Bristol's smart city agenda: vision, strategy, challenges and implementation

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Abstract: This case study explores Bristol's goal to create a smart city, anchored by a 30-year city vision and the vital role digital connectivity and smart city technologies play. It describes Bristol's 2050 One City Plan, where city partners are collaboratively shaping the city through place-based leadership, community involvement and co-production, and Bristol City Council's complementary smart city strategy – Connecting Bristol. This digital agenda supports by developing the 'foundations' required to become a data-enabled city with world-class connectivity and inclusive public services; elements which enable many One City goals. It examines the importance of a challenge-led, people-focused approach with responsible innovation practices that ensure digital initiatives align with the One City Plan's equitable goals and values. Implementation strategies, including an 'innovation ambition' matrix used to manage a portfolio of smart city initiatives, and challenges are described along with the need for inclusive infrastructure and ethical data practices. The emerging role for local government in shaping a trusted smart city is explored. This study ends by discussing Covid-19 and economic recovery, in response to which the Council seeks to become a more agile, streamlined organisation, and concludes by highlighting the need to keep people at the heart of 'smart' city development.

1 Introduction

Bristol City Council has a vision of Bristol as a liveable, sustainable and prosperous city – a place that attracts people and businesses because of a high quality of life, vibrant culture and good access to opportunities, amenities and services. To achieve this vision, Bristol needs to become digitally well-connected and data-enabled with technology playing a key role in delivering value to the city's diverse range of citizens and businesses. This is even more vital now for the recovery from the COVID pandemic and the future resilience of city and the Council.

Bristol sits within a strong economic area, working with its neighbouring cities and towns to maximise economic growth through the west of England and south Wales. It is also part of many international networks, facilitating trade, connections and shared learning [1]. It is a growing city, described by its residents as vibrant, diverse and friendly. It is a diverse city with at least 45 religions, 187 countries of birth and 91 main languages spoken. It has high levels of deprivation in some areas [2].

However, Bristol is a city of contrasts, despite its economic success there are stark differences in equality existing across the city resulting in vastly different health, education and economic outcomes, with many people in Bristol live in the bottom 10% most deprived parts of England [1, 2].

This case study discusses the Bristol's One City plan, how this has shaped the Council's smart city strategy, highlighting the positive role that digital technologies will play in shaping Bristol's future, as well as sharing some of the steps being taken to ensure that everyone benefits.

2 Vision for Bristol

Bristol's One City Plan [1] is an ambitious vision for the future of Bristol, decade by decade up to 2050. Its goal is to bring the city together around common causes, shared values and an understanding of the challenges which need to be addressed on route to creating a fair, healthy and sustainable city. The plan, reviewed and refreshed annually, was a response to hundreds of unaligned city strategies, disconnected city boards and short-term thinking [3], a situation probably familiar to most councils.

The overarching vision statement, first published in 2019, is a call to action so that 'in 2050 Bristol is a fair, healthy and sustainable city. A city of hope and aspiration, where everyone can share in its success' [3]. The 30-year plan is currently structured around six interdependent themes: connectivity, health and wellbeing, homes and communities, economy, environment, and learning and skills. Each theme has a targeted 2050 vision statement with thematic boards (Table 1) designed to convene city stakeholders and coordinate action, with boards run joint sessions with fellow boards to work through interdependencies. The sub-themes reflect the complex challenges affecting Bristol [4].

Annually there are 18 goals (three per theme) to help sequence activity, provoke action and act as a challenge to the city to progress towards its long-term vision. As part of an annual review cycle, these goals are refreshed and three are chosen as priorities for the City Office to focus on [5]. In January 2020, three new priorities were collectively selected by city stakeholders [6]:

1. Connectivity – ‘Funding measures are explored to secure investment to develop mass transit systems, including underground and overground, and increased support for public transport, cycling and walking options, improving the movement of people across the city’.
2. Environment – ‘Ensure Bristol is accredited as a gold standard in the Sustainable Food City awards and establish a legacy programme’.
3. Homes & Communities – ‘Build on and deliver city-wide interventions to tackle homelessness with a focus on reducing the number of families in temporary accommodation’.

Some challenges affecting Bristol are global in nature, such as the need to address climate change and decarbonise the city. In November 2018, the Council unanimously set an ambition for Bristol to be ‘Net Zero’ by 2030 [7]. This ambitious pledge and a commitment to the United Nations Sustainable Development Goals (SDGs) are written into the 2050 One City Plan [8].

Weaving the SDGs through-out the One City Plan aligns Bristol's local plan to a globally-agreed agenda for sustainable and inclusive prosperity that ‘leaves no-one behind’. The 17 SDGs provide a common set of targets and indicators across...
Table 1  Bristol one city themes [4]

| One city thematic board | Sub-themes                                                                 | 2050 vision statements                                                                 |
|-------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| connectivity            | healthy, active, sustainable transport                                    | by 2050 everyone will be well connected with digital services and transport that is efficient, sustainable and inclusive; supporting vibrant local neighbourhoods and a thriving city centre |
|                         | well-connected city                                                       |                                                                                      |
|                         | world class communications                                                |                                                                                      |
|                         | infrastructure                                                           |                                                                                      |
| economy                 | tackling economic exclusion                                              | by 2050 everyone in Bristol will contribute to a sustainable inclusive and growing economy from which all will benefit |
|                         | economic growth and productivity                                          |                                                                                      |
|                         | neighbourhood and employer integration                                    |                                                                                      |
| environment             | carbon neutrality                                                        | by 2050 Bristol will be a sustainable city with low impact on our planet and a healthy environment for all |
|                         | healthy, ethical, sustainable food                                        |                                                                                      |
|                         | healthy natural environment                                              |                                                                                      |
| health and wellbeing    | mental health                                                             | by 2050 everyone in Bristol will have the opportunity to live a life in which they are mentally and physically healthy |
|                         | health inequalities                                                       |                                                                                      |
|                         | adverse childhood experiences                                             |                                                                                      |
| homes and communities   | affordable, secure, warm, homes                                           | by 2050 everyone in Bristol will live in a home that meets their needs within a thriving and safe community |
|                         | safe city for all                                                         |                                                                                      |
|                         | connected inclusive neighbourhoods                                        |                                                                                      |
| learning and skills     | school engagement and attendance                                          | by 2050 everyone in Bristol will have the best start in life, gaining the support and skills they need to thrive and prosper in adulthood |
|                         | improved support for children                                             |                                                                                      |
|                         | post 16 and lifelong learning                                             |                                                                                      |

Environmental, social and economic dimensions of sustainability [9].

Overall delivery is coordinated by the Mayor's City Office and One City partners using the innovative One City Approach [10]. There is a strong focus on enhancing civic capacity through place-based leadership, community involvement and co-production, a way of working focused on collective problem-solving and reaching outcomes [10].

This ‘place-based action’ [11] is designed to bring together a range of public, private, voluntary and third sector partners, drawing on complementary strengths to jointly shape the future of the city [10]. Through the thematic boards a model of modern city leadership is emerging, with a conscious movement from local government to collective city governance [1].

3 Bristol philosophy

Cities are complex, social places in which people congregate to live, work and connect with each other. A successful city is one that is liveable, sustainable and prosperous; attractive to both people and businesses because of the high quality of life, easy access to jobs, amenities and services, and vibrant culture. The One City Plan is Bristol's articulation of this.

Bristol is recognised for having a distinctive approach to innovation [12]. It is highly creative, places people at the centre and takes an engaging, sometimes even playful, approach to tackling serious urban challenges. Since the Council’s early forays into smart city projects over a decade ago, there has been a drive to experiment with digital technology in the streets of Bristol, not in a lab [13]. The One City Approach and Bristol City Council's smart city agenda both continue to reflect this people-centred ethos, with a recognition that the city is on a social and technological journey.

Commonly cities are framed in terms of infrastructure [13], and as such, a ‘smart’ city is one that understands how to harness digital technology to create an efficient city. In Bristol, the challenge is framed differently. Cities exist for people, so ‘smartness’ is seen in terms of understanding how to use smart technologies to co-design our future and release the smartness of people [13].

4 Renewing Bristol's smart city agenda

The 2020 refresh the One City Plan also highlighted the importance of technology and innovation, recognising they underpin and enable many of the One City goals [1]. These ‘golden threads’ that run throughout the One City Plan means that digital connectivity all its guises has a key role to play in enabling Bristol's vision, helping city partners transform the both city and the council. To bring focused support Bristol City Council launched a new smart city strategy, 'Connecting Bristol', in 2019 [8].

Connecting Bristol sets out how the Council will support Bristol's smart city journey, aiming to create a digitally enabled, well-connected city with world-class infrastructure and inclusive public services [8]. It outlines the top-level priorities for the next 5 years aligned to six smart city themes (Fig. 1). Each theme is seen as foundational capabilities that support the delivery of the Bristol's city vision and priorities (i.e. the One City Plan).

The six smart city themes (Fig. 1) are focused on developing a specific capability that, in combination, will strengthen the digital foundations of both Council and City. The themes align ‘city requirements’, for example Net Zero [7] or better digital infrastructure [1]. The focus of each theme is detailed in Table 2. Themes 1–3 are city-focused. The goal is to directly address the real problems affecting Bristol, improving telecommunications infrastructure and supporting city-led initiatives. Themes 4–6 are council-focused. The aim is to enhance the Council's ability to manage the innovation process, digitise public services and embed responsible innovation practices that ensures any technology used is people-centred, ethical and aligns with the values of the One City Plan [8].

Whilst the strategy is underpinned by a portfolio of initiatives, it is not a roadmap to implement smart city technologies. Rather it outlines ambition and reframes the focus, away from technology,
onto the real-world opportunities and problems facing the city. It takes a step towards a mission-oriented approach [14] that would align well with the One City ethos.

Allied to this, the Connecting Bristol strategy highlights that cities are messy, emergent, social places in which people congregate to live, work and play. By emphasising that the role of digital technology should be to enhance, not degrade this messy, human energy, the strategy builds on existing commitments to deliver public value and capacity-building community engagement [13].

Technology can be a valuable enabler for catalysing change, but it is not the destination. In a Bristol context, the goal is the vision of an inclusive, sustainable, vibrant city. Technology’s role is to help people shape their future and make that vision a reality. A smart city is therefore more than the successful application of data and technology to increase efficiencies, optimise costs and enhance convenience; it is using these digital tools to enable a more liveable city and better outcomes for people.

As a result, Connecting Bristol is a conscious departure from technology-push smart city models. A challenge-led approach aims to ensure that smart city projects are grounded by specific challenges aligned with our city vision and corporate strategy. The starting point is to ‘articulate the challenge rather than a technology solution’ [15]. Shifting the focus away from the latest technologies, towards outcomes and goals [8], should in turn help to guard against over-emphasising the role of technology and risks of framing complex, social issues as problems that ‘can and should be solved with technology’ [16].

The strategic framework also reflects the Bristol Philosophy, discussed above, both through the focus on responsible innovation and guiding principles [8] that express our focus on collaborative partnerships, co-development, user-centred design and social value. This makes our underlying values explicit to future partners and investors.

Like the One City Plan, the smart city strategy is a starting point. It is the first iteration of a strategy, which will grow and evolve in response to city needs. In light of the current COVID-19 crisis, the ability to connect people across the city is critical for recovery. The smart city programme is currently being pivoted

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**Table 2** Connecting Bristol smart city themes, focus areas and projects [8]

| Smart city themes          | Focus                                           | Example projects                                                                 |
|----------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|
| city challenges            | mobilise projects that support the one city plan’s annual priorities | H2020 replicate programme, H2020 TwinERGY programme, period dignity app          |
| world-class connectivity   | drive the roll-out of digital infrastructure across the city | one city dashboard, social housing broadband pilot, avonmouth fibre extension     |
| city-wide innovation ecosystem | foster an inclusive, city-led approach to digital innovation | Bristol and bath community data hackathon, our data initiative                   |
| responsible innovation     | promote citizen-centred, ethical, trusted use of data and technology | digital inclusion programme, data ethics training, data ethics and governance     |
| innovation management      | improve innovation outcomes and reduce impact of limited resources | horizon scanning, innovation ambition matrix, smart speakers pilot                |
| public service innovation  | exploit new technologies to deliver transform public services | communities team digital engagement pilot                                        |
towards supporting economic recovery. Whilst digital infrastructure and digital inclusion were already priorities, these will require committed focus and investment to build back better [17]. In addition, enhancing the Council’s ability to innovative with limited resources is now more important than ever to achieve its newly stated mission to become more financially sustainable, resilient and agile [18].

5 Implementation

Short-term implementation is focused on expanding digital infrastructure across the city, addressing digital exclusion and enhancing the Council’s ability to exploit smart technologies. Given current funding pressures, the Council needs to innovate effectively with limited resources. This will require targeted investment with the ability to shepherd promising ideas through the innovation lifecycle, across the ‘Valley of Death’ [15, 19] and scaling into new services and solutions.

A simple ‘pipeline’ approach has been implemented in which potential projects or grant funding opportunities are scored against criteria (e.g. match with strategic objectives, likely impact, level of funding and social value) to create a simple go/no-go stage-gate process [20]. This enables a ‘long list’ of possibilities to be refined into a ‘short list’ of projects (or bids) that have resources assigned. These down-selected initiatives form the pipeline of projects delivering the Connecting Bristol strategy. To refine this process a portfolio approach [20], which enables pipeline initiatives to be compared with each other, is being trialled to further refine which smart city initiatives are prioritised and resourced. All initiatives in the pipeline (planned, in progress and complete) have been mapped onto a modified Innovation Ambition Matrix [20] (Fig. 2) to provide a holistic view of anticipated impact and risk.

Traditionally an ambition matrix is used to define commercial ‘innovation ambition’ trading off growth with tolerance for risk on the basis of a product’s ‘newness’ versus a target market that is well-known or unfamiliar [21]. In a public sector context, ‘market’ is substituted by challenge, enabling innovation to be categorised as either ‘inventing the new’ or ‘improving the old’ [20, 22]. This tool therefore provides a way to align innovation investments with the organisation’s appetite for risk, justify longer-term investments and offset the risks associated with more transformational initiatives [20].

Bristol’s innovation portfolio (Fig. 2) is predominately focused on enhancing existing services that address known challenges. This represents a mid-level of risk and a focus on near-term solutions [20]. Grand city challenges, such as the need to decarbonise, are being addressed through a small handful of multi-year research & development programmes (e.g. REPLICATE and TwinERGY, both focused on using novel technologies to support sustainable community energy use). These more cutting-edge transformational projects are purposefully fewer in number. Whilst they offer the greatest opportunity to transform the city, these big ambitious projects are also more risky [20]. Limiting the number of these types of projects reduces the Council’s exposure to risk, whilst still creating opportunities for transformational change.

An example of a project creating new solutions to new challenges is REPLICATE (Renaissance in Places with Innovative Citizenship and Technology), Bristol’s flagship smart city programme launched in 2016. It is a 5-year EU-funded pilot to explore how new technologies could tackle inequalities, ease fuel poverty and increase sustainable travel [23]. Bristol City Council leads this €7 million programme working in partnership with local organisations and the Ashley, Easton & Lawrence Hill Neighbourhood Partnership area [24].

This area is Bristol’s largest district with 50,600 residents, the highest percentage of black or minority ethnic residents (44%; Bristol average is 16%) and it is growing rapidly. Since 2001 30% of all new household spaces in the city have been located in these three districts, with many people living in social housing, 51% of the accommodation being flats (the Bristol average is 20%). Car availability is low, 46% of households have no car (Bristol average is 29%), yet air pollution and noise from traffic is perceived to be significantly worse compared to other areas [23].

Over the last 4 years, the programme team worked directly with communities to implement a suite of projects encompassing smart energy, smart mobility, intelligent data, digital infrastructure and digital inclusion. The smart energy projects are helping people try new energy efficiency measures – 151 homes now have smart appliances installed, with loft insulation, boiler upgrades and solar PV systems to save money on bills and reduce their carbon footprint. Integrating the smart appliances with an energy demand management system is enabling residents to use energy more cost-effectively. A new district heat network is also operational, providing 13 social housing blocks with lower carbon, more efficient, cheaper heating [23].

The innovations generated by the REPLICATE programme are not limited to technology. A strong focus on community engagement and co-design has led to the development of ‘The Bristol Approach’ [25]. This framework of participatory methods [26, 27] supports people to access the knowledge, technology and resources needed to tackle a problem, using Asset Based Community Development [27] methodologies to co-create
solutions to community challenges. This award-winning approach [28] has empowered community organisations and individuals to take the lead on developing solutions and engaging citizens.

From the outset REPLICATE has sought to understand how to create pathways from pilot to implementation and ultimately to city-wide scale-up. During its final 2 years, the focus is on how successful elements of the programme can be incorporated into mainstream delivery of services and new business models. Critical learning also comes from the other cities involved in the programme, particularly San Sebastian (Spain) and Florence (Italy) [22]. Each city is testing different solutions with a view to learning from each other, sharing good practice and understanding which approaches could be used across Bristol, other European and international cities [22]. Lessons from this programme will be embedded into the Council’s innovation management process.

6 Challenges ahead

The pace of digitisation has increased significantly with lasting implications. This greater reliance on digital infrastructure will continue to shape Bristol’s future and the local economy. However, there are significant risks. Sometimes this is due to the ‘power and importance of technology’ being over exaggerated [16]; the counter is recognising that not all city challenges require a digital solution (see discussion in Section 4). More specifically, there are risks associated with the increasing use of data and artificial intelligence, including algorithmic bias, poor transparency, erosion of privacy and a lack of meaningful consent from people to collect, use and share their data [29]. These issues could significantly erode public trust and undermine any benefits [29].

Bristol needs to become well-connected and data-enabled without exacerbating the very problems this is meant to solve, e.g. unequal access to opportunities and digital exclusion [16]. Responsible innovation is a central theme within the Council’s smart city strategy. This expands a long-standing digital inclusion programme, to consider how the Council can navigate the wider ethical, societal and regulatory challenges of smart cities. A central tenet is that ‘a future smart Bristol might be enabled by technology and data, but it will only be sustained by trust’ [8]. The aim is to address issues such as data ethics directly to ensure the technological choices made now align with Bristol’s vision.

The concept of responsible innovation is broad one, with no fixed definition. Essentially, the intent is to use data and smart technology in an ethical, responsible way; promoting applications that will have positive impact, whilst mitigating the unintended consequences of technology that can cause harm. In this sense, our long-standing focus on digital inclusion and community co-design is extending to encompass a range of issues, including: digital equity; accessibility and human-centred design; trust and public acceptance; safety, reliability, and resilience; cyber security; and sustainability. This is not an exhaustive list, but from a glimpse of topics issues we expect to engage with and the emerging smart city challenges we foresee. The following sections explore a couple of these areas in more detail.

7 Infrastructure and inclusion

Secure reliable digital infrastructure, such as full-fibre broadband, is now the foundation of a modern city. Digital technology depends on the availability of this infrastructure, and so do we, as since March 2020 life is increasingly lived online. Yet this infrastructure is not available everywhere. As of 2019 only 35.9% of premises across the city had access to full fibre (UK average for urban areas is 10%) [30].

This digital divide is a key challenge for Local Government to address. The Covid-19 crisis has amply demonstrated how digital connectivity can sustain a remote workforce and this will continue to be essential during recovery and economic renewal. Development of this infrastructure is a priority, but it is reliant on commercial market-led investment or Government grant funding. This approach has created spatial inequalities throughout the UK [31] which are mirrored across the city.

With ~200 km of municipal duct and fibre, the Council is well-placed to further expand this network (known as BNET) across the city and address this connectivity deficit. This city-wide fibre network saves the Council >£3 million in utility costs. Two such projects include the Avonmouth Fibre Extension, taking fibre to Bristol’s western borders, and the Social Housing Broadband Pilot, which aims to improve broadband connectivity within seven council-owned social housing blocks, ahead of scaling to other council properties.

To secure the investment needed to extend BNET and meet the connectivity needs of the city, including city wi-fi and mobile coverage, the Council is exploring how to engage forward-looking organisations, investors and innovators. The goal is to place social value at the heart of a procurement process and create a future operating model that enables the Council to capitalise on its digital assets, moving at pace to address Bristol’s infrastructure challenges and deliver socio-economic benefits.

The digital divide does not just affect access to the internet. Data from the Council’s Quality of Life Survey show that it impacts Bristol’s population in a variety of ways. For example, people who are ‘comfortable using digital services’ is lower, by 10% points, in the most deprived areas (72%). Nearly 20% of older (≥65 years) and disabled people indicate that they ‘feel uncomfortable using smart technologies’ (19.4 and 19.6%). The impact of digital exclusion on the most deprived areas [2] or more vulnerable groups will prevent the benefits of digitisation spreading across the city, counteracting the One City aim to ‘leave no one behind’ [3].

8 Data governance and safety

Using technology to optimise costs whilst not undermining the equitable values of the One City Plan is a more difficult challenge. One which requires a focus on technology governance, particularly around the use of data as the Council becomes increasingly data driven to deliver better services. This presents a number of legal and ethical challenges. Whilst more effective use of data and smart technologies could transform services, complex ethical issues such as transparency, accountability, privacy and bias also need to be considered.

The aspiration to use trusted, ethical smart city technology for public good will require digital service standards and safe, ethical innovation practices to be embedded throughout the Council. Active engagement with the ethical, societal and regulatory challenges of smart cities, combined with policies and governance, is needed to enable the Council to appropriately balance what can be done (what is technologically viable), what may be done (from a legal perspective) and what should be done (what is ethical and acceptable).

Safety and security need to be considered. As local authorities play a greater role in the development of digital solutions, their safety remit will extend beyond health and safety responsibilities. The development of digital services and data-enabled solutions should be approached with a digital ‘product safety’ mind set. It is vital that smart technologies are developed with sufficient safeguards to minimise the risk of harm these technologies may cause, be that data protection and privacy breaches or biased, discriminatory outcomes.

Currently, the Council follows a raft of legislation, codes of practice and guidance. The Data Protection Act 2018 & General Data Protection Regulations [32], Digital Economy Act 2017 [33], ICO data sharing code of practice [34], UK Policy Framework for Health & Care Research guidance [35] and ICO Explaining AI decisions [36] are all relevant, and far from the exhaustive list. It is not enough to be compliant with existing legislation. There is, rightly, an expectation that ‘privacy by design’ practice will evolve to include ethics, but as yet no coherent framework exists.

To address this gap, the Council has partnered with the Open Data Institute to run data ethics training and help participants identify potential ethical issues that an initiative might have [37], and more recently with the Centre for Data Ethics & Innovation, launched in 2018 with a unique remit to help the UK to help the UK navigate the ethical challenges presented by AI and data-driven technology [38]. During this joint initiative, due to complete November 2020, the DEI will review current data policies,
practice and governance arrangements with the aim of developing an ethical data governance framework. As the Council seeks to use data to improve services, this governance will ensure that its approach is ethical, inclusive, transparent and driven by responsible innovation. This is a first step towards the goal of developing a trusted approach to collecting and using city, citizen and council data.

9 Emerging role for local government

In shaping a trusted, ethical smart city, there is an emerging stewardship role for local authorities, especially with regard to city and citizen data. Whilst there is still little understanding of the public’s view on how their data should be used [39] (a gap that exists across national, regional and local government), councils are well-placed to become trusted intermediaries and play an active role in ensuring that digital technologies support the creation of public value.

As an active partner in the One City Plan, the council plays a role in shaping the local economy. The recently published Economic Statement of Intent demonstrates a desire to create a new economy that builds resilience and supports inclusive, sustainable growth [17]. From a digital economy perspective, this opens opportunities to rethink the value of digital public assets, including public-held data relating to traffic, social and healthcare, and content related to culture, education and tourism [40].

With the link to local government, smart cities offer a way to change the balance between the potential growth for private sector businesses and the opportunity to create public rather than shareholder value through different models, such as publically-owned mutuals and not-for-profit organisations. Bristol’s One City partners are committed to achieving a circular economy. This could be extended to include a ‘circular economy for data’ focused on delivering social value.

For this reason, ‘data trusts’ are of interest. They offer a way to provide a robust data framework that enhances digital rights, gives people greater control over personal data and minimises risk of data-enabled services discriminating, excluding or eroding privacy [41]. Whilst this is still an aspiration, it would build on Bristol’s existing Open Data Platform [42], which supports the Council’s goal to be transparent about the information it holds and to encourage data reuse.

Bristol’s open data initiative started in 2010 to enable local people and organisations to use and benefit from data. The platform currently provides access to 211 datasets and a series of data dashboards organized by themes (e.g. location of electric vehicle charge points, journey times and traffic speeds for selected Bristol’s roads, real-time and historic air quality data, City Ward Profiles with an interactive data tool with population, demographic and outcome data) [43]. A live, collaborative document ‘Our Data Bristol’, facilitates an open ‘community conversation about the use of data and information in and around Bristol city’ [44]. The final element of the open data programme is live events designed to bring together people, open data and real-world challenges to create prototype solutions [45].

10 Covid-19 and economic recovery

A first draft of this paper was started in early 2020, under very different circumstances. On 23 March 2020, the UK was put into ‘lockdown’ to attempt to limit the spread of coronavirus. Digital infrastructure kept people connected enabling many, though not all, to work and access services remotely. Smart technologies enabled people to support each other. A recent interview with Bristol’s deputy mayor highlighted that ‘within 48 h of the city asking, nearly 9000 people had signed up on the Can Do Bristol website to help the vulnerable and shielded’ [46].

Data played a central role during the crisis, for example enabling teams to ‘live manage’ situations and make decisions. The Council’s Covid Response Teams utilised data to develop plans that would enable public spaces, shops and cafes across the city to re-open safely. Data-driven modelling enabled them to understand how people would flow and move around shopping centres, occupancy monitoring to manage the number of people in a given area and live data from the city’s transport networks to manage capacity in real time. These insights directly informed plans and action on the ground.

Looking forward the Council, the City Office and One City partners are focusing on Bristol’s economic recovery and renewal [17], with a greater focus on resilience [18] than before. The ability for the Council to become more agile, streamlined and focused [18], able to remain in step with the ambitions of the city has never been more critical. Effective innovation to exploit digital technologies and scale new public services and new ways of working will be a key enabler [8]. The value of a more connected city is more than just the ability to work remotely. During this crisis, digital connectivity has provided a lifeline for many and enabled the continuity of vital public services.

Whilst digital will support recovery and renewal – it needs to work for everyone. The current crisis has further exposed the stark digital divides across our city. Bristol cannot be a smart city while these still exist, and digital does not work for everyone. Bristol, with a cohort of other cities, highlighted the importance of digital inclusion [47], but this only goes so far. To deliver the promise of smart cities, there is a need to develop our training and education for all ages so that everyone can gain the digital skills needed to participate fully [17]. To ensure this is the requirement to innovate responsibly so that no one is excluded, disadvantaged or left behind. This more human-centred, holistic approach to urban digitalisation will enable everyone to fully participate in Bristol’s digital society, democracy and economy.

11 Conclusion

As a city, we have a choice about which direction we take next. Surprisingly, the Covid-19 crisis has not fundamentally changed our strategic approach for developing Bristol as a smart city – the focus on getting the basic ‘digital foundations’ in place remains. What has changed is that there is greater recognition of the role digital connectivity plays in across the city and the need to close the digital divide in terms of infrastructure, access and skills [17].

The One City Plan is about fostering greater public–private–people collaboration to shape Bristol for the better. The Bristol’s smart city agenda builds on that ethos. City-wide engagement will be crucial to Bristol’s digital future. This quote illustrates that journey: ‘People will get their backs up until we have a whole story about how smart technology can actually benefit. There are ups and downs. It’s not that straightforward. But, […] fundamentally, we’ll get smarter’ [46].

As long as people are at the heart of what it means to be a ‘smart’ city then digital technology, when used responsibly, has the potential to address the grand challenges, from decarbonisation, traffic congestion and health and social care, but also make cities and places fairer and more inclusive.

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