

Demystifying the smart city – working towards better implementation

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Contents

Executive Summary	04
Introduction	06
Recommendations	09
Chapter 1: Prepare	11
Chapter 2: Access and engage	16
Chapter 3: Delivery	26
Conclusion	35
References	36
Acknowledgements	37

Executive Summary

Smart cities offer new opportunities to address many of the systemic challenges facing local areas today. Despite this, the implementation and delivery of smart initiatives is often complex and challenging.

Developed by techUK and its member organisations, this paper is aimed towards cities developing smart city capabilities. It shows how cities and technology businesses are rethinking the approach to planning and delivering smart cities to overcome complexity and drive step changes in public service and infrastructure provision.

Through the development of action-oriented digital visions, interwoven into existing plan making, cities are able evidence the business case for innovation, showing how it drives opportunities to protect the planet, strengthen the economy and improve the day-to-day lives of communities.

Forward thinking approaches to stakeholder engagement, hinged on place-based and citizen-centric design, are helping build trust amongst residents and local businesses to ensure social license and nourish vibrant local innovation ecosystems.



Partnership working between the public and private sector is creating exciting opportunities to ensure greater financial sustainability for projects, strengthening local skills bases and delivering impactful measurements to generate actionable local insights.

Our report in May 2022 '[Local Public Services Innovation: Creating a catalyst for change](#)' made the case for enhanced digital innovation adoption across the UK's local public services to improve citizens' lives. This paper seeks now seeks to address the ways technology businesses and local authorities are making this a reality.

Introduction

Smart cities are no longer simply 'nice-to-have' projects but are fundamental to enabling cities to achieve their economic, social and environmental ambitions.

Sectors like healthcare, policing, energy, water, and mobility are rapidly innovating and digitising, embracing a new era led by data and analytics to provide better services to consumers, customers and communities.

However, cities are faced with challenges on multiple fronts which both accentuate the need for smart city initiatives and jeopardise the ability to effectively implement them.

Economically, COVID-19 and its emerging consequences are placing immense pressure on local councils which need to maintain service delivery against a backdrop of reducing revenues and increased expenditures. Digital technology is also creating a 'digital economy', tasking local areas with ensuring they have the right infrastructure to facilitate this change and that all people can participate.

Environmentally, roughly 300 councils have declared climate emergencies. The UK has pledged to reach net zero carbon emissions by 2050, and in sectors such as energy by 2035, with research from the Centre for Cities showing that cities and large towns account for 45 per cent of all carbon emissions due to the dense populations and economic activity occurring there.¹

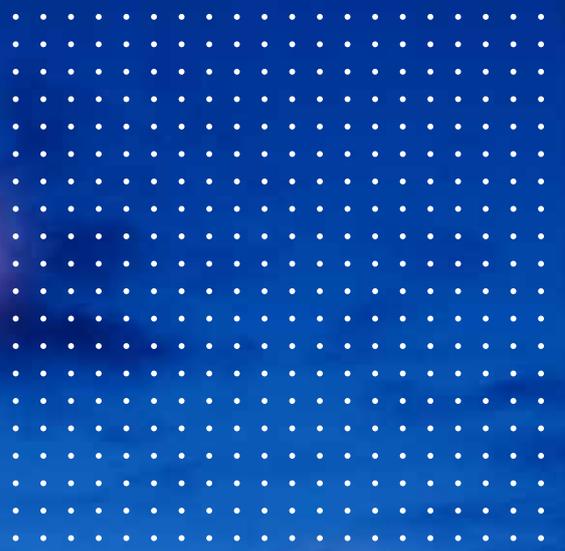
Socially, the number of people aged 65 or over in England will increase by 65% in the next 25 years placing pressure on healthcare and social service provision. At the same time, highstreets and town centres are continuing to decline, threatening community cohesion and resilience.

Technology and data are helping cities surmount these challenges. Innovation is allowing places to understand their population needs better while simultaneously spurring economic development, improving health and social outcomes, and making processes more efficient and sustainable. Yet smart cities face barriers to implementation. Issues relating to procurement, regulation and standards, access to physical assets, data and computing resources, cyber security and public trust can frustrate the delivery process and risk a lost opportunity.

This report aims to highlight how local authorities and technology businesses are forging lasting partnerships to overcome some of these issues. It intends to highlight some of the truly innovative approaches being used to design better solutions, drive stakeholder engagement and citizen participation, build trust and create better social outcomes for all.

This paper is divided into three sections titled 'Prepare', 'Access & Engage' and 'Deliver'. Within these, we have illustrated some of the key principles which help to drive better delivery along with case-studies. Through highlighting these approaches, we hope to start a conversation around how we can design better solutions, engage communities and stakeholders, improve delivery and build trust and confidence in smart initiatives.





Five pillars of a successful smart city:

1. **Technology:** Smart cities should be built upon placing an emphasis on data, emerging technologies and connectivity infrastructures within service provision.
2. **Integration:** Smart cities should look laterally across multiple aspects of their infrastructure, neighbouring surroundings and service provision and examine how they might exchange data to drive inward and outward facing opportunities.
3. **Citizen-centric:** Smart cities should find ways to engage citizens and examine how new technologies and data make a step-change to the way citizen needs are served.
4. **Cross-sector collaboration:** Smart cities should work across business, government, academic and third sector communities in genuine collaboration.
5. **Strong commercial models:** Smart cities should embed dynamic commercial models which are delivery and outcomes focussed.

Recommendations

1. All cities, regardless of their size or location, should be exploring the opportunity to build smart city capabilities

As a nation, we face significant challenges which can't be left to a few leading cities to attempt to overcome alone. All cities, regardless of their size or location, should be looking to develop smart city capabilities if we are to drive change at the scale and pace currently needed.

2. Digital must permeate every aspect of local public services

Digital visions or strategies cannot be standalone documents developed in siloes but deeply interwoven with all elements of local plan making and service provision.

3. Local innovation ecosystems should engage all participants in the smart city

Everyone is touched by smart city innovation. Local innovation ecosystems are therefore not just about councils engaging externally but fostering dynamic relationships across the resident, business, academic and third-sector landscape which is part of a continuous feedback loop within and beyond the city limits.

Recommendations

4. Establish a regional Chief Digital Officer forum

To help improve collaboration locally, between industry and public services, there should be Chief Digital Officer forums across the country to support collaborative working and co-ordination and providing knowledge to smaller towns and cities. This builds on techUK's [Local Digital Capital](#) work where we believe strengthening how the tech sector collaborates will help improve Local Digital Capital.

5. Technology businesses and councils must work together to forge new approaches

Delivery obstacles risk a missed opportunity for technology to deliver step changes in cities. To overcome them, technology businesses and local authorities must rethink traditional approaches and paradigms, requiring a departure from the 'customer' and 'vendor' relationship towards genuine and lasting partnership working.

Chapter 1: Prepare

This chapter sets out the importance of building a vision for smart initiatives. Doing so assists local leaders in better understanding how technology supports them in achieving their ambitions and serves as a clear and transparent commitment to communities.

1.1 Adopting a 'place-based' approach

Cities are physically and socially unique places. Each area has defining characteristics built from the people who live there, their economic prosperity and the natural environment. It is also true that much of what goes into making an area function (e.g., traffic systems, energy systems, refuse collection and street cleaning) is based on similar processes.

However, there is a great deal of complexity when examining the different approaches adopted towards delivering these services. For example, some cities may operate their own waste collection while other may contract this service to the private sector. There is also a wide range of parties engaged in delivering other critical services such as policing and healthcare. The result is that level of innovation carried out in an area vary based on the local context and the approaches taken towards service delivery.

Embedding a 'place-based' approach therefore becomes a useful way of dealing with complexity. Adopting this approach means rethinking current paradigms and recognising the importance of the local context, that is the combination of social, cultural, and institutional features within a given urban space. It also drives an imperative towards involving local communities, to use their knowledge, to collaborate with all relevant stakeholders and to promote cross-sector collaboration.

1.2 Embedding a clear vision

1.2.1. Know where you want to go

Cities hoping to drive long-term change based around smart city elements should translate their understanding of the drivers of change and understanding of the value proposition into a compelling vision. This vision might be a standalone proposition that articulates the role and trajectory of digital technology in the city, or as is more commonly seen, integrated into an existing local strategy.

Embedding digital into existing strategies helps to encourage a cultural shift around the role of technology within all elements of service provision. Through generating greater awareness around how technology can help council officers, citizens and the local business community in achieving their ambitions, it underlines how technology acts as a horizontal across multiple aspects of local infrastructure and service provision, exploring the ways these systems may interact and drive opportunities.

The outcomes proposed within a vision should not simply be digital adoption, but rather a set of citizen-centred objectives, co-designed with stakeholders and the community, which respond to the varying political, social, economic and environmental drivers of a local area. Smart Kalasatama in Helsinki is a particularly successful example of this.² The vision for the city, created together with local residents and other stakeholders, is for everyone to gain an extra hour of free time every day.



This clear articulation of how technology and data will benefit residents has been successful in engaging citizens to the extent that businesses now use Smart Kalasatama to test new products and services purely because of the actively engaged end-user base.

Through relating to national strategies such as the National Data Strategy³ or the NHS What Good Looks Like⁴ framework, these visions also serve to lay out the purpose, remit and expectations for investment in the area simply and clearly and can be used to structure both investment decisions and governance structures. Finally, they also act as a commitment to citizens and the local business community to which the council may be held accountable to build trust and transparency.

1.2.2. Knowing how to get there

An effective vision should be broken down into an actionable strategy or roadmap which details the component projects that will lead to the delivery. This allows for planning to occur early around the business case, delivery mechanisms, procurement and operating model, harnessing the available data, information and insights.

Once outcomes have been established, visions should set out the route to achieving them. Understanding, for example, whether a project will be led by the local authority independently, through a partnership or fully outsourced, means that engagement can begin earlier and provides additional security to businesses who may wish to be become involved within the project.

It is also important to establish which body will have responsibility for procurement. Local councils often find themselves occupied with day-to-day service provision, however, longer-term technology strategies rely on the planning and delivery of advanced technologies. The supplier community also has a role in shaping and optimising this process for councils underscoring the importance of early and sustained engagement with industry. The most effective delivery mechanisms for individual projects, establishing governance structures, responsibilities and workflows should be established from the outset.

Birmingham City Council and Jacobs: rethinking smart city governance

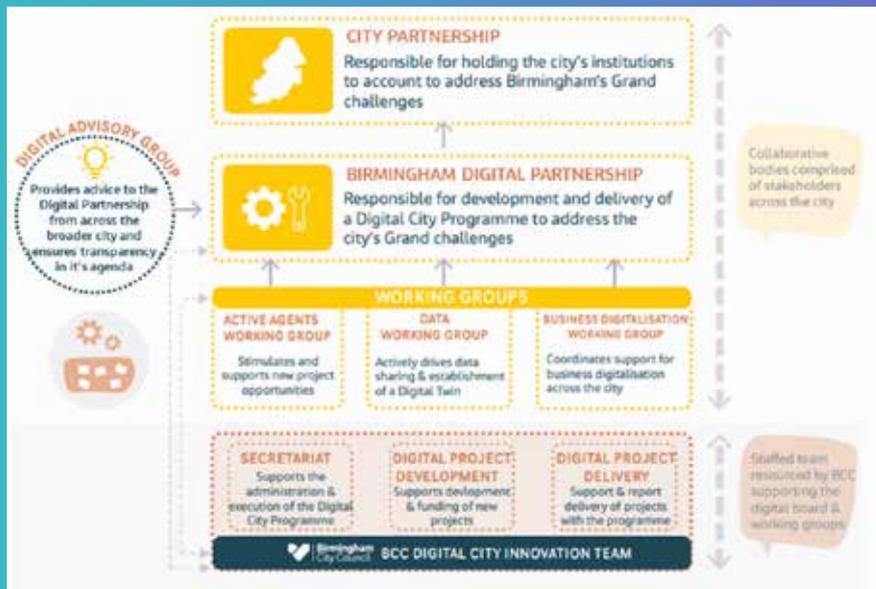
Jacobs worked with Birmingham City Council to create its [Digital City Programme](#). The programme aims to equip Birmingham's institutions, communities and businesses with the digital infrastructure, data platforms and enablement initiatives required to thrive in the future. The council was keen to ensure this programme not only sets a high-level direction of travel, but also focuses on delivering immediate outcomes and impact.

The programme is centred around a Roadmap, comprising an initial set of projects that are deliverable now, alongside a candidate pipeline of medium-term projects. This roadmap is a product of extensive engagement and consultation with a wide range of stakeholders. Instead of focusing only on projects that the council can deliver itself, it also reflects broader set of initiatives that city stakeholders can collectively deliver together.

To oversee the delivery of these projects and enable the ongoing evolution and extension of the programme, a multi-tiered, cross-city governance and delivery model has been implemented. This model, shown in the diagram on the next page, aims to:

- Establish a coalition of stakeholders from multiple organisations to drive Birmingham forward as a digital city
- Hold the Digital City Programme to account in delivering against the city's objectives
- Ensure that new projects aligned to the city's objectives are constantly identified and driven forward
- Make the required resources available to support the programme

The governance and delivery structure comprises three main tiers of activity:



- 1. Birmingham Digital Partnership:** is comprised of digital leaders from the city’s major public, private and third sector organisations. It sets the strategic direction for the programme, inspiring and facilitating digital initiatives, and has overall accountability for delivery. It reports into the City Board, which has been established for several years.
- 2. Working Groups:** are comprised of operational level representatives from organisations across the city and focus on key areas of activity, including cross-city data sharing and small business digitalisation. They also work to identify new initiatives emerging from Birmingham’s communities and business ecosystem and bring them to the attention of the Digital Board.

- 3. Delivery Resources:** the governance structure has also led to the recruitment of a Digital Project Delivery capability within the Council. This team will provide the secretariat for the programme, and support the development, funding, and delivery of projects.

Together, the layers in the governance structure integrate the digital challenges, capabilities, programmes, and funding for the city into a single model. It ensures digital ambition is not only considered across every facet of the local authorities, but also more widely across all major institutions in the city. It promotes iterative engagement and continuous conversation with city stakeholders ensuring widespread buy-in and support. This integration and coordination will enable the city to act in a more cohesive and effective manner towards the digital agenda, paving the way for Birmingham to become a leading digital city.

Chapter 2: Access and engage

This chapter sets out the importance of undertaking meaningful engagement as part of smart city initiatives.

Everyone is touched by smart city innovation. This means that genuine engagement is about more than councils simply engaging externally but fostering dynamic relationships across the resident, business, academic and third-sector landscape, feeding a continuous feedback loop within and beyond the city limits.

2.1 Stakeholder engagement

Smart city projects require stakeholder engagement to occur at multiple levels. Firstly, engagement should take place across council departments. This might be through bidding collaboratively for funding, providing advice and support, or convening workshops to explore joint aspirations and complementary capabilities.

Creating such engagement is a catalyst to sharing both citizen-centric and commercial data, which is otherwise trapped within silos, thereby unlocking insights which enable smarter decision making informed by real-world information.

Secondly, there is also a need to understand the capabilities and roles of the wider ecosystem of city and community stakeholders. Leeds City Region has embraced this realisation through the [MIT REAP programme](#) which engaged a wide range of stakeholders including the University of Leeds, Leeds City Council, Leeds City Region Enterprise Partnership and the business community to understand local capabilities better and prime the city for investment and innovation.

The case study illustrates how through cross-city working, there is a huge asset base that can be leveraged with which to attract investment with increased purchasing power.



Leeds City Council MIT REAP programme: harnessing the power of cross-city working

Leeds City Region has taken a leadership position in developing its innovation ecosystem through its [MIT REAP programme](#). Created by MIT for cities and city regions, the REAP programme has allowed Leeds to co-develop long-term strategies and deploy new interventions to strengthen local innovation and entrepreneurial capacity.

Through bringing together stakeholders including the University of Leeds, Nexus, Leeds City Council, Leeds City Region Enterprise Partnership, KPMG, Arup, Nexus, Monroe K, the Leeds Academic Health Partnership, entrepreneurs and investors, the programme has sought to position the city as the place for entrepreneurs with innovative ideas to start and grow a business and be renowned globally as a place where innovators and entrepreneurs solve societal challenges.

The team set out in 2019 to get a better understanding of the ecosystem and to develop a smarter approach, not only to measure it but also create more impactful interventions that would make it more inclusive. Becoming more self-aware meant to understand the pathways that influence decision-making processes and therefore more effectively measure them. Outcomes from the collaboration have so far included a new method of quantifying innovation-driven enterprises and an accelerator for diverse founders with socially impactful innovations.

Another tangible demonstration is Ingenuity, a new purpose-designed hub and real-world testbed for collaborative smart city innovation being developed by Munroe K at White Rose Park in South Leeds, a deprived area of the city. In the run up to the hub opening in 2024, Munroe K is working with Nexus, Arup, Urban Foresight, Intel, Leeds City Council and other stakeholders on a continuous rolling programme of workshops and hothouses along with physical and virtual showcases and demonstrations of the art of the possible alongside market-ready solutions. These are bringing the Ingenuity vision and smart city innovation to life, engaging companies, public organisations, researchers and users in a compelling and meaningful way, and driving innovations in testing and implementation.



Ingenuity will adopt 'living lab' principles, emphasising end-user involvement alongside multistakeholder participation in the development and testing in real-life settings of new products and services.

The surrounding office park will form a controlled testbed environment for innovations related to work, education, building performance, and mobility requirements for transport to the park. Ingenuity is seen as a potential catalyst for a living lab in South Leeds, utilising a wider range of settings including the adjacent White Rose shopping centre and engaging diverse user communities.



Building a culture of sharing best practice and knowledge is important for communities undertaking smart initiatives. Participation in forums and networks such as the UK Smart City Network provide a route to enabling a better understanding of how projects have worked in the past within different locations and an opportunity to consult with other authorities on best practice and common challenges. techUK is also launching an [Innovators Network](#), a neutral forum bringing together local government and techUK members to address common challenges.

UK Smart Cities Network: embedding a culture of knowledge sharing

The UK Smart Cities Network is an informal knowledge sharing forum for towns, cities and places. The Network was established in 2019 and meets quarterly to discuss lessons learned, opportunities for collaboration and best practice across a range of topics including connectivity, IoT, data, inclusion and standards.

Over 40 places from across the UK have joined the network which provides an informal and safe space for cities to share with other cities, something that was felt to be missing from supplier-sponsored networks and events.

During the pandemic the network meetings shifted online, with cities sharing smart city responses to COVID-19 recovery, the Net Zero challenge and Future Connectivity.

The most recent Network meeting was held at the Smart Mobility Living Lab in London where the cities present heard not only about future mobility solutions but also met with local tech SMEs.

The Network meetings have helped encourage greater collaboration across cities in strategic and project level smart city activities and has also provided a helpful conduit for the engagement of a broader group of smart places through organisations such as DCMS and BSI. Membership of the Network is open to all working in the public sector on smart city programmes and projects.



Finally, local authorities and technology developers need to have established processes for listening to the views and needs of consumers, particularly for authorities who are having to deliver services to diverse communities. To tackle this [DG Cities](#), an innovation company set up by the London Borough of Greenwich, runs a quarterly engagement survey with the DG Cities Community through which they test the latest emerging technologies and trends to understand public attitudes and perceptions. Their [latest study explored electric scooters](#) and highlighted a significant difference between how older and younger people view their safety. This showed the importance of engaging with diverse communities on divisive but potentially transformational new urban technologies.

2.2. Charters and trusts

The use of charters and trusts to govern to use of technology and data within smart cities can provide an effective route to improving trust and transparency particularly from a citizen perspective.

2.2.1 Technology charters

Technology charters provide a set of practical and ethical guidelines for smart city emerging technologies which lay a clear pathway for the ethical use of future technologies in cities.

One of the most prominent examples in the London's Emerging Technology Charter⁵ which provides a framework for technology such as driverless cars, facial recognition software, drones, sensor networks, robotics, mobility services, augmented and virtual reality, and automated and algorithmic decision making. The charter sets four principles for implementing technology in London: be open; respect diversity; be trustworthy with people's data; and be sustainable. The Mayor of London has since established a Data for London Board as an independent, multi-sector leadership group to co-ordinate how data is used across the public and private sectors.⁶

As well as creating greater transparency and a commitment to citizens to responsible conduct, charters also guide investment decisions of the private sector while structuring and informing discussions around adoption.

2.2.2. Data charters

Data charters have shown promise in increasing data usage through providing a common reference point for public-private sector data-sharing initiatives, improving transparency of collective purpose while increasing efficiency by giving everyone the same strategic policy starting point.

The London Data Charter is a good example of this which, in line with the National Data Strategy⁷, is designed to help businesses and public entities of all sizes to innovate and explore opportunities using data through facilitating its sharing among different organisations.⁸ Data Mill North is another established example of this in action.⁹

However, simply having and sharing data does not necessarily generate instant value. If data is continuously collected and nothing improves or changes, citizens may grow impatient and lose trust. There is also a cost to processing and cleaning data which makes it uneconomical to be constantly gathering data sets without clear use-cases. Therefore, defining these clear use cases is critical both to ensuring the delivery of value, and also sustaining citizen support.

2.2.3. Data Trusts

Data trusts have emerged as a possible solution for managing the vast amounts of data that smart cities will generate, in a way that provides accountability for a wide variety of stakeholders with different interests while maintaining expectations around privacy. Borrowing concepts from legal trusts, data trusts are intended to allow a trustor to put an asset into a trust, giving control of the asset to a trustee for a defined purpose, on behalf of a beneficiary. They can provide a route to sharing best practices focused on data privacy compliance to increase trust from a citizen perspective.

The Open Data Institute is exploring data trusts, prototyping, and evaluating various governance models along the way. The underlying governance principle is that by placing the citizen at the centre of the governance model and through co-design, the structural processes that enable improved privacy and increased engagement are facilitated along with social aspects including trust.¹⁰

New technologies now also have the capacity to address privacy concerns. Employing agencies or building skills internally means data can be encrypted, attached with meta-data tags to indicate whether it is personal information or sensitive data, and build in or take advantage of privacy rules that can be or have been programmed into applications.

Central to all of this remains the vital need to educate the public on what measures are taken to protect the data of citizens and promote ethical data science within department structures.

2.3. Citizen-centric design

The Connected Places Catapult reported in 2018 that smart city projects historically gave citizens little chance to engage with the design and deployment of new technologies.¹¹ Research from the public relations firm Edelman also suggests that the default tendency of 60% of the population is to distrust something until they see evidence that it is trustworthy.¹²

For smart cities, the need to engage communities and end users with the design and implementation of projects therefore becomes critical, especially when not seeing behavioural change and adoption represents a significant risk to investors.

While the early days of the smart city movement were characterised by the strong technology focus, today there is a greater appreciation of the need to engage citizens with local decision making, design and implementation. There are several ways to channel this appreciation, with some of the core principles outlined in this section.

2.3.1. Community co-design

The best examples of smart initiatives are citizen-centred, so engagement strategies should include mechanisms to consult citizens and businesses to gain valuable insights and assist in the codesign of services and solutions.

In the case of novel technologies, citizen engagement is found to be effective in helping to shed fears around their reliability, thereby building confidence. This is strongly evidenced in the case of self-driving cars. A survey in 2022 found that 55% of respondents would not feel comfortable using a self-driving car if given the opportunity.¹³

DG Cities has worked closely with the community to support the development of safe and trustworthy machine learning AI for use in self-driving cars. A key challenge for self-driving technology is whether AI can be trained to deal with highly infrequent and high-risk scenarios which are difficult to predict and therefore train for. To tackle this challenge DG Cities conducted a crowd-sourcing exercise via workshops nationwide and a national survey of over 2,000 people to capture unique stories and build a library of "edge-cases" for developers to use.

2.3.2. Citizen science

The use of citizen-science research methods is another useful route for engaging communities in the design of smart cities. This is where research or monitoring is carried out by citizens rather than technology systems or professional researchers.

Citizen-science projects are also more than collecting data, they are about raising awareness, building capacity, and strengthening communities. Likewise, smart cities are not only about ICT, energy and transport infrastructures. They are about smart citizens, who participate in their city's daily governance, are concerned about increasing the quality of life of their fellow-citizens, and about protecting their environment.

There are several examples of citizen-science methods being used in projects active today. In Brussels, 3,000 citizens were asked to monitor the air quality of their streets via measuring tubes on the facades of their homes. The findings revealed a striking disparity in air pollution levels across the city, showing socio-economically vulnerable neighbourhoods are more likely to suffer from poor air quality.¹⁴

In Brazil, a citizen-science monitoring project led to a mobile phone app that could help vulnerable communities to prevent floods and build resilience. A collaborative design process involved community members actively shaping how the app worked and a citizen-scientist monitoring network by enabling them to generate data about rainfall and local flood impacts while showing them a visualisation of all the data, including those from official sources.¹⁵

The challenge, however, is to ensure that the datasets from citizen science projects are interoperable with other initiatives and that there is reusability of the data, apps, and services developed in each project. The ephemeral nature of much of the data, which disappears shortly after the end of the projects, means that there is a lack of reproducibility making longitudinal analysis challenging.

2.3.3. Engaging end-users

It is also vital that the intended end-users of technologies are engaged in the process early on. As seen, people's natural tendency is to

distrust something until they see evidence of its trustworthiness.

Hardware deployed in communities can easily become the object of suspicion if the purpose and promised benefits of these technologies is not made explicitly clear. Authorities undertaking such deployments should seek to ensure that clear communications are issued which set out the role and function of new technologies within communities, as well as giving a point of contact for local people.

Investment must be placed into suitable training for those expected to operate the technology itself to ensure that people confident and comfortable using it. In doing so, smart city operators will be able to anticipate how new technology will be received, ensure citizens are digitally included, and build confidence and trust in their intended purpose.

Citizen-centric design warrants a far deeper conversation. However, it is hoped that this section has signposted the importance of embedding inclusive thinking into smart city projects.



Chapter 3: Delivery

Delivery obstacles risk a missed or lost opportunity for technology to deliver step changes in cities.

This chapter sets out how technology businesses and local authorities are working to rethink traditional paradigms to overcome implementation challenges.



3.1. Understanding digital capability

In order to deliver on the ambitions of a smart city vision or strategy, there is a need to understand how well a city is positioned to benefit from new approaches. The BSI has worked to establish a capability assessment which leaders can use to assess their progress against key components including the leadership environment, service enablement and delivery, physical and digital asset management, and performance management.

In addition, techUK has developed the [Local Digital Capital Index](#) tool which provides local leaders with an insight over how their area performs against six components understood to be needed to create 'digital capital'. This insight is designed to help local understand the digital maturity of their areas to structure decisions about the potential for technology to strengthen shared prosperity.

3.2. Preparation, procurement and financing

There is a need for understanding how procurement procedures affect a city's ability to procure from a diverse range of suppliers. As a result, appropriate procurement approaches should be developed that enable innovation such as pre-commercial models or through early engagement with the community of suppliers.

In Barcelona, the municipality inverted the process, adopting challenge-based procurement which invited proposals for a range of approaches to address a particular issue.¹⁶ A change in political leadership has since caused a slow down in smart city work, underscoring how continuity can be destabilised by a political change.

Citymart is another example of a business helping to reshape procurement through a range of innovative processes.

In San Francisco, Citymart helped the local government articulate their problem statement when procuring smart streetlighting and also built in a pilot period within the tender. Setting out the objectives, as opposed to pre-specifying solutions, allowed the market to respond with the most innovative solutions and also enabled time for the success of the project to be evaluated within the pilot.¹⁷

Knowing what assets are owned is vital to shaping what infrastructure needs developing, retrofitting, or building. To provide a baseline for investment, councils need to maintain an understanding of the range of data available, the data gaps and supporting infrastructure. With a broad overview established, albeit for what will be an evolving landscape, they can begin developing a market engagement approach. This needs to include consideration of the way they procure the data that accompanies assets. Insisting on data being provided in the way that the council wants to consume it, rather than only through a restrictive and proprietary portal, ensures the council can address emerging use cases. Data locked behind portals or APIs is restrictive, so addressing this during procurement contract negotiation is vital to futureproofing ongoing data use.

Financing options that reflect the vision, strategy and organisational structure of the council can also be considered. Central government grants are often the first port of call for funding smart city projects; however, these are often time limited in nature and can limit the sustainability of projects.

Cities should therefore look to explore other funding and financing options and commercial models to scale-up smart city projects. These might include public private collaborations, partnerships for innovation, internal investment, grant external funding, private finance, or direct or embedded budgets. The UK Infrastructure Bank and Public Works Loan Board may also be an additional funding stream where projects are of significant scale, utilise local authority assets and are accompanied by a proven business case.

Partnership working with industry can also give rise to new and innovative delivery models which are specific to ICT projects. Overall, the smart city agenda touches all parts of the city and there is a significant amount of work to align strategies and needs. External stakeholders, from asset owners through to the public, must be kept informed and working in partnership towards common goals can greatly increase spending power, insight and delivery capabilities.

Jacobs Future Models Team and social housing: new approaches to funding the smart city

In the UK, 'smart city' projects are often funded using time-limited innovation grants from central government, or historically European funding sources. While useful in testing the technology involved in smart city projects, they rarely seek to test the wider commercial models associated with the use-cases. This often results in projects struggling to achieve financial sustainability. Furthermore, it is often the case that the benefits generated from one use-case are rarely sufficient to pay for the underpinning infrastructure required, whether that be a data platform, fibre, or wireless communication network.

The recently created Jacobs Future Models Team are pioneering a new approach to funding and financing smart city infrastructure and services. Instead of looking at projects independently, their method involves taking a portfolio approach to project selection, using a revolving fund model in which benefits from one or more commercially viable projects, enable the delivery of additional projects which may not generate

sufficient monetisable benefits, but deliver wider economic, social, and environmental outcomes.

As an example of this approach being used in practice, Jacobs are working with a large social housing provider in a UK city whose properties are poorly served by existing connectivity providers. Jacobs have led the development of an investment case that will see approximately 60,000 properties served by a new connectivity infrastructure. This infrastructure will then enable the delivery of a number of connected use-cases, including predictive asset maintenance, online education, and enhanced remote social and healthcare services. All of these interventions are wrapped into a single investment case, allowing the revenues from one project to subsidise the delivery of less directly monetisable projects. The team is also exploring the inclusion of a community energy network, energy grid balancing, and housing retrofit solutions in the wider portfolio.

This collective portfolio approach avoids some of the value extraction pitfalls of delivering all revenue generating use-cases first, leaving behind those that may deliver huge social benefits but lack a funding avenue.

3.2. Skills and human capital

Investing in smart city programmes requires skills that are not historically associated with the technical capability of a council ICT department. More strategically minded and entrepreneurial characteristics are required. Re-skilling and training public sector employees to understand the technical and strategic implications of ICT and smart technology programme investment for the city should be considered a fundamental step.

This also needs to be understood in the context of current baseline activities and where resources have the potential to be redeployed or leveraged to prevent the need for unnecessary spending.

Breaking down silos between departments is therefore fundamental. To deliver smart infrastructure, teams will need work in a cross-departmental fashion, exchanging resources between ICT teams and the departments managing specific council assets such as social housing, planning and highways.

As mentioned earlier, there is also a need to consider the skills requirements of the end-user. It is likely that end-users will need to be upskilled for deployments to be successful and change management training is necessary both internally and externally.

This capacity can be grown through a collaborative approach between the public and private sector, where the supplier community is helping to provide training and upskilling.

DG Cities Get Digital Loan and Learn scheme: supporting communities throughout COVID-19

During the COVID-19 pandemic, DG Cities and the Royal Borough of Greenwich developed the Greenwich Get Digital Loan and Learn scheme to support hard hit communities.

Working with charities and community volunteers the team built a tablet lending and digital skills training programme which catered to vulnerable groups, including elderly residents, and those with English as a second language.

The project loaned 92 devices to vulnerable people for periods of 2-4 weeks and trained almost 50 elderly and at-risk people with basic digital skills throughout the pandemic. The programme was created and delivered by the community, with the support of DG Cities and the Royal Borough of Greenwich.



3.3. Cyber security risks

Cyber security risks should be considered as early as possible in the investment, procurement and deployment of smart cities technologies. It is now well reported that cities and critical national infrastructures are a target for cyber threat. This should not be feared but considered and addressed as any other risk. Early consideration and action will ensure an architecture which is inherently more secure by design.

The Network & Information Systems Regulation (“NIS Regulation”) came into UK law from an EU directive in 2018. The EU directive, and the UK regulation, outlines a requirement for all critical national infrastructure operators to increase the maturity of their cyber security policies and procedures. It also prompts those operators to recommend to their suppliers to do the same. This regulation applies to sectors adjacent to smart cities including energy, transport, health, water and digital infrastructure.

The second version of the NIS Directive (aka “NIS2”) from the EU is due to come into force in 2024, and, although NIS2 is not required to be implemented in the UK due to the UK’s exit from the EU, it is expected that the UK’s NIS Regulation will be updated in a similar way. The EU’s NIS2 directive will add the waste management and public administration into scope, amongst other sectors.

This means that there is not only an ethical rationale for considering cyber security when considering smart cities, but also a legal requirement. In the UK, the National Cyber Security Centre (NCSC) has produced the Cyber Assessment Framework (CAF) to assess cyber risks to essential functions.¹⁸ The NCSC and DCMS have also produced some guidance on cyber security specifically for connected places.¹⁹

3.4. Measurement

The progress and impact of smart city investment programmes should be reflected upon at various stages throughout its lifecycle. Smart cities provide a rich source of digital insights across key metrics, and these should be routinely analysed in order to report project progress and feed back to citizens and other key stakeholders.

This should be undertaken from both an operational (project management) and strategic perspective for projects to stay on target and realise their desired impact.

This reflection should not be purely quantitative but should incorporate a consideration on the softer and broader aspects of the programme’s overall functioning and delivery. Critical reflection of this nature, carried out through focus groups and interviews, should be undertaken at all stages throughout the programme, including its potential feed into new project cycles.

These measures could be understood through creating partnerships with institutions that specialise in understanding social and economic impact of complex programmes such as universities.

Case study: South London Partnership and Hitachi Solutions: harnessing the power of data and measurement

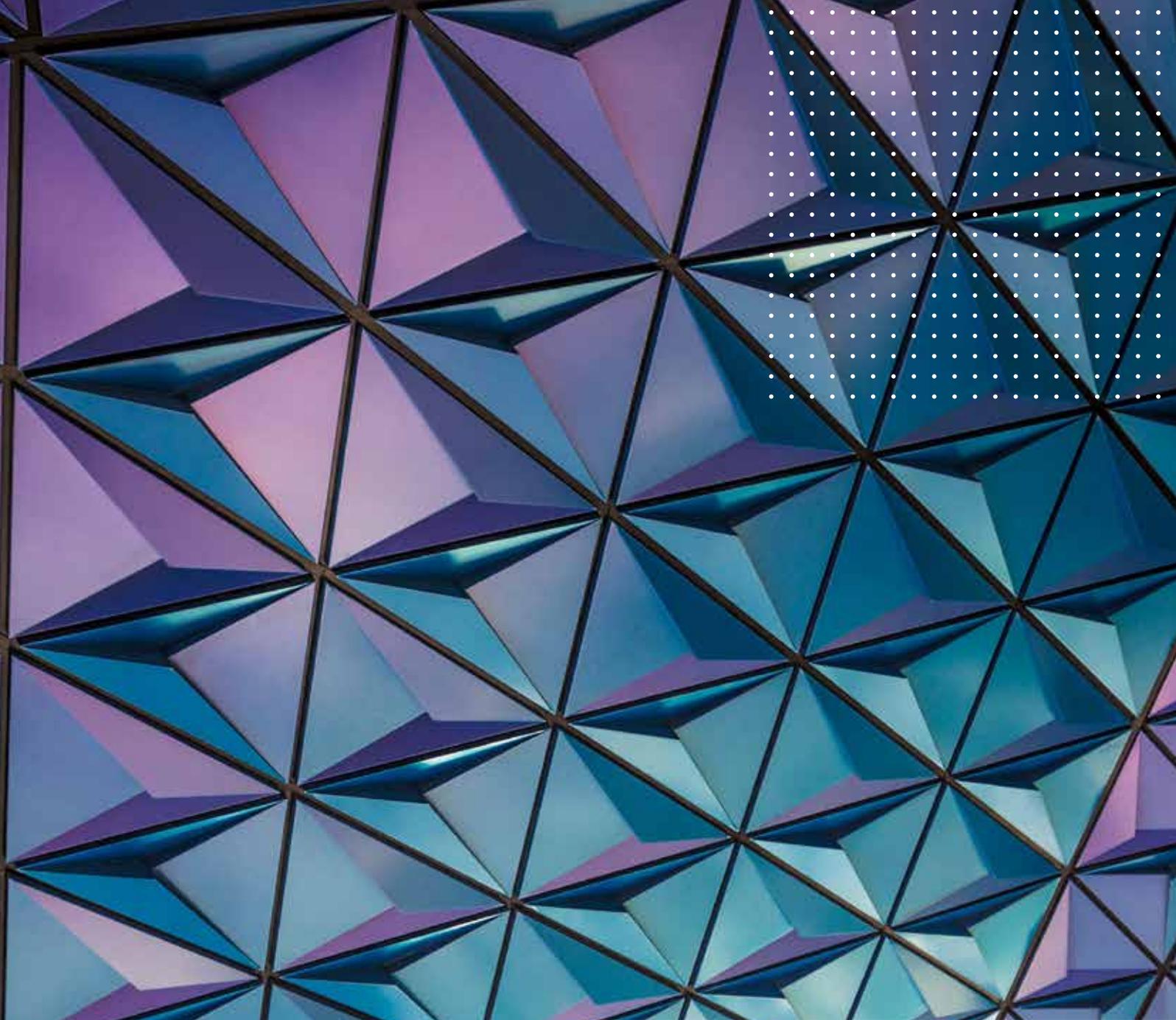
The South London Partnership's (SLP) five London boroughs, in association with Hitachi Solutions, a Microsoft technical consultancy, have been working to deliver a smart city platform with the primary aim of improving lives and wellbeing, supporting economic growth and responding to the climate emergency. Through delivering physical infrastructure across the region, the programme encompasses 42 live trials addressing real world problems with ten IoT sensor partners providing in excess of 2,800 devices and a data ingestion platform.

Hitachi Solutions is implementing Microsoft's Azure cloud services, capable of aggregating and analysing the multitude of different datasets presented through a visually rich and interactive dashboard display. The platform, Microsoft Power BI, can be interrogated to gain insight, aid decision making and help identify where action is required. The platform's capability can

also be extended to overlay different datasets and in the case of SLP this includes third party datasets, such as Met Office weather data, and existing council data. This approach provides a highly rounded perspective as well as greater context on any given area of interest.

The project's use-cases have started to deliver early benefits including saving four vulnerable residents' lives and providing invaluable insights into the correlation between air quality, traffic movements and modal types. Additionally, insights from the fly tipping trials have shown that most incidents occur on weekday mornings, something the council was not previously aware of.

Principles of the project funding mean that the work will be published and available for all public sector organisations to make use of dashboard visualisations and technical designs. The hope is that as more organisations adopt and contribute to ongoing development, the work will continue to be shared across the sector to maximise its impact and benefit.



Learnings should be consistently shared within the council in order to feed into future strategic processes and programmes of work and with wider stakeholders through reporting. This helps to fulfil accountability and transparency requirements as well as enabling stakeholders to respond by evolving capabilities accordingly.

Conclusion

In the current climate of increasing costs, the need to decarbonise and achieve economic recovery from the COVID-19 pandemic, the imperative to deliver smart cities in an effective, efficient and impactful way has become more pronounced. However, multiple barriers to faster deployment run the risk of a missed opportunity.

What this paper illustrates is that despite these challenges councils and technology businesses are succeeding in forging innovative and dynamic new approaches at every stage of the smart city value chain.

Through developing clear visions in partnership with local business and academic communities, councils are able to drive investment into their communities and deliver technologies which align to their commitments to residents.

New approaches are emerging to engage a wider pool of stakeholders to form innovation ecosystems which involve communities from the outset to drive transparency and trust. Delivery mechanisms are being rewritten to create greater efficiency in procurement, financing and deployment.

To engage more closely with these approaches, we encourage the local public sector to connect with the work of techUK. Through joining our Innovators Network and our various working groups and committees, we are continuing to forge closer ties between digital leaders and technology businesses to discuss challenges, validate approaches and deliver the smart city.

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About techUK

techUK is a membership organisation that brings together people, companies and organisations to realise the positive outcomes of what digital technology can achieve. We collaborate across business, Government and stakeholders to fulfil the potential of technology to deliver a stronger society and more sustainable future. By providing expertise and insight, we support our members, partners and stakeholders as they prepare the UK for what comes next in a constantly changing world.



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info@techuk.org