

Seven Key Principles for Smart City Success in the UK

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Introduction

It's an honour to talk to you today at this exciting event to encourage partnership and collaboration on urban innovation and smart city solutions. My background is in urban planning and sustainable development consultancy, considering social, environmental and economic aspects of how cities are developed, managed, lived in and experienced.

I'm also a co-founder of UrbanEmerge, a network of independent consultants who can work together under a shared brand and resources, helping public and private sector clients shape sustainable urban development. In 2017 I was part of the team that delivered the Scoping Study for the UK's Government to fund a global Future Cities Programme. This work included a comprehensive overview of UK expertise in digital and smart city solutions.

As a UK national, from the south of London, I've also been living in Hangzhou, China, since 2016 and have had the opportunity to visit many cities and witness the fast pace of urban innovation in China. As such, I feel that I can bring some good insights to you about the potential for collaboration and knowledge sharing between the two countries.

I'm going to provide a few tangible examples of digital and smart city solutions being applied in the UK and then want to set out seven principles for smart city success, highlighted by examples from our experience in the UK.

How can digital and smart city solutions help?

First, I'd like to be clear about what we're talking about. There is a lot of hype around the term 'smart city' and its definition can be ambiguous. For today's purpose, I refer to smart cities as those that use data and technologies to improve the lives of the citizens and businesses that inhabit them. Solutions based on Information and Communication Technologies – ICT for short – that are augmented by data sharing and analytics, the Internet of Things and artificial intelligence, have enormous potential to empower city managers to help plan and develop, maintain and govern cities.

They can help improve sustainability by more efficiently managing limited resources, by better balancing supply and demand and by enhancing resilience to disasters. Smart solutions also empower individual citizens in participating in the planning and management of cities, helping to improve their own quality of life.

Digital and smart city solutions are a vast and rapidly growing market area. Around the world, city governments are expected to invest \$80 billion in smart city technologies this year, in order to make better, data-driven decisions. The 2016 HABITAT III summit in Ecuador also made it clear that the concept of smart cities, and how it should be applied, is one of the key questions for future city development.

UK Cities as sites of innovation – some tangible examples

Cities are sites of great innovation. They often act as proving grounds for technologies, providing opportunities for people to invent new things, and then test and sell them.

Bearing this in mind, urban innovation presents very interesting opportunities for a diverse range of experts to be involved in urban development and management solutions. In the UK, the things that city governments and businesses are developing vary hugely, but I'd like to give a few tangible examples:

Many water companies are installing sensors along their pipes to enable them to self-monitor and detect and report leaks. They are also using data analytics and AI to intelligently match supply with demand, without wastage, and anticipate any future changes in demand related to various events across a city.

In Bristol, a new Smart City Operations Centre pulls together the city's Emergency Control Centre, Community Safety and Traffic Control Centre.

In Cambridge, self-monitoring rubbish bins report when they are full and allow a GPS-connected bin collection lorry to follow the most efficient collection route, helping to reduce emissions and save time.

Transport for London uses an AI-based system to predict areas of traffic congestion based on previous experiences that correlate with weather reports, CCTV footage and Twitter feeds. This data allows them to take action in real time to improve journey times.

In Glasgow, a newly developed, cloud-based e-governance service integrates with huge amounts of other complimentary data sources, helping citizens and businesses to more efficiently access public services and develop and market their own data based solutions.

Key elements of smart city success, with some examples of UK smart city innovations and expertise:

With even these few examples, we can see how urban services are changing across the UK with increased availability and use of ICT and data. And I can

see that there are many examples being shown at the Shenzhen Smart City Expo here as well. This rapidly evolving and growing ecology of smart city solutions has so many innovative and new ideas. It's easy to feel that things are moving so fast that it's hard to keep up!

For the rest of my talk I'd like to take a step back from the individual ideas and focus on seven principles, which I believe are important for smart city success. I'll illustrate those principles with a few more examples from the UK.

1. Government and academic backing to support smart city research and innovation

The first principle is government and academic backing to support smart city research and innovation. Over the last decade, the UK Government has been directly supporting research in urban innovation by setting up the Future Cities, Digital and Transport Catapults to accelerate business solutions. The UK Government has also established the Smart Cities Forum chaired by Government Ministers to help coordinate national and international initiatives across industry, Government, academia and society.

The UK has a strong research and innovation culture driven by universities and businesses, with strong government support. World-leading academic institutions, such as LSE Cities and UCL's Centre for Advanced Spatial Analysis, all contribute to UK and international expertise.

Other relevant UK programmes and institutions include Liveable Cities, the Centre for Sustainable Development and Urban Big Data Centre.

City governments in the UK are increasingly preparing a strategic approach to integrating smart solutions into urban areas. They are looking to understand how different factors can contribute to overall smart city objectives, as well as making sure the strategy is flexible enough to embrace rapid change.

UK cities are increasingly using smart city solutions as part of a more integrated approach to planning and managing urban spaces.

2. Open data platforms to support many new uses for data analytics

The second key principle for success is open data. Maximising the opportunities for governments, companies and entrepreneurs to access detailed and ideally live data sets, makes smart solutions possible, and can rapidly enhance ICT-based solutions for cities.

The UK came second in the 2018 Global Open Data Index and also second of 50 in the 2017 Global Geospatial Readiness Index. Organisations such as Ordnance Survey, City Mapper and the London Datastore are all contributing to open data platforms. The London Datastore alone provides open access to

over 700 different data sets, ranging from health statistics to property prices to household level census data.

The demand from local governments in the UK for new tools in storing, managing and sharing data, particularly around planning and environmental enforcement, has played a key role in pushing the diversification of the offer from tech SMEs. A notable example is Chip Side, which has evolved from being a software company to providing data management platforms to over 130 local authorities across England and Wales.

A great example of how open source data enables smart city solutions is the city of Bristol, about 200 kilometres west of London. In 2017 Bristol was named the leading smart city in the UK in the UK Smart City Index, which was commissioned by Huawei.

The city's ultra-fast terabit fiber network, referred to as Bristol is Open (or BiO), connects sensors on streetlights that monitor traffic and air quality and a supercomputer and 3D display at the Bristol Planetarium. Think of BiO as the smart city backbone.

All the data generated is anonymised and made public through an open data portal, along with many other data sets. Being open also means they proactively share what they learn with other cities, tech companies, universities and citizens.

3. Strong connectivity to enable the Internet of Things

The third key principle for smart city success is enabling the Internet of Things. The IoT is creating never-before-seen opportunities to converge the physical and the digital – via data analytics – to improve efficiency, both in public and private sectors, drive economic benefits and improve livelihoods.

Our phones contain a variety of sensors that can constantly record and transmit enormous amounts of information; houses and cars are 'smarter' than ever before; our public infrastructure, such as street lights, elevators, and roads, contain many sensors that are essential for their maintenance and our safety.

However, internet connectivity is key. As well as widespread and robust 4G and 5G networks, there will be a much heavier reliance on 'small cells', to boost connectivity in those hard to reach areas. There are increasing opportunities for companies to develop, install and maintain such infrastructure.

Smaller towns or less densely populated regions often lose out on fast connectivity and to solve this problem, many smaller regions or districts in the

UK are joining forces across boundaries, aggregating their demand so it's more attractive for telecoms suppliers to respond.

Central to the Milton Keynes Smart City Initiative, MK:Smart, is the creation of a state-of-the-art 'MK Data Hub' which supports the acquisition and management of vast amounts of data relevant to city systems from a variety of data sources, including IoT related sensors. These include data about energy and water consumption, transport data, data acquired through satellite technology and crowd-sourcing.

Making use of the rich level of data available through the IoT and Data Hub in Milton Keynes, the city developed the MotionMap app. This offers bus routes, along with walking and live waiting times, and car journeys complete with advisory information on the live availability of parking spaces.

There are also many opportunities for companies that provide IoT sensors. A good example is Utterberry, a company that spun off from research at the University of Cambridge. They provide miniature, artificially intelligent, ultra low-power sensors, which form a mesh network and relay data between each other, working as a family to solve targeted challenges.

4. Partnerships to enable collaboration, knowledge sharing and new ideas

The fourth key principle that I'd like to suggest is central to smart city success is collaboration and partnership. Tackling urban challenges in new ways, supported by technology, requires a joined-up approach.

One of the main stated objectives of the UK Future Cities Catapult is to bring together businesses, universities and city leaders so that they can work with each other to solve the problems that cities face.

This will require new partnerships, between sectors and companies that perhaps haven't typically worked together before. For example, between property developers and tech companies who wish to integrate technology into physical assets, or between cloud providers, emergency services responders and local government, who may wish to work together on using real-time data to assign the fastest route to emergency vehicles and change traffic lights to green along the way.

Organisations involved in cloud computing, digital interface and data analytics are increasingly developing smart city solutions and partnerships between them and urban planners or architects is increasingly common.

Local governments in the UK are also demonstrating successful collaboration to enable smart city innovations, including the Manchester City Verve, Future City Glasgow and Bristol is Open.

To illustrate the potential of smart city involvement for businesses in partnership with local or municipal authorities in the UK, Microsoft CityNext is an example of a partner-led initiative that Microsoft says ‘empowers cities to be more sustainable, prosperous, and economically competitive’.

Cities can tap into the solution portfolios of Microsoft and its partners and innovate at their own pace, deploying real-time solutions that can interoperate with and improve upon existing ICT solutions. These partnership initiatives transform city operations and infrastructures, engage citizens and businesses, and accelerate their economic development and environmental sustainability.

New partnerships are also being created to finance urban innovations, particularly in structuring public private partnerships.

5. Human-centred approach to improve quality of life

When we’re getting excited about all the technological possibilities out there, it’s important to remember that smart city solutions must first serve the people of cities. Taking a human-centric approach to developing solutions is my fifth key point for smart city success. This is particularly important in the context of rising inequality in terms of income and access to opportunity in many cities around the world, including in the UK and China.

Access and mobility present a real challenge in many cities. Cities Unlocked is a UK-wide initiative that allows visually impaired people the freedom to move more easily around cities. As a partnership between Microsoft, Guide Dogs UK and the Future Cities Catapult, Cities Unlocked took a holistic approach to identifying the challenges that urban environments pose for the visually-impaired, and developed a demonstrator headset device in response.

The new headset allows a smartphone app to provide the wearer with 3D-soundscapes, augmenting reality to provide a richer understanding of their surroundings. The headset was adapted using GPS, accelerometers and a compass to detect head orientation and provide spatially tailored audio guidance, to give the wearer a better understanding of their surroundings. Currently it interacts with GPS, Bluetooth beacons and Wi-Fi along a technologically enabled pilot route in London.

Citizen participation is also a key aspect of smart city success and a good example is a popular UK app called ‘FixMyStreet’. Residents are able to make local councils aware of problems such as pot-holes or fallen debris that need to be fixed or cleared.

With an ageing population, and a growing proportion of elderly internet users in the UK, there is a huge opportunity to use technology to enhance the way healthcare and assisted living is delivered. For example, Inavya, has

developed Avatr, a tool which enables users to create a digital profile of themselves which can be shared with doctors and family. This allows them to receive personalised medical care outside of the hospital, increasing access to healthcare for those less able to travel such as the elderly and disabled.

6. AI and machine learning to support urban systems

The sixth principle to smart city success is in using AI and machine learning to develop smart systems that can help us manage cities. AI can help city officials learn more about how people use cities. It can improve infrastructure and optimise the use of these resources. It can improve public safety in cities.

Much of this is possible through deep learning. To give an example, closed circuit television cameras are now embedded throughout cities in the UK, generating much more information than could ever be processed by human analysis. AI driven processes can count vehicles and pedestrians. They can read license plates and recognize faces. They can track the speed and movements of millions of vehicles to establish patterns or process the huge volume of satellite data to count cars in a parking lot or track road use.

Several UK companies are providing innovative solutions in this area. Massive Analytic, who are here today, are working on artificial precognition, which provides unique solutions to the growing challenges posed by IoT and big data. For example, working for Transport for London, their software analysed Vodafone cellular data, weather data, CCTV footage and Twitter feeds to provide insights into likely traffic flow. When new events occurred, their machine learning algorithms informed TfL of the likely impact they would have on traffic conditions, and predicted where congestion might arise. Subsequent actions by TfL increased local journey speeds by up to 10%.

AI in cities is so much more than autonomous vehicles, which is an exciting area by itself. However, the introduction of IoT in smart cities creates new demands in areas such as security and inter-operability, and UK businesses are also providing expertise to help solve these problems.

7. A view of cities as systems that must balance economic, social and environmental needs

Finally, but perhaps most importantly, my seventh point is that urban innovation must help us to apply digital technologies to address a full range of social, environmental and economic goals that will enable sustainable development.

Reducing greenhouse gas emissions through more efficient mobility or smart energy management can be enabled by smart tech. Improving community resilience to disaster can be improved through early warning systems.

We can improve urban ecology and wildlife as technology can support effective monitoring of environmental indicators. Greater understanding leads to new and better solutions.

A good example of how an IT platform provides an integrated systems view of a city region is the resilience.io app, developed by Resilience Brokers and the UK's Ecological Sequestration Trust. Designed to incorporate many data sources, this is an analysis and decision-support tool for resilient urban decision-making.

The platform combines computer representations of resource flows, human and business activities and infrastructure systems. It allows users to understand the trade-offs between things like fossil-fuel energy generation and health and climate impacts, or increased flood risk against poorly designed urban surfaces, rather than just measuring urban development in economic terms. This allows for much better informed business cases for sustainable infrastructure.

Resilience.io contains a growing library of process models for typical human, industrial and ecological systems, the relevant ones of which are used in a local instance to create a tailored integrated systems model for a city-region. The platform also allows city inhabitants to access the different scenarios, enabling more effective consultation on proposed developments and solutions.

Overall, the urban future is fast arriving. It's a future in which there are so many opportunities to create more liveable cities and contribute to the global sustainable development goals. The UK and China are global pioneers in smart city development and I hope that this summit and others like it can provide a good platform for continued collaboration and partnership.

Thank you very much.