps prior to an online interview). You should use the standard consent form provided as a basis for your informed consent documents.

You must consider whether participants have the capacity to give informed consent. If you believe that the person cannot give informed consent, then they should not be included in the research, unless there is someone who can consent on their behalf. You must discuss this with your supervisor before any data is collected.

Great care must be taken to ensure that parents/carers and children/young people understand exactly what taking part in the research entails and what will happen to the information they provide. Even if a child or young person has given their informed assent/consent to take part, you should be aware of their body language and look for signs that they are uncomfortable or may be withdrawing their assent/consent. Do not involve a child in your study if they are not happy to take part, even if their parent has given consent.

Where written consent is not possible, you should record reading the questions on your consent form and the participant's verbal agreement. This should be transcribed and saved securely.

Declaration	**Yes, No or not applicable**

I will obtain written/online/electronic consent for informed, voluntary participation	
I will record verbal and transcribe the participants' verbal consent	
I have adapted the standard consent form and my consent document is attached. (This can be part of the online survey).	

If you cannot get written consent, please give the reason here	

h) Impact of your research on participants

What potential risks to participants are there? How will you address these risks? List any potential physical or psychological dangers. Please pay specific attention to any vulnerable groups you have included in question **1a**. For example, a survivor of abuse may be at further risk from the perpetrator if they take an information sheet away with them. Professionals who are being asked about their professional role and being offered anonymity may not be considered at risk of harm, but you should consider risk to their professional reputation if you are asking about their professional practice.

You should prepare an information sheet containing information about ways in which participants can get support if they are upset by taking part in the research.

Risk	**How you will address this risk.**
Example: Participants may get upset during the interview	*I will stop the interview and offer them support. I will only restart the interview if they are willing. I will offer them information about support services.*
Example: A participant may tell me about illegal activity	*The information sheet and consent form warn of limits to confidentiality. I will remind them that I will need to break confidentiality if someone is at risk of serious harm.*
Example: a survivor of abuse may be at further risk from the perpetrator if they have a paper copy of the information sheet.	*I will ascertain if it is safe to send the information sheet to their home address. If this is not safe, I will organise for the information to be shared in person via the gatekeeper.*

Declaration	**Yes or No**
I confirm I am attaching a document describing suitable support services	

i) Your physical safety: **DO NOT COMPLETE IN YEAR 20/21.**

You should take your mobile phone (charged and with credit/contract minutes) with you and use public/community venues. You should not go to private addresses/participants' homes. You should tell someone you trust where and when you are doing the fieldwork and what time the fieldwork is expected to finish. You should contact your trusted person as soon as you have left the participant. **You must not tell them any details about the participant.**

Declaration	**Yes, No or not applicable**
I confirm that I will use the public/community venues described in question* for my face to face fieldwork.	
I confirm I will take my charged, with credit/contract minutes mobile phone with me	
I confirm that I will notify a trusted person of the location of my face to face fieldwork and when I am expected to return. I will contact them when I have left the participant.	

j) What will you do if you have too many participants?

Are you likely to have too many potential participants that fit your criteria? If so, you will need to thank them for their interest and say politely that you do have enough participants, so you will not be including them in your research. This would usually be done by email or letter. This email/letter should be checked by your supervisor.

Declaration	**Yes, No or not applicable**
I confirm that I will thank unneeded participants for their interest by email/letter. If necessary, my supervisor will check this communication.	

SECTION FIVE – DATA MANAGEMENT

To be completed by all students whether you are doing primary research including fieldwork or secondary analysis.

1) How will you manage your data?

All identifiable electronic data should be stored on the university password protected server.

Data should be anonymised as soon as possible and identifying files kept securely away from anonymised data.

Unanonymised data must **never** be stored on a memory stick or digital recorder (other than on your return journey from an interview) unless it is a highly secure password protected and encrypted device (e.g. FIPS 140-2 Level 3 security). Any paper document, such as consent forms, should be locked away in a secure draw or cabinet until they can be scanned and saved on the University of Bristol server. The documents should be scanned as soon as possible. Paper documents should be disposed of securely by shredding or in the confidential waste bins in SPS.

In accordance with the Data Protection Act, **the data collected must not be kept any longer than necessary than for the purpose it was collected for**. Therefore, you must delete your data from the University server when you are awarded your degree.

If you plan to publish (write a paper about your findings) or plan to do a further degree and use the data as the starting point form your Masters Dissertation, you must discuss your plans with your supervisor. This is because the data must remain stored at the University of Bristol – usually in your supervisor's account on the University Data storage facility. You are not permitted to store data outside of the University.

If it is agreed that your supervisor will hold your data for you, then you would need to explain that you want to keep the data and describe how it will be used in your information sheet. You must also ask for specific consent to keep the data for the specified purpose.

Declaration	**Yes**
I confirm that that data collected/used will be stored on the University of Bristol server.	**y**es
I confirm that paper documents will be stored in a secure draw or cabinet until they can be scanned and stored on the university server	**y**es
I confirm that I will dispose of any paper documents securely	**y**es
I confirm that I will keep my data until after I have been awarded my degree: I will then destroy all data collected, including electronic audio and document files and shred hard copy transcripts.	**y**es

SECTION SIX – YOUR EMOTIONAL WELL-BEING

To be completed by all students whether you are doing primary research including fieldwork or secondary analysis.

Dissertation topics are often selected due to personal interest/experience and you will be working on your chosen subject for a number of months. This may have an emotional impact. If you are investigating a topic that is sensitive for you, you need to have a plan regarding ensuring your emotional wellbeing, to be self-aware and ask for support if you need it. You should discuss your well-being plan with your supervisor. You can access support from:
https://www.bristol.ac.uk/students/wellbeing/services/wellbeing-access/

The Big White Wall is a digital support service you can use to help you deal with everything from everyday stresses to major life events.
https://www.bristol.ac.uk/students/wellbeing/services/big-white-wall/

Risk	**How you will address this risk.**
I feel upset after interviewing a participant.	*I will take some time to myself and do something that helps me feel better such as exercise or watch my favourite comedy. If I still feel upset, I will use the big white wall for confidential online support or contact my supervisor.* *I will talk to trusted friend without revealing any of the confidential information shared with me.* **You would only talk about how the information made you feel and not share any details about the interviewee**.
I feel upset after reading about violence to children as part of my systematic literature review.	*I will take some time to myself and do something that helps me feel better such as exercise or watch my favourite comedy. If I still feel upset, I will use the big white wall for confidential online support or contact my supervisor.* *I will talk to trusted friend.*

SECTION SEVEN: CONFIRMATIONS AND SIGNATURES

A) Student:

Declaration	Yes
I certify that the statements made in this request are accurate and complete, and if I receive approval for this project from my supervisor/unit convener I will conduct my research as stated.	yes
I agree **to inform my advisor/supervisor/unit convener in writing of any emergent problems or proposed procedural changes** and that I will not proceed with the research until any proposed changes have been reviewed and approved.	yes
I have attached all the relevant documentation necessary to carry out this research.	yes
I am aware that this form and, if necessary, REC approval from the SPS REC must be included in an appendix in my dissertation.	yes

Signature:	Yaping Ma
Date:	17/06/2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	X

B) Student advisor/supervisor: Please tick the first box and one of the subsequent boxes:

Declaration	Yes
I have reviewed this form.	x
I approve the information in this form and do not think higher level approval is necessary.	x
I have sought advice from the SPS REC, this advice has been headed and approval has been given.	
This form should be examined by the SPS REC.	
This project has been submitted for ethical approval to an NHS REC	

Signature	Sarah Ayres (e mailed 17.6.21)
Date	17.6.21

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	x

C) The dissertation convenor, unit convener or programme director, on behalf of SPS Research Ethics Committee:

Please tick the appropriate box:

Declaration	**Yes**
Approval is granted to this project	Yes
This form is being referred to the appropriate SPS/NHS REC	

Signature:	
Date:	22/06/2021

Please indicate with an X in the following box that you are submitting this form by email with an electronic signature	

Instructions for adapting this form

The black text is the suggested wording

You should insert the specific information about your project in these brackets, i.e. [name of study]

The blue text is where you include the details of about your study.

School for Policy Studies

Outline information sheet – [name of study]

This can be adapted and added to the start of an online survey/email or post about the survey.

Introduction- Who are you and what is the research about?

I am ***[name]*** and I'm an undergraduate/MSc student at the University of Bristol. I am undertaking a piece of research for my dissertation about ***[complete title]*** I would like to invite you to take part in my study.

Why have you been invited to take part?

You have been invited to take part in this study because ***[provide explanation]***. Taking part in the study is completely voluntary. You do not have to take part.

What will happen if I take part?

If you agree to take part in the study, you will be invited to take part in an interview/focus group/online survey/diary writing etc. (Add the method you are using). **You then need to give a brief overview of the information they will be asked about and say how long their involvement (with each method) will take, how many times it will happen.**

If doing interviews/focus groups, you need to say if these will be recorded or if notes will be taken or both. You will need to say if the interview/focus group will be face to face and if so where it will happen or if it is online.

If you are contacting them through a 'gatekeeper' – you need to make it clear whether the gatekeeper will know they have taken part, for instance if they agree to take part via the gatekeeper or if the interview is in a school.

What will happen to the information I provide?

The information will be kept confidential unless someone is at risk of serious harm, then ***[add in the appropriate authority]*** will be informed. The information you provide will be anonymised (all identifying information will be changed) and stored securely in a password protected file only accessible to me on the University of Bristol server until my degree has been awarded. You have the right to withdraw your data at any time, however this may not be possible once the data has been anonymised.

If the participant is a public figure/has a key role that would be recognisable to others in the field and you want to identify their quotes, you need to ask for specific permission.

If the participant might be recognised from the information they provide or by using their specific job title, you need to make this clear. Even though I will do my best to anonymise the information provided, due to your role/position ***[add details]***, it is possible that you might be identified by ***[add details]***. **This may need to be combined with the comments about them being a public or recognisable figure in the field being studied.**

Or for anonymous online surveys etc. The information you provide will stored securely in a password protected file only accessible to me on the University of Bristol server until my degree has been awarded. As the survey is collecting information anonymously, it will not be possible for you to withdraw the data you provide

The information provided will be used in my dissertation. With your permission, I may include anonymised quotes from the information you provide. **If they are a public figure and or it is important to include their specific role, you need to make it clear you are asking for specific permission for this.**

If you are planning to write a feedback sheet for participants or share your findings with relevant organisations – add this here. You may want to tell them if you will send them a copy of the summary of findings.

[**If you are planning to do further study using the data, this should be discussed here**].

Are there any benefits or risks related to taking part?

I hope that this study will improve understanding of ***[add details]*** You should be aware that there is a risk that as the research is talking about: ***[put topic here]***, there is a possibility that you may discuss information that is upsetting. If you became upset, then I will pause the interview and offer you support. You will also be provided with a list of organisations that you could approach for support.

Who should I contact for more information?

Please contact me, *[name]*, for more information about this study. My email address is *[add email address]*. You may include a mobile number too – but only if this is a number just for the study – NOT your personal mobile.

If you have any complaints/comments about how the study has been carried out, you should contact my research supervisor:

[Supervisor name and email]

This study has been approved on behalf of the School for Policy Studies Research ethics committee at the University of Bristol.

Instructions for adapting this form

The black text is the standard consent information. This should not be changed.

You should insert the specific information about your project in these square brackets, i.e. [name of study]

The notes in the grey boxes are for guidance only. They should be removed from your final consent form.

The **blue text** are option statements that may be required.

If possible, try and keep the consent form to less than one page.

Informed Consent for [name of study]

Please tick the appropriate boxes

1. Taking part in the study

	Yes	No
I have read and understood the study information dated **[**DD/MM/YYYY**]**, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction		
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason. I understand that if the information has been anonymised, it may not be possible for the data to be withdrawn.		
I understand that taking part in the study involves **[**……**]**.		

Describe in a few words how information is captured, using the same terms as you used in the information sheet, for example: an audio-recorded interview, a video-recorded focus group, a survey questionnaire completed by the enumerator, an experiment, etc.].

For interviews, focus groups and observations, specify how the information is recorded (audio, video, written notes).

For questionnaires, specify whether participant or enumerator completes the form.

For audio or video recordings, indicate whether these will be transcribed as text, and whether the recording will be destroyed.

	Yes	No
If there is a potential risk of participating in the study, then provide an additional statement: **I understand that taking part in the study has [……] as potential risk.**		

2. Use of the information in the study

	Yes	No
I understand that information I provide will be used for [……].		

List the planned outputs, e.g. reports, publications, website, video channel etc., using the same terms as you used in the study information sheet. **Consider whether knowledge sharing and benefits sharing needs to be considered, e.g. for indigenous knowledge.**

	Yes	No
I understand that the information I provide will be kept confidential unless it suggests that someone is at risk of serious harm.		
I understand that the data I provide will be stored securely at the University of Bristol until [name] has been awarded their degree.		

	Yes	No
If you want to use quotes in research outputs, add: I agree that my words can be quoted anonymously in research outputs.		

3. Signatures

Name of participant [IN CAPITALS]	
Signature:	
Date:	

For participants unable to sign their name, mark the box instead of signing **I have witnessed the accurate reading of the consent form with the potential participant and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.**	
Name of witness [IN CAPITALS]	

Signature	
Date	

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Name of researcher [IN CAPITALS]	
Signature:	
Date:	