

# SMART CITY STRATEGIES

## A Global Review 2017

**CATAPULT**  
Future Cities



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# FOREWORD

## A GLOBAL REVIEW OF SMART CITY STRATEGIES

For many years I have seen cities around the world embrace the idea of becoming a smart city, but struggle with the transformations that it requires. The most beautiful visions and the most intricate plans fall down when they are confronted with the messy reality of living cities.

Nonetheless numerous demonstrators, including our own, have shown how smarter services can make cities better, from digital tools for planning, to intelligent transport systems for faster emergency response. And as this report suggests, if cities do not engage with this issue, then technology will disrupt them regardless.

At Future Cities Catapult we believe that creating positive, impactful transformation on the ground requires strategies for dealing with the reality of cities. To this end, we help create smart city strategies led by cities and citizens.

This report is a step towards providing that support for any city that wants to become a smart city or wants to innovate. It surveys the journey that 21 cities have taken in creating their smart city strategies, looking for trends and lessons that others can learn from. We hope that it will help you to forge a path towards a vision for your citizens and your city's future.



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# EXECUTIVE SUMMARY

The 'smart city' was popularised as a concept in the early 2010s to describe how advances in technology and data could allow us to plan and run our cities better. Since then interest in the idea has exploded, attracting influence, investment, and criticism across the world.

This study aims to provide a global overview of why cities engage in the smart cities agenda, what challenges they meet along the way and how they are attempting to solve them. We studied 21 cities during this research, based on a mix of geography, population size, maturity of smart city strategy and capacity to contribute to the project.

This report lays out some of the principles and patterns that we have seen across smart city strategies today. These are structured around

- (i) How the smart city concept is changing
- (ii) What smart city strategies are trying to do and why
- (iii) How smart city strategies are being made
- (iv) How smart city strategies are being implemented

Through this research we are building a richer knowledge base for cities that are embarking on their own smart city strategies, as well as a reference for those who are already some way through the journey.



EXECUTIVE SUMMARY



## (I) THE EVOLUTION OF THE SMART CITY

The 'smart city' rose to prominence in the public consciousness as a marketing concept from global technology companies that saw an opportunity to sell digital transformation and new technology into big city systems (water, energy, transport). 'Smart City' caught the imagination as smart phones and digital transformation spread across the world at a phenomenal rate.

But while the market opportunity was clear to technology companies, the proposition for cities was less clearcut, and voices from government and academia quickly questioned the value of the solutions coming from these companies from the city and the citizen's perspective. In the space of a few years the concept of a smart city shifted from a focus on technologies and systems, to a focus on citizens and services for them.

We are now witnessing a challenge to the vision of a citizen-centred smart city arising from the disruption brought by Silicon Valley companies. Digital transformation is allowing these companies to disrupt existing ecosystems, offering both challenges and opportunities to citizens and city stakeholders. For the most part, governments have been slow to consider whether their strategies and regulations are fit for purpose in the context of this rapid disruption.

## (II) THE AMBITIONS OF SMART CITY STRATEGIES

Smart city strategies have broad ambitions that are often hard to pin down. They typically cover the range of economic, social and environmental outcomes that most cities strive for.

Over time, the emphasis of smart city strategies has shifted from ambitions to achieve efficiencies in service provision, to ambitions for higher quality of life for citizens and more sustainable living. Indeed, our interviews show that these ambitions are underpinned by a drive to improve quality of life, empower citizens and make cities safer. That shift has corresponded with the evolution of the smart city concept from a technology-led narrative on how service efficiency can improve, to a citizen-centric narrative on how services and infrastructure can be transformed to improve the lives of citizens.

While the narrative and ambition of smart city strategies has evolved over the years, ICT infrastructure and data analytics remain at the core of how these strategies are expected to have

their impact on the city. In most cases, regardless of the cities' goals, smart cities are primarily associated with the deployment of ICT solutions and collecting and analysing data to improve decision-making.

However in some cities, for example in Helsinki, the core enabler of the strategy is an innovation ecosystem. In these cities, a thriving innovation ecosystem is seen as critical to drive the creation and adoption of smart city solutions. Supporting such an ecosystem is then the major component of these strategies.

In developing countries like India, smart city strategies encompass the delivery of core infrastructure as well as the ICT and innovation. The smart city concept in this context is a signal of the aspiration to leap to the cutting edge of modernity.

## (III) HOW SMART CITY STRATEGIES ARE MADE

In most regions that we observed, smart city strategies are made through collaborative stakeholder engagement with city stakeholders and citizens. The merits of such a collaborative approach are well-understood – it creates a better suited strategy that has more buy-in with the stakeholders that need to deliver it. However such an approach takes longer to complete, and more resources.

Governments in rapidly urbanising areas, particularly in China and South East Asia, opt for a top-down approach, which tends to limit consultation to internal stakeholders (i.e. departments). This approach allows for rapid decision-making in a context where cities are growing at unprecedented rates. Whilst this meets an immediate short-term need, there is an emerging desire to achieve a rebalancing towards a more collaborative approach to meet citizens' needs. The collaborative approach also ensures that citizens are engaged as innovators and thus a bigger pool of intellectual capital is harnessed.

## (IV) HOW SMART CITY STRATEGIES ARE IMPLEMENTED

### Presenting the Strategy

Cities that are writing a smart city strategy for the first time usually create a separate strategy to start with. Twelve of the cities in our research fell into this category. This approach helps focus attention on a specific document and clarify thinking.

Five of the cities in our research had embedded strategies. As strategies mature, there is evidence that they gradually become more embedded within the overall city vision, such as New York. This gives ownership of the smart city strategy to the service and budget owners that have the power to implement and scale.

Four of the cities in our study had limited, thin or no documentation of their strategy. This approach has allowed them to avoid the delay of a formal strategy process. However it is not clear whether the key benefits of a formal strategy (political weight, signalling to the market, stakeholder engagement and alignment) can be achieved through informal means.

### Governance and Delivery Models

Smart city strategies generated through collaborative strategy formulation usually lead to the creation of an arm's length organisation or public-private partnership to deliver it. This is the natural successor to the networks that convene to bring city stakeholders together during the collaborative strategy process.

The other common model for cities to adopt is to create a smart city office within City Hall. This office can spearhead the smart city strategy within city government, connecting the aspirations of leadership with the various departments required for implementation.

### Finance

Finance for smart city projects is intrinsically linked to the governance and delivery structure of the strategy as well as commitment from national administrations. Currently, funding primarily comes from public sector sources: the overall city budget, national government or in Europe, EU funding. In North America and Africa, private investment plays a larger role.

Smart city funding is still highly dependent on project financing, and is not often tied to core city funding. This reflects a failure to connect innovation and pilot schemes with large scale services and purchasing decisions. Where direct cost savings are available, e.g. smart lighting, support from core city funding may be easier to secure. This represents an opportunity for scaling solutions that generate savings or revenue streams. But as the ambitions of smart city strategies extend beyond service efficiency and cost savings, new modes of value capture may be required to tap into core city funding.

### Implementation Challenges

There are a range of challenges that prevent cities from implementing smart city initiatives.

The key challenge highlighted in our research, however, is the lack of strong leadership, skills and capacity across all levels of local government. Political buy-in is essential for maintaining the momentum of the smart city agenda. That momentum can become unstuck as the political cycle turns, so strategies need to convert to impact that can be recognised across political divides. Further challenges include the lack of innovative procurement, cross-city collaboration, private sector engagement, and interoperability.

The cities in our survey are taking steps to deal with these challenges, from promoting more innovative procurement (e.g. Dublin) to creating city-wide networks that encourage collaboration (e.g. Berlin). Their experiences are what lead us to make the following recommendations.

## RECOMMENDATIONS

Based on the challenges and best practices that emerged during our research, we would propose the following recommendations to cities embarking or already on a smart city journey:

- Establish **strong leadership to develop skills and capacity** within local government to deliver at-scale smart city projects. Go to page 28 to see how cities like Tel Aviv are appointing champions and upskilling their council staff.
- **Embed your smart city strategy** within existing statutory frameworks in order to ensure the strategy's implementation and funding. Go to page 23 to learn about how cities like Sydney and São Paulo are weaving their smart city thinking into their city plans.
- When creating your smart city strategy, **consider a collaborative approach**, coupled with strong political support, to ensure that you harness your citizens' and businesses' capabilities and respond to their needs. Go to page 20 to see how cities like Pune and Toronto are achieving this at scale.
- **Tap into core city funding** by regularly scanning your existing city assets and budgets in order to leverage these for smart city projects. Go to page 35 to see how New York carves pilot funding out of the city budget.
- Create a **plan for private sector collaboration**, as well as a designated person or team for communicating with businesses and investors. Go to page 27 to learn about how Chicago works with the private sector to run pilots and scale them to the market.

# 1

## INTRODUCTION

### 1.1

#### WHY DO WE NEED A GLOBAL REVIEW?

The use of technology is changing everyday life for people in cities, and how the city is evolving to meet their needs. This is nothing new, we only need to see how the elevator made possible high-rise buildings, or how cars allowed cities to grow horizontally. But the pervasive nature of digital technology means that this change is impacting people's lives at an unprecedented pace.<sup>1</sup>

As digital technology spread across the globe, the concept of a 'smart city' was popularised as a concept in the early 2010s to describe the use of these new advances in technology and data to make better decisions about governing cities and delivering services. Since then, interest in the concept has exploded, attracting influence, investment, and criticism across the world.

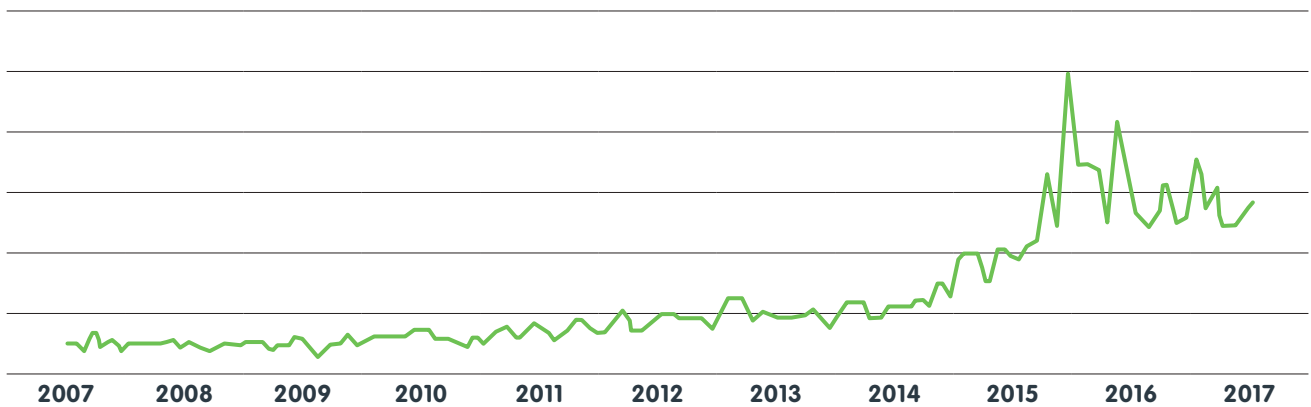
Governments and policymakers have struggled to match the promise of smart cities with the 'messy' reality of their cities. That messy reality has not deterred Silicon Valley tech companies, as they spread around the world at an astonishing pace, leaving policymakers and

regulators scrambling to understand and react to the digital disruption they bring. The rise of companies such as Uber, Airbnb, and Deliveroo is rapidly changing urban life. Local governments are now realising that they have a role to play in both protecting and furthering the interests of their citizens and businesses amidst this disruptive landscape.

It is in this context that a review of smart city strategies is critical. Strategies serve as a mechanism for cities to renew themselves. Understanding why and how cities are creating smart city strategies is vital when designing and improving future strategies. It is just as important to understand how these strategies are delivered because in most parts of the world, these strategies are not statutory. One potential impact of this is market uncertainty resulting in low levels of investment confidence.

For these reasons, Future Cities Catapult has embarked on an ambitious research programme to take stock of the rich experience of smart city strategies that are emerging on every continent. This study is the first output from that research.

#### GOOGLE TREND – WORLDWIDE INTEREST



Line depicts change in interest levels relative to peak, as represented by Google searches related to 'Smart city' as a topic.

Source: Google Trends<sup>4</sup>



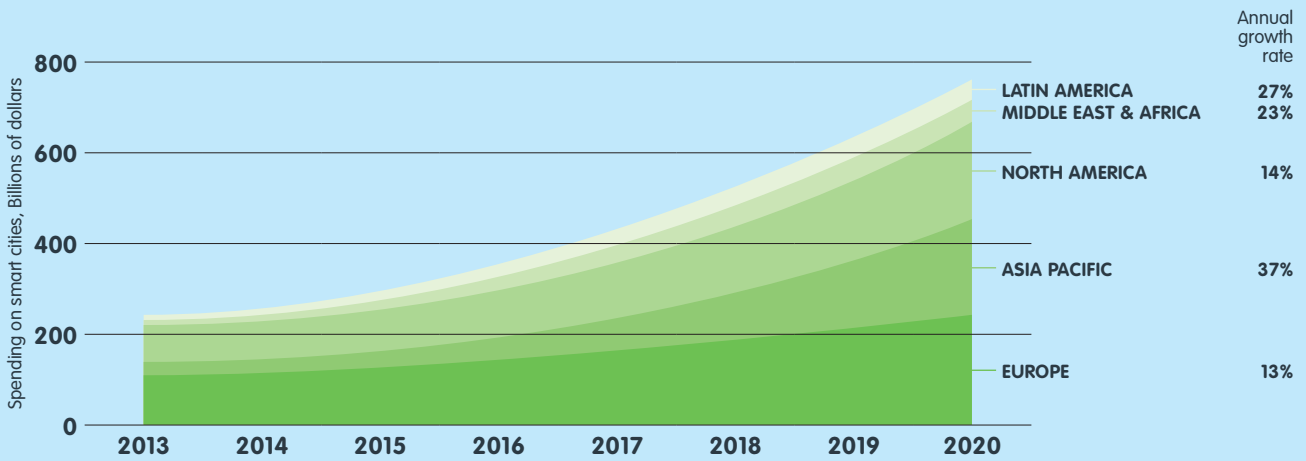
**MARKET CONTEXT**

The latest projections show that the smart cities market is expected to grow by 20% per year from over \$300bn in 2015 to over \$750bn in 2020.

The largest market currently is Europe with a size of close to \$130bn. The Asia Pacific region is expected to grow at the highest rate of nearly 37%, increasing the size of the market from around \$50bn to \$220bn.

The projected growth in the APAC region is fuelled by factors such as the launch of many new projects in China, South Korea, Japan, Singapore, Thailand, India, and Australia in 2015. These projects are often part of large scale development projects that involve significant capital spend.

Even though Asia Pacific is currently seen as having the highest potential, the Middle East & Africa as well as Latin America also have high potential, with expected growth of 23% and 27% respectively.



Source: Markets and Markets 2

We aim to:

- Understand why and how cities are creating smart city strategies
- Explore how local governments are implementing these strategies
- Discover how the approach to creating the strategy relates to governance and implementation
- Draw out differences between strategy creation, governance and implementation across geographic regions globally
- Analyse the implementation challenges across regions

In **Chapter 2**, we will begin by revisiting the evolution of the term ‘smart city’ and how the perception of the term has changed over the years. **Chapter 3** will explore why cities are creating smart city strategies, what they are focussing on and what form these strategies take. **Chapter 4** will explore the process of creating strategies in different cities, and **Chapter 5** will present different governance models and implementation processes. The report then concludes with a set of recommendations, and appendices that explore four cities in detail.

# 1.2

## METHODOLOGY

21 cities were chosen for sufficient spread across:

- Geographic location
- Population size
- Maturity of smart city programme
- Data availability
- Capacity to contribute to the project

These criteria led to the following cities:

- **Africa:** Johannesburg, Nairobi
- **Asia:** Jakarta, Ningbo, Pune, Seoul, Tokyo, Wuhan
- **Australia:** Sydney
- **Europe:** Amsterdam, Barcelona, Berlin, Dublin, Ghent, Helsinki, Manchester, Tel Aviv
- **North America:** Chicago, New York, Toronto
- **South America:** São Paulo

We analysed the smart city strategy of each city. As part of this study, we carried out over 25 in-depth interviews with city officials and experts in the field of smart cities. We hosted a panel discussion at Smart City Expo Barcelona 2016, where we engaged four city and government officials from China, Manchester, New York and Tel Aviv. Our review also included practitioner literature and market studies. The desk research focused on understanding strategy development, governance and implementation models.

## CITIE FRAMEWORK

The variety of the selected cities is reflected in their categorisation in the CITIE framework<sup>5</sup>, which assesses cities' capabilities to support innovation and entrepreneurship. Our selection includes:

- Five 'Front Runner' cities: Amsterdam, Barcelona, Chicago, Helsinki, New York – these cities build on the foundations of well-established innovation practices and mature entrepreneurial ecosystems
- Four 'Challenger' cities: Berlin, Seoul, Tel Aviv, Toronto - these are ambitious and dynamic cities riding a wave of technology-enabled growth
- Three 'Builder' cities: São Paulo, Sydney, Tokyo - these cities are at a stage of rapid transition, actively investigating policies to enhance their budding ecosystems
- Three 'Experimenter' cities: Jakarta, Johannesburg, Nairobi - these cities have yet to take decisive action to prioritise innovation and entrepreneurship
- Six cities that have not been categorised yet by the CITIE framework: Dublin, Ghent, Manchester, Ningbo, Pune, Wuhan.

## SOME HIGHLIGHTS FROM THE LITERATURE

**8** leading world cities created plans outlining their 'smart city' approaches in 2013-2015 alone: New York, Chicago, London, Barcelona, Singapore, Hong Kong, Dublin, San Francisco

**240** cities in the EU-28 have "significant and verifiable Smart City activity"  
(European Commission, 2014)

**4** types of strategic approaches: facilitative, learning, systems and interventionist  
(Townsend & Lorimer, 2015)

**3** routes to becoming 'smart': anchor, platform, beta city  
(Machina Research, 2016)

**6** typologies of city governance: commanding, implementing, providing, legislating, collaborating, facilitating  
(C40 & Arup, 2015)

**5** criteria to assess successful execution: implementation, digital delivery, service delivery, environmental impact, community reach  
(Navigant, 2016)

**6%** of city budgets in the UK are spent on IT  
(*Delivering the Smart City*, Arup)

<sup>1</sup> Between 2011 and 2013, we generated more data than the total data accumulated in the history of mankind; ref: <https://www.sciencedaily.com/releases/2013/05/130522085217.htm>

<sup>2</sup> MarketsandMarkets (2016), *Smart Cities Market - Global Forecast to 2021*

<sup>3</sup> ibid

<sup>4</sup> <https://trends.google.com/>

<sup>5</sup> Citie.org

# 2

## THE EVOLUTION OF THE “SMART CITY”



### 2.1

#### THE MARKETER'S SMART CITY

The term ‘smart city’ has been appearing in the literature since the 1990s<sup>6</sup>, but was popularised by IBM in 2010 through the Smarter Cities Challenge. In the wake of the global financial crisis, IBM targeted their technology offer at city infrastructure and local governments<sup>7</sup>, sending experts to cities to propose solutions that would make them “smarter and more effective”<sup>8</sup>. IBM defined a smart city as “one that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources.”<sup>9</sup> Similarly, Cisco defines smart cities as those which adopt “scalable solutions that take advantage of information and communications technology (ICT) to increase efficiencies, reduce costs, and enhance quality of life.”<sup>10</sup>

This **first wave** of smart cities was thus driven by large technology companies. For these companies, “the technological component is the key component to their conception of smart cities”. Their focus was on big city systems (energy, water, transport), and the smart city definition focussed on the outcomes that the smart city would deliver through these systems, such as resource efficiency, improved decision-making, etc. Since then, the definition of a smart city has been vigorously debated.<sup>11</sup>

Despite or because of its vagueness, the ‘smart city’ has served as a marketing and promotional tool for cities seeking to attract investment for pilot projects, particularly in Europe and the US. Now companies, especially in Europe, are starting to suffer from “pilot sickness”<sup>12</sup>, caused by the unpreparedness of cities to scale pilots up

and roll solutions out. Smart city activities are carried out “on a project basis”, without a route to long-term or large scale operation. As a result, “few smart city projects are converted to full scale operating investments”<sup>13</sup>.

### 2.2

#### THE CITIZEN'S SMART CITY

In Western countries, the first wave of smart city initiatives saw the “smart city being defined more by the private sector than by government”. Cities deemed it essential to “put government back in the driver’s seat”<sup>14</sup> in order to rebalance the influence over the development of smart city projects. As policymakers, urban planners, academics and others took hold of the concept, the narrow technology-focussed conception of the smart city was criticised as incomplete and inappropriate to citizen needs.<sup>15</sup>

Broader aspects of city living came to form part of the conception of the ‘smart city’: aspects such as governance, education and inclusion.<sup>16</sup> This broadening of the concept brought citizens into the frame and citizen engagement came to the fore as the **second wave** of smart cities. Local authorities, particularly in Europe, became more proactive in reaching out to citizens through digital platforms, open data portals, civic crowd-funding, co-design and living labs, hackathons, innovation competitions and more.

At the same time, national governments seized on the smart city concept as an elaboration of an urban development ethos. As early as 2005, South Korea unveiled its plan to build a smart city, then called “ubiquitous city”.



New Songdo City was envisioned as “a giant test bed for new technologies’ that would demonstrate the country’s technological prowess to help attract foreign investment”.<sup>17,18</sup> The Chinese Government launched the National Smart City Pilot Programme in November 2012 and issued guidance on principles, objectives and security for smart cities. Singapore and India launched their national smart city programmes in 2014 and 2015 respectively. These programmes are aimed at using technology to improve life in cities, whilst attracting foreign investment to increase economic growth.

## 2.3

### THE CONSUMER’S SMART CITY

In the **third** wave we are seeing ‘Silicon Valley’ companies using the city as a platform to create their own markets. Previously the smart city was conceived as a reimagining of city services through the technological transformation of large scale traditional infrastructure. But transforming incumbent infrastructure and processes has proven to be extremely difficult. In these circumstances, companies are disrupting old business models and bypassing old systems, often delivering directly to citizens, or in this context, ‘consumers’. Globally, tech companies are using the ubiquity of digital technology to rapidly achieve scale, and in so doing, they are transforming cities around the world. Start-ups are using the digital connectivity and infrastructure of cities as a platform for providing consumer-oriented services, such as taxis, food deliveries, travel planning, laundry, accommodation, etc.

Governments are waking up to the implications of the digital transformation of urban life, and some are taking measures to protect their citizens and their data in this newly created marketplace. In the West, concerns are rising as a result of recent incidents with security, including the Internet-of-Things ‘denial of service’ incident<sup>19</sup>

and ransomware on San Francisco’s public transit system<sup>20</sup>. In Asia, over half a million Android accounts were breached between August and December 2016.<sup>21</sup> All these attacks on cyber security and data privacy require government action to protect citizens from such incidents occurring in the future, when most of our daily activities will extend into the digital realm even further.

But the implications of the digital disruption go far beyond the digital world. There is strong evidence that Airbnb is driving up rental prices<sup>22</sup>, to which cities have responded in various ways: some have banned Airbnb altogether (e.g. Berlin, Santa Monica), while others have imposed limits such as maximum rent periods and run consultation sessions with communities.

Digital companies are realising that they now play a much bigger role in the urban context. Instead of reacting to regulations, some of them are proactively trying to communicate and collaborate with local authorities, while others are more resistant to this. Airbnb, for example, is trying to secure 700 tax deals with cities<sup>23</sup>, while Niantic, the developer of Pokemon Go, is looking for ways to work with councils to activate public spaces<sup>24</sup>. On the other hand, ride-hailing companies like Uber and Lyft are reluctant to share their data on passenger journeys to aid transport analytics in New York City.<sup>25</sup>

Local and national governments are under growing pressure to play a more active role in enhancing the positive impact of technology and safeguarding against its negative effects. Smart city strategies, as they are currently conceived, are ill-suited to provide guidance on these issues.



BARCELONA

Barcelona’s smart city history vividly illustrates the waves of the smart city’s evolution and the dramatic changes that they carry. The city’s 2012 smart city strategy was well-publicised under Xavier Trias’ administration as a means of attracting international investment and promoting the economy. Barcelona attracted big technology companies to develop and test their smart city solutions. But Barcelona’s position as one of the world leading smart cities took a dramatic turn with the election of Ada Colau as mayor. She challenged the marketer’s smart city directly, saying<sup>26</sup>, “We have a real commitment to new technologies that go beyond just TV ads titled ‘Smart City’.

What has followed is a shift towards a smart city strategy that emphasises citizen empowerment, open source principles and local innovation / industry. The strategy’s emphasis on ‘building the smart city from the ground up with citizens’ reflects an evolution towards the citizen’s smart city.

At the same time, the strategy consciously prepares for the implications of platform companies. As a global tourism centre, Barcelona has been a hotspot for debate on the effects of Uber and Airbnb and the city has had to wrestle with how to deal with the rise of the consumer’s smart city. Barcelona’s approach to this has been two-fold. First, the city is enforcing regulation from the top, insisting that platform companies must respect the law. Second, the city is funding and supporting alternatives to global platform companies, in the form of bottom-up digital social innovation. This is consistent with the strategy’s focus on bottom-up transformation.

## CONCLUSION

Despite all the developments in the smart city landscape, there is still little agreement on what the term ‘smart city’ means in 2017. Attempts have been made to standardise the definition (e.g. by the British Standards Institute). Nonetheless, our global review finds that the different conceptions of ‘smart city’ around the world have a shared emphasis on technology, data and connectivity, and innovation. A smart city strategy does not reflect so much the definition of the term but rather the vision and priorities of the city in question.

<sup>6</sup> Albino et al, (2015), Smart Cities: Definitions, Dimensions, Performance and Initiatives, *Journal of Urban Technology*  
<sup>7</sup> Townsend A (2013), *Smart Cities*  
<sup>8</sup> <https://smartercitieschallenge.org/about>  
<sup>9</sup> Cosgrove M & al, (2011), Smart Cities series: introducing the IBM city operations and management solutions. IBM  
<sup>10</sup> Falconer G & Mitchell Sh (2012), Smart City Framework A Systematic Process for Enabling Smart+Connected Communities  
<sup>11</sup> Arup (2014), *Delivering the Smart City*  
<sup>12</sup> Arup (2016), *Growing smart cities in Denmark*  
<sup>13</sup> Copenhagen Capacity (2014) “Smart City - En styrkeposition i Region Hovedstad”, available at: <http://www.copcap.com/newslist/danish/spi-samarbejdet-lofter-smart-city-udfordringer-og-potentialer-i-region-hovedstaden>, p. 20.  
<sup>14</sup> Interview with Jeff Merritt, Director of Innovation at New York City  
<sup>15</sup> Greenfield (2013), *Against the Smart City*  
<sup>16</sup> Lombardi et al., (2012), “Modelling the Smart City Performance”  
<sup>17</sup> [http://www.nytimes.com/2005/10/05/technology/techspecial/koreas-hightech-utopia-where-everything-is-observed.html?\\_r=0](http://www.nytimes.com/2005/10/05/technology/techspecial/koreas-hightech-utopia-where-everything-is-observed.html?_r=0)  
<sup>18</sup> Ibid.  
<sup>19</sup> <http://www.bbc.co.uk/news/technology-37738823>  
<sup>20</sup> <https://www.technologyreview.com/s/602979/ransomware-took-san-franciscos-public-transit-for-a-ride/>  
<sup>21</sup> <http://www.cnn.com/2016/12/01/android-malware-breaches-security-of-more-than-1-million-google-accounts.html>  
<sup>22</sup> <https://qz.com/842996/what-happens-when-a-30-billion-startup-stops-being-nice-and-starts-being-real/>  
<sup>23</sup> <https://www.ft.com/content/c87a1a0a-aecf-11e6-a37c-f4a01fb0fa1>  
<sup>24</sup> <http://www.lgiu.org.uk/2016/08/04/pokemon-goes-local/>  
<sup>25</sup> ref: <https://www.bloomberg.com/news/articles/2017-01-05/uber-doesn-t-want-to-give-nyc-or-anyone-more-data>  
<sup>26</sup> <http://fortune.com/2015/07/29/barcelona-wired-city/>

# 3

## THE AMBITIONS OF SMART CITY STRATEGIES

Sweeping digital transformation is changing all areas of life, government, and the economy. Local and national governments are looking for ways to respond to and leverage the digital transformation to stimulate the local economy, optimise city services, create a seamless dialogue with citizens and collect enough data to understand citizens' habits and needs. In this section, we unpack these trends and illustrate how they differ across regions and cities.

Our analysis distinguishes between the *ambitions* and *drivers* of strategies - ambitions are the objectives of a strategy, typically articulated in documents and public communication; drivers are the underlying factors that have induced a city to adopt that strategy.



**São Paulo** shows why a distinction between ambitions and drivers can be helpful. São Paulo views the smart city as one that provides opportunities for its citizens and simplifies everyday life through improved economic development and public management. The concept of smart city adopted by the Municipal Secretariat for Innovation and Technology focuses on the simplification of administration and on the promotion of e-services as a means to reduce the bureaucratic workload of the city government. Thus, while improving citizens' lives appears to be a significant ambition of the strategy, it is administrative and economic efficiency that are highlighted as key drivers.<sup>27</sup>

# 3.1

## THE AMBITIONS OF SMART CITY STRATEGIES

We are accustomed to seeing smart city visions with broad ambitions, from economic development to improving quality of life. We have sought insight by highlighting the ambitions that strategies are focussing on. We analysed the published strategies of cities in our sample to find out what their main ambitions are. We categorised them under three headings:

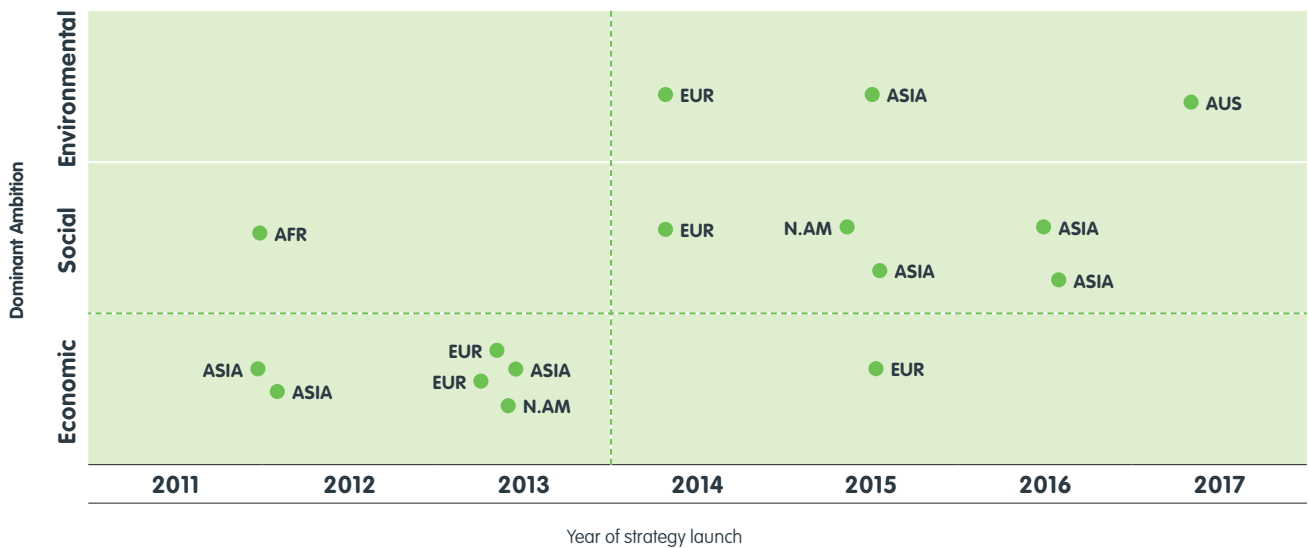
1) **Economic ambitions** - Cities that seek to use technology to improve services and create efficiencies, while attracting investment and boosting economic development.

2) **Social ambitions** - Cities that want to encourage inclusivity, transparency, trust and empowerment of citizens.

3) **Environmental ambitions** - Cities that seek to achieve environmental sustainability.

### CHANGING AMBITIONS OVER TIME

AFR=Africa AUS=Australia ASIA=Asia EUR=Europe N.AM=North America S.AM=South America



Our analysis shows that the main ambitions of strategies have changed over time. Before 2013, the focus of strategies tended to be economic, while after 2013, social and environmental ambitions were key for seven of the cities studied. This shift is aligned with the changing nature of a “smart city”. As described in Chapter 2, the first wave of smart cities was focussed on the benefits of deploying technologies to achieve efficiencies. As the smart city discourse moved towards a citizen-centric vision, the focus of strategies has shifted towards ambitions for citizen engagement and improving quality of life.

Our interviews with city officials shed light on the drivers behind these ambitions. During our interviews, we explicitly asked our interviewees what the drivers behind creating a strategy were. These drivers followed a similar pattern to the ambitions of the strategies: on four occasions, the drivers were economic (e.g. efficiency or economic development) pre-2013, while post-2013, eight of the interviewees cited social and environmental drivers (e.g. quality of life and citizen empowerment).

## 3.2

### DRIVERS OF ECONOMIC AMBITIONS

All cities that had a primarily economic focus in their smart city strategy were striving to achieve a better quality of life for their citizens, a thriving local economy and efficient services.

#### Technology as an enabler to improve city services and create efficiencies

Many cities see technological solutions as enablers to achieve their goals such as service improvement and efficiency as well as cost effectiveness. These are especially important in the face of rapid population growth, congestion and pressure on public services. Out of the eight cities that focused on city service efficiency, four are in Asia, and the rest in Europe and North and South America. These cities share a large and growing population that puts pressure on city services. Our interviewee from Berlin, for example, pointed out that the city is growing at such an unprecedented rate that it needs to use technology in order to increase the quality of life of citizens. Similarly, in Wuhan, technology is seen as the best cure for the biggest pain point of the city, traffic congestion.

The pressure to improve services is also coming from citizens themselves. City authorities are under growing pressure from their citizens to provide seamless services in line with what they expect as digital consumers. Seoul, for example, recognises the “need to provide easier and more convenient services to the public as the level of our citizens’ expectation is growing higher”.<sup>28</sup>

#### Promotion and attracting investment

Some cities and politicians are using the ‘smart city’ vision to signify transformation, modernisation and innovation, for example in India or South America. European cities are also signing up to the ‘smart city’ concept as a way to access EU research funding. Our interview with Berlin’s economy development agency Berlin Partner, for example, showed that the city needed to create a smart city strategy in order to be able to also apply for the EU’s Lighthouse funding programme.

Besides attracting public funding, cities are aiming to lure private companies to invest in smart city projects. Professing an open and innovative smart city environment is seen as a way of signalling market opportunity. Dublin’s Smart City Program Manager, Jamie Cudden, stresses the importance of communicating with

industry and working closely with companies to demonstrate what the opportunities in Dublin Region are. Showcasing the region’s successes would put it on the map and attract investment from international companies.

## 3.3

### DRIVERS OF SOCIAL AMBITIONS

From our analysis, social ambitions are driven by a variety of factors dependent on the local and national context. These include issues such as: crime and safety, citizen empowerment, quality of life, and economic growth. Quite often these are determined by the long standing economic and industrial legacy of the city. Post-industrial cities with significant pockets of deprivation, such as Manchester in the UK, seek to emphasise issues such as health, well-being and improved productivity. Where this is less pronounced, such as Amsterdam and Helsinki, the emphasis is often on citizen empowerment recognising the role which citizens can play as innovators. Barcelona’s new smart city strategy now falls into this camp as well (see page 13), having moved beyond its prior focus on economic promotion.

#### Creating an equitable, inclusive city

UN Habitat notes that “the prosperity generated by cities has not been equitably shared, and a sizeable proportion of the urban population remains without access to the benefits that cities produce.”<sup>30</sup> This is an issue that faces cities across the globe. With the rise in importance of digital skills, it is ever more important for cities to ensure that the most vulnerable in society can take advantage of digital solutions and avoid the negative impacts of digital exclusion.

Many cities recognise this need. Creating an equitable, inclusive city appeared to be the focus of the smart city strategies in four of the cities we studied across Europe, North America and Africa. This is a priority in many African countries, where governments need to ensure that funded projects are accessible to everybody and do not create further inequalities.<sup>31</sup> The spread of connectivity is seen as a key priority for ensuring inclusion and reducing inequality. Johannesburg aims to utilise technology to enhance transparency and universal access. This commitment stems from the overall vision for Johannesburg: to create an “equitable, non-racial, prosperous, non-sexist and just society.”<sup>32</sup>



Creating an equitable, inclusive city is also the key aim of US cities we studied – New York City and Chicago. The latter aims “to realize Chicago’s potential as a city where technology fuels opportunity, inclusion, engagement, and innovation for all.”<sup>33</sup> Similarly, New York City’s smart city strategy underpins the overall city vision OneNYC for a “strong and just city”.<sup>34</sup> This is a key priority for New York since income inequality has surpassed the national average and “45% of New Yorkers are in or near poverty”.<sup>35</sup> To achieve this aim the city is investing heavily in broadband infrastructure with an emphasis on improving access to high-speed capability in its most deprived areas.

### Citizen engagement and transparency

Out of the cities we studied, four across Europe, South America, Asia and Africa identified citizen engagement and transparency as the key priority of their smart city strategies. Seoul, for example, places significant importance on citizen participation in the process of policy development. This is achieved through an online portal with a staged process. Citizens can suggest ideas for resolving civic issues, departments are then able to select and develop the idea, while the citizen tracks progress. The aim is to empower citizens to participate in the policy making process and thus increase government transparency.

Smart initiatives that encourage open data are often seen as a way to improve transparency of certain government processes and to reduce the opportunity for corruption. In Kenya, the national government is digitising payment services, e.g. for utility bills, in order to reduce the danger of corruption and bring about transparency. The latter is a driver for South American countries as well.

## 3.4

### DRIVERS OF ENVIRONMENTAL AMBITIONS

There are a few examples where smart city strategies are seen as a route to sustainability since some smart city technologies provide the opportunity to contribute towards environmental standards and targets. The hope that the smart city approach can help address some of the environmental challenges cities face today is in part a reflection of the evolution and development of digital technologies but also perhaps the inability of traditional instruments such as regulation to achieve these ambitions.

### Environment and sustainability

Our research shows that environmental sustainability is the key driver for three of the cities we surveyed, namely Helsinki, Sydney and Tokyo. During our interview with Roope Ritvos, Director at Helsinki’s innovation unit, he stated that the key objective of the smart city strategy was to achieve reductions in CO<sub>2</sub> emissions.<sup>36</sup> Sydney’s smart city strategy is embedded in the overall “Sustainable Sydney 2030” vision for the city, while Tokyo’s reflects the city’s ambition to deliver a sustainable 2020 Olympic Games.

## 3.5

### ENABLING THE STRATEGY

There are a range of enablers which cities have at their disposal to achieve the outcomes set out in their strategies. Although not all smart city strategies are prescriptive as to the steps for taking the strategy forward, we found three different core enablers that cities utilise to help them achieve their aims and objectives:

- Improving ICT infrastructure, data collection and analytics
- Innovation and crowd-sourcing solutions
- Improving core infrastructure (e.g. sanitation).

Our analysis shows that ICT infrastructure and data analytics are seen as the key enablers for smart city strategies in 14 cities, both pre- and post-2013. This focus proves that regardless of the cities’ goals, smart cities are primarily associated with the deployment of ICT solutions and collecting and analysing data to improve decision-making. On a few occasions, creating an innovation ecosystem to drive the creation of smart city solutions is the key enabler.

### ICT & Data analysis

The first wave of smart cities was primarily focussed on the deployment of technology. Even though the focus has now shifted towards using technology as a tool, this is still the backbone of many smart city strategies. Berlin’s strategy explicitly states that ICT is a “key technology”:

“Data and ICT infrastructures are the technological backbone of a Smart City. Large pools of data and their analysis form the other basis and starting point of ICT to ensure the functioning and performance capability of a Smart City.”<sup>37</sup>



The Mayor's Office of Data Analytics (MODA) is **New York City's** civic intelligence centre. MODA aggregates and analyses data from across city agencies to more effectively address public safety, and quality of life issues. The office uses analytical tools to prioritise risk more strategically, deliver services more efficiently, enforce laws more effectively and increase transparency. For example, during Hurricane Sandy, which displaced an eighth of NYC's population, the city's response was managed through analytics. MODA integrated residents' responses to surveys to allocate disaster response resources to the most vulnerable residents.<sup>38</sup>

#### BEYOND OPEN VS PROPRIETARY

Data and ICT infrastructure is a foundation for practically all smart city strategies. But there is huge variation in how cities build that foundation. Early examples of smart city initiatives were driven by large tech companies, who deployed large scale proprietary infrastructure, e.g. IBM's control centre in Rio de Janeiro. Tech companies have run into difficulties in trying to spread this model beyond single cities and pilot projects that they fund themselves. Cities are naturally wary of locking themselves into relationships with single providers.

In parallel, the open data movement has gained traction worldwide, prompting many city governments to release their data through open data portals as part of a transparency agenda. These initiatives are often the starting point for cities moving into the smart city domain, as they see the potential to leverage this data to stimulate innovation from the wider city ecosystem. But this movement has also run into difficulties in trying to reach the full potential of a 'data economy'. Much of the most valuable data in a city is held by asset owners with little incentive to provide this data for free, particularly as doing so comes with privacy and security risks.

These issues around proprietary and open systems are giving rise to technical and business model innovations that seek to encourage interoperability and open access and while providing incentives to innovate. For example, Manchester and Helsinki are partners in SynchroniCity, a European project to establish single digital market for internet of things through a shared, open source data architecture.

ICT is closely linked with data collection and analysis. ICT creates the infrastructure for services built on exploitation of data. New York's Mayor's Office of Data Analytics is a primary example of this (see example box).

Many more cities rely on ICT and data to implement their smart city strategies, including Chicago, Ningbo, Johannesburg, Ghent, and more. This signifies that deployment of smart technologies and the accompanying data analytics remain at the core of the smart city.

#### Innovation and crowdsourcing

'Softer' enablers such as an innovation ecosystem and crowdsourcing applications and solutions from citizens are being increasingly deployed to achieve strategic aims - an approach which is likely to increase as city authority budgets become more constrained. The Helsinki Smart Region strategy explicitly states the importance of innovation for achieving the region's economic, environmental and social goals:

"There is a need to create strong regional innovation ecosystems as platforms for collaboration, learning and co-creation, as well as testbeds for rapid prototyping of many types of user-driven innovations, based on transformative and scalable systems."<sup>39</sup>

Tel Aviv's focus on innovation and crowdsourcing is also seen as a creative way to deliver smart city projects with limited budgets and finance. The Inter-American Development Bank recognises Tel Aviv's ability to deploy its start-up ecosystem in order to deliver solutions that do not require large public expenditure:

"One of the greatest strengths of Tel Aviv's smart city is its ability to harness the potential of its thriving, innovative start-up ecosystem to drive solutions to pressing needs. For example, the city is supporting at least three transportation apps. The benefits of this collaboration are threefold: it provides a great service to citizens, which is continuously improving due to market demand; it decreases public expenditure; and it supports and encourages new, innovative businesses"<sup>40</sup>

Fostering and using the innovation ecosystem in smart cities is therefore used to both generate economic growth and stimulate local solutions that can be tested and scaled at a lower cost.

### Improving core infrastructure

For other cities, improving the quality of core infrastructure, such as sanitation and water supply, are at the core of their smart city ambitions. From our selection of cities, Pune focused on this enabler, reflecting the focus of India's Smart Cities Mission on core infrastructure. For Pune, this means investing in future-proof infrastructure that can provide greater quality of life:

“Pune aspires to become one of the most liveable cities in India by solving its core infrastructure issues in a “future-proof” way, and by making its neighbourhoods beautiful, clean, green, and liveable.”<sup>41</sup>

### CONCLUSION

Our study finds that the shift in the discourse around smart cities, from technology-led to city-led, has been mirrored in the ambitions of smart city strategies created over the last five years.

Furthermore, our analysis of their drivers shows that quality of life, citizen empowerment and safety are important to many of the officials that are leading smart city strategies. This suggests that the shift towards citizens is being championed by those charged with driving these strategies forward.

City authorities have at their disposal a raft of levers and enablers, which on analysis are not being fully utilised. These include those around procurement and spatial planning. City authorities procure millions of pounds of services on an annual basis, yet very rarely is much thought given to how the scoping of such services can be enhanced through digital technology. Similarly in spatial planning, little attention is given as to how planning policies can encourage developers to roll out digital infrastructure.



India's Smart City Mission is directing \$7bn of central government funding towards smart city initiatives in Indian cities. The objective of the programme is to 'promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions'. Core infrastructure here is defined as:

- i. adequate water supply
- ii. secure electricity supply
- iii. sanitation, including solid waste management
- iv. efficient urban mobility and public transport
- v. affordable housing, especially for the poor
- vi. robust IT connectivity and digitalization
- vii. strong governance, especially e-Governance and citizen participation
- viii. sustainable environment
- ix. safety and security of citizens, particularly women, children and the elderly
- x. health and education.<sup>42</sup>

<sup>27</sup> Written interview with São Paulo officials in the Municipal Secretariat for Innovation and Technology

<sup>28</sup> Written interview with Younghoon Choi, Chief Information Officer for Seoul Metropolitan Government

<sup>30</sup> UN Habitat, 2012/2013 State of the World's Cities Report "Prosperity of Cities", [mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=3387&alt=1](http://mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=3387&alt=1)

<sup>31</sup> Interview with Gartner specialist on technology in Africa

<sup>32</sup> Joburg 2040 strategy, e.g. <https://thesa-mag.com/features/infrastructure/city-johannesburg-metropolitan-municipality-delivering-big-city-vision/>

<sup>33</sup> <http://techplan.cityofchicago.org/executive-summary/>

<sup>34</sup> <http://www1.nyc.gov/html/onenyc/index.html>

<sup>35</sup> Ibid.

<sup>36</sup> Interview with Roope Ritvos, Director at Forum Virium Helsinki

<sup>37</sup> Berlin strategy, [http://www.stadtentwicklung.berlin.de/planen/foren\\_initiativen/smart-city/download/Strategie\\_Smart\\_City\\_Berlin\\_en.pdf](http://www.stadtentwicklung.berlin.de/planen/foren_initiativen/smart-city/download/Strategie_Smart_City_Berlin_en.pdf)

<sup>38</sup> <http://www1.nyc.gov/site/analytics/initiatives/disaster-response-resiliency.page>

<sup>39</sup> [http://www.uudenmaanliitto.fi/files/14178/Helsinki\\_Smart\\_Region\\_Paper\\_2014\\_2nd\\_Edition\\_15.9.2014.pdf](http://www.uudenmaanliitto.fi/files/14178/Helsinki_Smart_Region_Paper_2014_2nd_Edition_15.9.2014.pdf)

<sup>40</sup> IADB report, <https://publications.iadb.org/handle/11319/7718>

<sup>41</sup> <http://www.punsmartcity.in/?wicket:bookmarkablePage=:Com.SmartCity.Page.Internal.Cityvision>

<sup>42</sup> 'Smart Cities, Mission Statement and Guidelines', Ministry of Urban Development for India, June 2015

# 4

## HOW SMART CITY STRATEGIES ARE MADE

In this chapter, we explore the approach towards creating a smart city strategy. The research showed that there are primarily two types of approaches – collaborative and top-down.

### 4.1

#### THE COLLABORATION APPROACH

The Collaboration Approach usually involves a wider stakeholder engagement process, which could also evolve into the creation of a public-private smart city network or working group, e.g. in Berlin, Dublin and Toronto. In the 21 cities we studied, those in Europe, North and South America, Africa and Australia produced their smart city strategy through a collaborative process, which we call the ‘Collaboration Approach’. It is the result of consultation across council departments and with other public sector organisations, private sector, academia, and to a limited extent citizens themselves.

In Toronto, which is currently creating its smart city strategy, a Smart Cities Working Group has been set up to consult over 35 organizations, spanning industry, academia and other orders of government, in order to determine what “smarter” could mean for them. This approach reflects Toronto’s long-standing culture of collaboration. The City has been working closely with its stakeholders and pioneered many “cluster initiatives” such as in Financial Services, Fashion and Design, Healthcare, etc. It is approaching “smart” as a similar cluster and is looking to better understand, leverage and strengthen its “smart ecosystem”.

Similarly, Dublin has set up an Advisory Network with a business focus, to advise on the creation of the Smart Dublin Strategy.

Both Toronto and Dublin started the process of creating a strategy by gathering information

about what’s already happening in the city to feed into the strategy. Integrating the great things happening in the city and identifying its strengths can form the basis and focus of the smart city strategy. Chief Data Officer of Ghent, Bart Rosseau explains, “You should start with the DNA of your city, what data and tech are there, and engage people”.<sup>43</sup> He goes on to stress the importance of shaping the goals of the strategy by engaging citizens, government and other stakeholders. In any case, the focus should not be on the technology but on the end goal: “technology is the tool to achieve wider city goals”.<sup>44</sup>

The largest scale of engagement during the strategy creation process we have witnessed is in Pune, where 3.5 million people were engaged through an innovative campaign over 45 days. Multiple channels were used, including online platforms for voting and door-to-door engagement with citizens.<sup>45</sup>

### 4.2

#### THE TOP-DOWN APPROACH

The Top-Down Approach to creating a strategy is an internal process, focussing on the engagement of relevant city departments. In the Asian cities we interviewed, the strategy was developed by a special-purpose committee or government agency responsible for creating and guiding the implementation of the strategy. We call this the Top-Down Approach. This is usually related to a statutory requirement for a strategy. This top-down approach also enables cities to scale solutions more quickly and thus instil market certainty.



In May 2016, **Toronto** organised a Smart Cities Summit to launch its Smart Cities Working Group (SCWG), a diverse group of leaders from the public, private, not-for-profit and academic sectors. The goal of the summit was to catalyse the vision of what 'smarter' means for Toronto, establish a forum to leverage local smart city events, and develop a survey of five city divisions to benchmark against international peers. These deliverables fed into a report and recommendations to stakeholders on how to take the Smarter Toronto agenda further, e.g. by creating a strategy and establishing a Smarter Toronto Board. This Call to Action paper was launched at Toronto's May 2017 Smart Cities Summit, attended by 250+ businesses, government and academia leaders.

In cities in Asia, strategies are usually created by a specific department within local government. In Jakarta, for example, the Jakarta Governor was responsible for the strategy creation but is currently working with the remaining government agencies to ensure implementation occurs. Similarly, in Seoul the strategy creation was led by the Office of the Chief Information Officer in cooperation with related departments. The Digital Strategy Committee consisted of IT experts, urban planners and professors.

### CITY NETWORKS

The notion of creating a smart city strategy is novel to most cities. Strategy formulation requires more than taking inputs from stakeholders and balancing interests – it calls for learning and experimenting in ideas that are usually confined to theory. Officials and strategists are reaching out to each other through networks to accelerate and share their learning, and in so doing bring their city to the cutting edge. The list of city networks that cities are using to learn about smart cities is long.

City networks also form an important channel for encouraging standardisation across cities. Interoperability and standardisation are significant challenges for creating new solutions that can be sustained at scale. Networks like Open and Agile Smart Cities strive to establish principles and standards across cities that would allow solutions from one city to be deployed in another. It is likely that these networks will play a role in establishing the dominant technologies and standards of the future.

Examples of city networks with smart city coverage:

- C40
- CityNet
- City Protocol Society
- Eurocities
- ICLEI – Local Governments for Sustainability
- INTA – International Urban Development Association
- Leading Cities
- Project consortia networks, e.g. SynchroniCity
- Open and Agile Smart Cities
- Smart Cities Council
- Standards networks, e.g. City Standards Institute
- United Cities and Local Government
- 100 Resilient Cities



NINGBO

**Ningbo** in China has a committee which develops the plan and establishes principles and focus areas every five years. The agencies under the city government have to follow the guidance and principles, with the support from the Smart Cities Development Coordination Office, to develop more specific initiatives and turn them into pilots or 'business-as-usual' services.

In another Chinese city, **Wuhan**, the development of the strategy was undertaken internally within the city authority. However, once completed its execution and delivery was given over to a specially commissioned body, the Wuhan Smart City Institute (WSCl). The WSCl is a joint venture, forming a limited company between the city government and universities, who provided initial resourcing.

The national government plays a key role in this top-down approach. In China, the Ministry of Housing and Urban-Rural Development (MoHURD) launched the National Smart City Pilot Programme in November 2012. In August 2014, the National Development and Reform Commission (NDRC) with another seven ministries jointly issued a guidance document, the Guidance on Promoting the Healthy Development of Smart Cities<sup>48</sup>. The policy provides guidance to cities for smart cities development by setting out development ideas, principles, main objectives and information security concerning smart cities.



WUHAN

## CONCLUSION

The process for creating a strategy needs to be tailored to the local and to a lesser extent the national context. A collaborative approach is more likely to result in greater long-term participation by the citizens as the process provides the basis to improve levels of awareness, ownership, transparency and credibility. More often than not this approach develops a strategy that is tailored more directly towards citizen needs and therefore has a greater chance of achieving improved outcomes for those who live and work in the city. Moreover, the collaborative approach can tackle one of the most important implementation challenges for smart city projects - the need for buy-in from multiple diverse stakeholders<sup>47</sup>.

This collaborative approach will almost always take longer to complete and require greater levels of resources. In rapidly urbanising areas however, e.g. in China, the length of time involved with a more collaborative approach is seen as unlikely to meet the need for more rapid decision-making. Whilst this meets an immediate need, there is emerging concern that a rebalancing towards a more collaborative approach may be needed to ensure citizens' needs are more fully met. Citizen engagement, user-centred design methods and co-creation could help governments understand the most pressing issues better.

<sup>43</sup> Interview with Bart Rosseau, Chief Data Officer, City of Ghent

<sup>44</sup> Ibid

<sup>45</sup> [http://www.business-standard.com/article/current-affairs/pune-on-a-smart-mission-after-3-false-starts-116061500918\\_1.html](http://www.business-standard.com/article/current-affairs/pune-on-a-smart-mission-after-3-false-starts-116061500918_1.html)

<sup>46</sup> Written interview with São Paulo officials in the Municipal Secretariat for Innovation and Technology

<sup>47</sup> Frost and Sullivan's September 2016 "Smart City Pulse" identified 'Gaining consensus/buy-in from diverse stakeholders' as the #1 challenge for organisations fulfilling a smart city project, based on a survey of 60 organisations.

<sup>48</sup> [http://www.sdpc.gov.cn/gzdt/201408/120140829\\_624003.html](http://www.sdpc.gov.cn/gzdt/201408/120140829_624003.html)

# 5

## HOW SMART CITY STRATEGIES ARE IMPLEMENTED

### 5.1

#### PRESENTING THE STRATEGY

Cities are, of course, complex. In a city like Toronto, there are over 80 arms-length organisations, including business improvement areas, agencies, corporations, and arenas, which deliver public services. The challenge in any city is to integrate service delivery around a single unified vision aligning stakeholders and partners. This creates the basis for improved information sharing between organisations as well as better decision-making.

But this may not require a formal smart city strategy document. Given the vibrancy of smart city activity across cities with or without a strategy, we have also considered in our study those cities that are operating without a smart city strategy.<sup>49</sup> We have therefore identified three types of strategy: stand-alone, embedded and unwritten.

Cities that are writing a smart city strategy for the first time usually create a separate strategy to start with. This helps focus the attention on a specific document and clarify the thinking around this new topic. As strategies mature, they could become embedded within the overall city vision.

#### Stand-alone

In most cases having a separate smart city strategy is associated with the existence of a single department or unit that is responsible for delivering the strategy and has an associated budget for smart city initiatives.

A stand-alone strategy can be more flexible and forward-thinking, since the strategy (in most cases) does not need to comply with statutory requirements. The risk, however, is that separate strategies might not be as well integrated with the rest of initiatives in the city, while the document itself might become a reference

material that is not incorporated into the overall city vision.

Out of the 21 cities which we included in our research, 12 had a separate smart city strategy. This trend was particularly evident in Europe and Asia, where five and six cities respectively had a stand-alone strategy. In Chinese cities, this stems from national government legislation, which require cities to create a smart city document. In Europe, having a smart city strategy is still a novelty. This usually leads to the creation of a separate strategy as a starting point.

#### Embedded

Embedding a smart city strategy into the overall vision document of the city is associated with linking the city's smart city goals to the broader commitments of the city. In our research, only five cities had made their smart city strategies part of the cities' overall vision. These cities were spread across all regions – Europe, Africa, North and South America and Australia. What they all had in common was the view that a city should have only one strategy and all “sub-strategies” should feed into this.

New York created a stand-alone strategy in the early 2010s but has now integrated its digital plans within the overall city vision in order to help think about technology more holistically. Every department and arm's length agency is driven by technology to achieve its goals. “Smart city” is a way to achieve goals rather than the goal itself.

For Ghent, it is important that digital needs are integrated in the overall city strategy because technology is only a tool used to deliver wider city goals. First, a city needs to understand what assets it has and what digital projects are already happening in the city. Then, it needs to identify related projects in a specific priority area and build on that. Making links between projects and making data-driven decisions ensure that the strategy is delivered coherently.<sup>50</sup>



**Manchester** has a history of digital innovation and success in the knowledge economy. When the smart city agenda rose to prominence, smart city ideas easily landed in the city's new urban strategy, "Our Manchester". But the city has not, to date, adopted a formal strategy specifically for smart city. Instead of waiting for formal adoption, the city has actively bid for and initiated large scale smart city projects, learning along the way. Manchester was able to do this because the city benefits from strong support for innovation from leadership, a productive local digital economy, and pre-existing networks of businesses that are engaged in the digital, innovation and smart city agenda. Thus, if a major function of a city strategy is to align and engage key stakeholders, in Manchester's case they were already aligned thanks to its legacy of innovation.<sup>51</sup>

Now Manchester has a portfolio of large, high-profile projects like CityVerve and Triangulum, and there is movement towards creating a strategy for pulling these projects together and building on them – a move from a pragmatic, opportunistic approach towards a considered, systematic approach. This step will allow Manchester to build greater collaboration across the city.

A similar process has been undertaken in Sydney, whereby 'smart' is woven into the overall Sustainability strategy for the city. And São Paulo's smart city strategy is also embedded in the current formulation of the Municipal Strategic Plan 2017-2020 (*Programa de Metas*).

### Unwritten

Not every city has a written document that outlines their smart city strategy. In some cases, cities start with specific projects, e.g. open data to demonstrate value. Four of the cities that participated in our study did not have a strategy at the time of our research. While Dublin, Manchester and Toronto were in the process of creating a strategy, Amsterdam and Nairobi had no plans to create one. In Amsterdam, the smart city agenda is expressed through the Smart City Amsterdam online portal, which lists all smart city projects in the city and all partners involved in their delivery. Nairobi, on the other hand, has been guided by Kenya's national digital strategy and has deployed disparate projects.

Why cities choose to implement projects without strategies varies. One reason is the desire of certain departments to spearhead and develop smart city initiatives without necessarily waiting for an overarching vision to guide their smart city activities. In other cases, a strategy could be informal, i.e. not laid out in a strategy document but through meetings, minutes and agreed actions on different projects. The effectiveness of operating a smart city programme without a strategy varies across cities, depending on the commitment of the city leadership and departments to engage in this agenda.





BERLIN

The Smart City **Berlin** Network leads the coordination of smart city initiatives across multiple departments, in conjunction with the Senate departments for Economic Affairs and for Urban Development. The network is led by Berlin Partner, a public-private partnership owned by private companies and the Senate for Economic Affairs and the Senate for Urban Development (responsible for implementing the strategy). Berlin Partner is responsible for managing smart city projects, making them visible and connecting them.



GHENT

In **Ghent**, smart city initiatives are linked to strategic objectives and ambitions. Each department is responsible for different aspects of those objectives, and reports accordingly. City managers on every level report on the progress of their initiatives. Responsibilities are linked to designated budget and personnel, who report on the progress of objectives against a set of criteria published as open data. This aids the transparency of the local government and creates a sense of accountability. Celebrating small successes is key to creating a sense of ownership of each project.

## 5.2

### GOVERNANCE AND DELIVERY MODELS

The governance and delivery of each smart city strategy that we studied varied across and within regions, but two common models emerged:

- Smart City Unit or Technology Office
- Arm's length organisation or public-private partnership

Our data indicates that governance models adopted are related to the approach taken to create the strategy. When a collaborative approach has been used to create a strategy, this has usually led to the creation of an arm's length organisation that leads the delivery of the strategy. There appears to be a weaker link between having a Smart City Unit or Technology Office and using either a top-down or collaborative approach to create the strategy.

#### Smart City Unit or Technology Office

In ten cities, spread across Europe, North and South America, Africa and Asia, the governance and delivery of the strategy was the responsibility of a specialist Smart City Unit or a Technology Office. Most of these departments are newly set up and operate independently.

In cities in which the strategy is embedded within the overall city strategy, each department has to report against the success of its initiatives, and the use of data and technology to achieve these goals is at the discretion of the department.

#### Arm's length organisation or public-private partnership

For three cities, the implementation of the smart strategy is the responsibility of an external or an arm's length organisation. These organisations are usually managed with representatives from the local authority and their operations are divided into work streams. These work streams are agreed between the local authority and the private sector companies that take part.

Five cities, which are still developing their smart city strategies, have not defined the body that will be responsible for the strategy governance and delivery, and therefore are not included in the classification.



JOHANNESBURG

In **Johannesburg**, the strategy is led by the Group Strategy Policy Co-ordinations and Relations department, commonly known as GSPCR. It has a strategic role to direct and facilitate overall strategy rather than implement individual interventions. GSPCR sets targets and approves project funding for projects that pursue these targets. Departments and municipally owned companies are responsible for implementation of specific projects and/or initiatives, e.g. smart meters are rolled out by Johannesburg City Power.



TEL AVIV

In **Tel Aviv**, the Computing and Information Systems Division (CIS) leads the implementation of the smart city strategy. The CIS division works with other departments to understand their main challenges and identify specific smart solutions. The Office of the Chief Knowledge Officer, in charge of data collection, management, and dissemination, is also involved in delivering many of these projects. A further participant in the process is the Chief Information Officer (CIO), who is in charge of the municipality's digital policies, tools, and vision. All activities are united by the political backing of the Mayor, who ensures that the smart city projects are aligned with the wider city goals.

In several cases, e.g. in Dublin and Manchester, the regional authorities create the smart city strategy for the local authorities in the region. From this perspective, the regional smart city team is responsible for creating toolkits and sharing best practice but local authorities ensure that implementation occurs as suitable in their area. 'Digital' champions are placed in some departments to ensure consistency.

We see an opportunity in using existing funding on new technologies that could improve efficiencies and achieve cost savings. Procurement practices geared towards procuring more innovative solutions could help leverage existing budgets to deliver smart city projects.

## 5.3

### FINANCE

Finance for smart city projects is intrinsically linked to the governance and delivery structure of the strategy as well as commitment from the respective national administrations. In Asia, for example, where the four cities in our study had a dedicated smart city unit, they also had a dedicated budget associated with the delivery body. In Europe, funding primarily comes from national government or EU funding but smart city projects are not usually dedicated a specific budget; each is funded on a case-by-case basis. In North America and Africa, the interviewed cities relied more heavily on private investment.

### Local government finance

Funding for smart city projects is still carved out of overall city or department budgets, either funding through existing spend, (IT, lighting contracts, etc.) or through designated 'smart city' spend, which is typically relatively small. It is therefore difficult to identify the exact amount local authorities allocate to such projects. Even though a lot of the finance for smart city projects comes from an overall city budget, cities have found it most beneficial to have a designated budget for innovation initiatives.

Often, cities that have a smart cities unit also have a designated budget for smart city activities. In Jakarta, smart city projects have a yearly budget of IDR 30 billion (USD\$3m), allocated from the local government fund and grants from universities.<sup>52</sup> Similarly, in Johannesburg, smart cities funding is allocated by the Mayor in each 3-year budget, and departments submit proposals for smart city projects.<sup>53</sup>

Chinese cities receive designated budgets from the national government to deliver their smart city projects. Ningbo, for example, was allocated an annual budget of CYN 300 million (ca. £30 million) in 2014.<sup>54</sup>

### National government and EU funding

Many cities still rely on either national or in the case of Europe, EU funding. Several countries have launched or are considering launching Smart Cities competitions, including the UK, India, Australia, the US, and Canada. This demonstrates the increasing importance of the smart city agenda for national governments, which perceive smart cities as a growing market that can create export opportunities and attract foreign investment.

The European Commission has since 2011 invested nearly €550m in smart cities programmes. Dublin, for example, has so far secured €3-4m of European funding from four Horizon 2020 projects and INTERREG projects, and Manchester – £25m, excluding private sector leverage.<sup>55</sup> The availability of EU funding is a driver for creating a smart city strategy in the first place.

In the US, the Department of Transportation launched the Smart Cities Challenge in 2015, committing up to \$40 million to one winning city. Similarly, Australia is launching the country's Smart Cities & Suburbs programme in 2017. With total funding of \$AUS 50 million over 4 years.<sup>56</sup> Canada's federal government has also launched an 11-year \$300 million dollar smart cities challenge. India launched its Smart Cities mission in 2015 with total funding of US\$7.1 billion, to be allocated through competition to 100 cities.<sup>57</sup>

Although competitions are a good source of funding, they usually instil a sense of competitiveness between cities. This precludes cities from sharing best practice and learning from one another's mistakes. Successes are more often shared than failures.

National governments are also encouraging or requiring that cities leverage public funding by increasing the participation of private sector in delivering smart city projects. This is particularly evident in the US, where the \$40 million Smart Cities Challenge was used by cities to leverage an additional \$500 million in private and public funding to implement their smart city visions.<sup>58</sup>

### Private sector participation

Businesses' experience with participating in the delivery of smart city projects has been dominated by pilot projects often utilising public sector grant funding. Research has found that both cities and companies are already suffering from "pilot sickness"<sup>59</sup>. Local authorities need to make more strides towards scaling pilot projects and procuring large-scale solutions. The problem is the lack of awareness of the opportunities which digital could provide within cities, which has led to a level of inertia within many cities. In addition, existing procurement regimes do not allow businesses to innovate as they are focussed more on outputs rather than outcomes. It is important that the city is able to articulate clearly the challenges it faces and develop a more open way for the market to respond.

Second, the Council needs to send a clear message that it is open to engage with businesses and create a clear path for this engagement. In many cities, including Dublin and Chicago, the City has set up advisory networks to use as forums for communicating with businesses on a regular basis. At the same time however, cities have low level of "investment readiness" for digital technologies and therefore struggle to engage effectively with the market.

In Chicago, technology demonstrations are carried out by a consortium of local government and private companies. City Digital is responsible for identifying pilots that can bring value to the city and have potential to scale up. The mission of the consortium is not only to run pilots but also to develop solutions for the marketplace and export these to other cities.<sup>60</sup> The work of the consortium is also backed by \$70 million<sup>61</sup> budget both from the Federal Government and in-kind contributions from corporate partners. Since both the City and companies are equity partners, it is in their financial interest to make pilot projects a success. The plan would be to export these solutions to a collection of 6-8 cities with previously identified problem statements.

## 5.4

### IMPLEMENTATION CHALLENGES

Cities still face difficulties implementing their smart city strategies or individual projects. Sometimes this depends on the extent to which cities think about implementation when they are writing their strategy. We have identified a series of ongoing challenges both through our interviews with cities and our broader experience in implementing smart city strategies.

#### Procurement

Procuring solutions is an ongoing issue. Creating a tender document is a long process and sometimes the technology specified has already become obsolete by the time the tender is issued.

Innovative procurement practices are being trialled in some cities. In New York, for example, the City allocates part of its budget to trialling a new technology or new approach. For up to 3 years, a department can trial the technology without undergoing the normal tender process or competitions. At the end of the 3 years, the project is evaluated against a set of measurement criteria specified in the beginning of the demonstrator. If the technology trial is successful, it can be procured through traditional procurement practices.

Dublin is also encouraging alternative procurement through 'procurement by challenge' competitions. Funded by the Small Business Innovation Research (SBIR) funding, the local authority has launched competitions to source innovative solutions. Successful ideas can win up to €100,000 to develop and test their idea. The first round of the competition focussed on the challenge of increasing cycling on the roads of Dublin.<sup>62</sup>

#### Changing traditional practices

Changing the way in which a local government operates requires strong leadership with commitment and skills to implement change within city departments. This along with capacity and resources to adopt new operational practices is at the heart of cities' implementation challenges.

Several cities have mentioned the importance of spreading the knowledge about the benefits of digital within councils themselves. According to Zohar Sharon, Chief Knowledge Officer of Tel Aviv, "in order to have good citizen engagement,

you need good government engagement."<sup>63</sup>

Educating civil servants about the opportunities of digital is key. This includes teaching council staff how to share data, knowledge and resources safely, and how to leverage technology. Attitudes need to change as well in order to move from a reactive to an intelligently proactive governance.

Councils around the world have approached their workers' empowerment in similar ways. For example, many have appointed Digital Champions across departments to 'spread the word' about the technological or digital solutions that are available in those specific areas. They also serve as the 'ears' of City Hall in terms of understanding the attitude and concerns with regards to technology within these departments.

#### City networks

Cities too often share what they wish others to see – the success stories. Real gains, however, also come from sharing what went wrong in a more open manner. Industry typically remains closed to cross-industry sharing, assuming they are more unique than is often the case. Sharing knowledge about new ideas and technical solutions, what works on the ground and what does not, is vital to ensure a broad uptake of innovative solutions.

Several city networks have been created to facilitate knowledge sharing between cities, for example Open and Agile Smart Cities, City Protocol, 6Aika, etc. These can be international, regional, or national. Both national and regional governments could do more to support these, e.g. through nationally or regionally-led strategies. Finland's Six City Strategy (6Aika) enables cities to connect and share knowledge but also to gain the same level of international recognition as larger global cities and create a critical mass to engage the private sector and funding bodies.

#### Lacking local capability to coordinate activities

There is a tendency for local authorities to work in silos; local policies can conflict with smart city roll-out and therefore inhibit progress. Uncertainty within the private sector is caused by policy uncertainty. In addition current approaches are insufficiently agile to cope with a more entrepreneurial approach to planning, and to respond to the pace of change in demographics, societal expectations, and technology. One of New York's key objectives is to enhance local knowledge and capabilities in selecting and operating smart city projects. More details are available in Appendix A.



DUBLIN

In **Dublin**, the Chief Executive Officer has set up a €0.5m innovation fund in the capital budget for the next 3 years. This is dedicated to small business innovation research (SBIR), which is crucial for experimenting with new ideas. This demonstrates to industry that the city is serious about 'smart'. SBIR funding can help the city trial innovative ideas; however, there also needs to be a long-term strategy on how such ideas will be deployed at scale.



SÃO PAULO

Under existing federal law in **São Paulo**, government can use open call competitions to gather proposals for innovative solutions from the public. However, it has proven difficult to implement these solutions at scale. This issue may be addressed by the development of a new procurement option called technological order (*encomenda tecnológica*), which sits under the Federal Law for Innovation.<sup>64</sup> Once regulated, the instrument would allow the government to order innovative solutions that do not yet exist from specific companies with knowledge in the field. The contract would then be remunerated depending on the results delivered by the contractor.<sup>65</sup>

### Risk profile of investment

In most cases, new investments will be needed for uptake of smart city solutions. However, due to budget constraints and increased demand for public services, the public sector has limited finance. This means that new market-oriented strategies of public-private cooperation must be developed and cities must seek greater levels of external investment. The investment community seeks certainty, and scale. However, most cities, at an individual level, presently deliver neither of these. Chicago is one city that has managed to form a PPP that allows both the city and private companies to come together as equity partners, test solutions and export them in order to achieve a return on investment both for the city and for the private companies.

### Interoperability and standardisation

There are various efforts to create smart city standards, including by the British Standards Institute and the International Organization for Standardization. However, there is a lack of agreed means to support interoperability across city systems. This is inhibiting cities from being able to, for example: optimise real-time multi-modal transport data; integrate renewable energy sources into the grid and enable more dynamic operations; reduce variation in building systems; really exploit location-based information; increase citizen participation, or provide common platforms for developers.

Standardisation can provide confidence in the market as it can support industrialisation of solutions; align approaches between city systems; speed up replicability, and help to create scale. As such, different forms of standards (guides, frameworks, protocols and technical specifications) must be employed. For smart cities, the variety of systems, the increased integration across them, and the dynamic and growing volumes of shared data, present a particularly challenging context.

<sup>49</sup> The European Commission has found that 240 cities in the EU-28 have "significant and verifiable Smart City activity"; ref: "Mapping Smart Cities in the EU", European Commission, 2014

<sup>50</sup> Interview with Bart Rosseau, Chief Data Officer for City of Ghent

<sup>51</sup> Interview with Manchester City Council official

<sup>52</sup> Interview with Jakarta city official

<sup>53</sup> Interview with Johannesburg city official

<sup>54</sup> Discussion with Ningbo city officials

<sup>55</sup> Interview with J Cudden, Smart City Manager at Dublin City Council

<sup>56</sup> <https://www.transportation.gov/sites/dot.gov/files/docs/Smart%20City%20Challenge%20Lessons%20Learned.pdf>

<sup>57</sup> <https://cities.dpmc.gov.au/smart-cities-program>

<sup>58</sup> <http://www.livemint.com/Politics/OBAdsQSOHayTH9FoYeW9VL/Narendra-Modi-launches-smart-city-projects-in-Pune.html>

<sup>59</sup> Arup (2016), *Growing smart cities in Denmark*

<sup>60</sup> <http://www.citydigital.org/>

<sup>61</sup> <https://news.northwestern.edu/stories/2014/02/northwestern-helps-chicago-secure-lab/>

<sup>62</sup> <http://smardublin.ie/smartchallenges/challenge-title-goes-here-14/>

<sup>63</sup> Interview with Zohar Sharon, Chief Knowledge Officer of Tel Aviv

<sup>64</sup> Federal Law 13.243/2016 [http://www.planalto.gov.br/ccivil\\_03/\\_ato2015-2018/2016/lei/l13243.htm](http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/l13243.htm)

<sup>65</sup> Written interview with São Paulo officials

# 6

## RECOMMENDATIONS

The landscape of smart city strategies is still vibrant, and cities around the world are creating strategies, implementing projects and creating local government capabilities to govern and deliver smart city projects. Based on the challenges and best practices that emerged during our research, we would propose the following recommendations to cities embarking on a smart city journey:

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### **1. ESTABLISH STRONG LEADERSHIP TO DEVELOP CAPACITY WITHIN LOCAL GOVERNMENT**

The biggest issue that stops cities from advancing their smart city ideas or projects is the lack of leadership commitment to the agenda. Gaining political buy-in is key to developing capacity and skills within the council to initiate and deliver smart city projects at scale. For example, the Mayoral backing of New York's digital agenda by Mayors Bloomberg and de Blasio was key to the development of their data analytics capabilities. This political support should then be translated into a full programme of transformation that enables the change of traditional practices, such as procurement and siloed departments.

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### **2. EMBED YOUR SMART CITY STRATEGY WITHIN STATUTORY FRAMEWORKS AND WIDER CITY PLANNING**

Creating a separate smart city strategy is advisable when cities are creating such a strategy for the first time. This helps focus thinking and wider engagement on a distinct topic and create a vision. However, in the long-term, embedding the smart city strategy within the wider city plan will help embed the plan for using digital technology within each department, or cross-departmentally. In some cases, embedding the strategy within the wider city plan makes it statutory and thus ensures that it is implemented and funded. More fundamentally, the regulatory and policy framework of the city should proactively address the opportunities and challenges of the city - a city plan that proposes new smart city ideas without addressing the challenges raised by technological transformation is incomplete.

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### **3. WHEN CREATING YOUR STRATEGY, CONSIDER A COLLABORATIVE APPROACH, COUPLED WITH STRONG POLITICAL SUPPORT**

The approach to creating the strategy needs to be tailored to the local context. A degree of collaboration with citizens, businesses, third sector organisations and academia brings more value to the process. This approach will both help governments understand stakeholders' challenges, and what their expectations of the smart city strategy are. Stakeholders will also be able to contribute to the strategy creation process with their knowledge, talent and skills. This is a good way to enhance the capacity of the local authority, which often lacks the right resource levels to embark on such a wide programme.

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## 4. TAP INTO CORE CITY FUNDING BY REGULARLY SCANNING EXISTING CITY ASSETS AND BUDGETS

City authorities procure millions of pounds of services on an annual basis, yet very rarely is much thought given to how the scoping of such services can be enhanced through the incorporation of digital technology. Tapping into core city funding budgets, e.g. for lighting, waste management, can allow departments to procure innovative digital solutions to help them reach their department targets. This also requires building capacity within each department to develop an awareness of the existence and benefits of smart city solutions within their areas of work.

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## 5. CREATE A PLAN FOR PRIVATE SECTOR ENGAGEMENT AND LONG-TERM COLLABORATION

The smart city market is growing rapidly and companies are developing innovative solutions to tackle urban problems. However, cities are not always quick to adopt these. Our engagement with the market has shown that the route to local authorities is not always clear and in most cases there is no obvious person to approach with regards to smart city solutions. Creating a clear 'front door' for businesses and an accompanying private sector engagement plan is necessary if cities are to embrace private sector innovation and investment. That front-door is most likely going to be a dedicated person or team.

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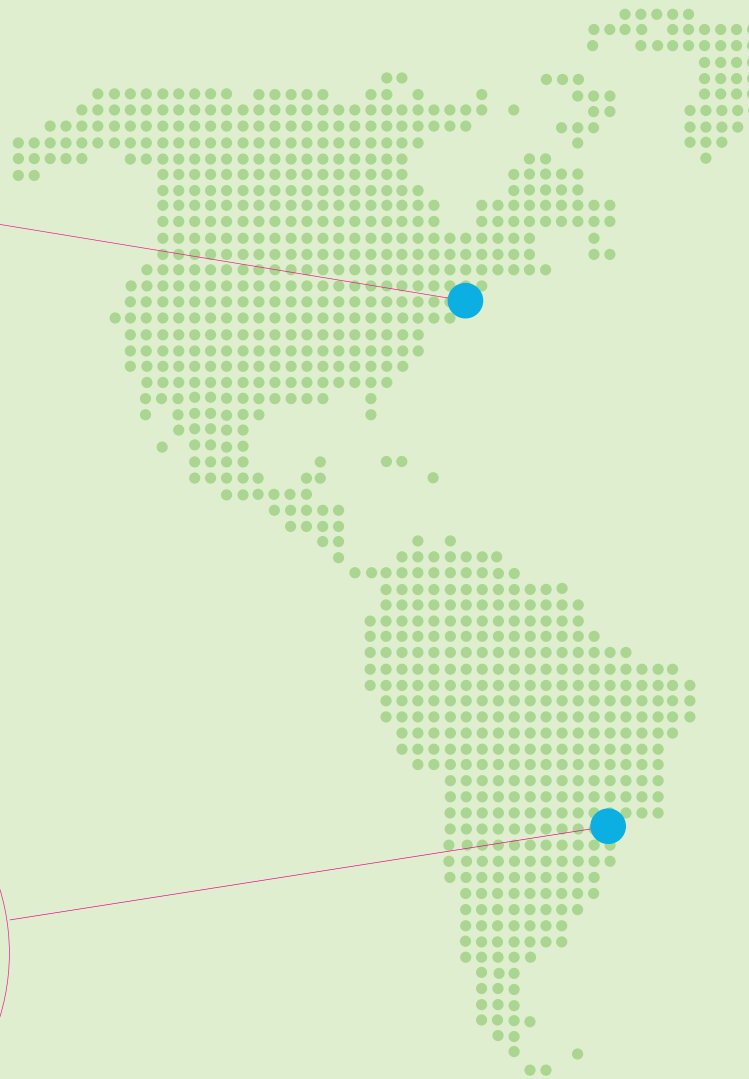
This report aims to help cities understand how their counterparts around the world are approaching the smart city agenda. We have seen how cities from very different settings have approached the creation and implementation of smart city strategies. We have seen some of the challenges they face and some of the steps they are taking to mitigate them. These findings will equip city leaders with the knowledge they need to make a start on their smart city journey. But building this knowledge base is an ongoing endeavour. For that reason, Future Cities Catapult is undertaking research in a variety of related areas, from impact assessment to large scale demonstrators. We will continue to do so as we seek to guide cities and shed light on the smart cities market.

# APPENDICE

APPENDIX A: NEW YORK



APPENDIX B: SÃO PAULO





# ES

## APPENDIX C: BERLIN



## APPENDIX D: MANCHESTER



# APPENDIX A: NEW YORK CITY

<b>Main ambition</b>	Social: Equitable, inclusive city
<b>Drivers</b>	Safety
<b>Approach</b>	Collaborative
<b>Key enabler</b>	Data analytics
<b>Governance</b>	Smart City Unit / Technology Office
<b>Strategy type</b>	Embedded



## WHY CREATE A SMART CITY STRATEGY?

The smart city strategy, which is embedded within OneNYC – the city’s overarching strategy, recognises that technology is an enabler of everything the government does. According to Jeff Merritt, Director of Innovation at New York City, just as every company is becoming a technology company, every city government must become tech-enabled. However, smart city work is not only about this use of technology; it is about leveraging new IoT tech and database decision-making to create efficiencies, as well as creating a more proactive rather than reactive government.

The key rationale for New York in creating a smart city strategy is to ensure the safety of its residents and visitors. This is seen as the primary objective of government and critical to ensuring high quality of life. Creating efficiencies, creating jobs and attracting investment are also key motivations behind the creation of the strategy.

Most importantly, the strategy needs to support the overall city vision for balancing growth, sustainability, resilience and equity.

## WHAT IS AT THE CORE OF THE STRATEGY?

The city is committed to using technology and data analytics to ensure that New York is an equitable, inclusive city.

New York aims to create a series of tools that empower experts within the city’s agencies to improve the city in their day-to-day work. This includes (1) leveraging smart technology to improve data-driven decision-making, (2) ensuring that the city’s agencies are using technology responsibly by understanding its complexity and engaging communities accordingly.

### Key strategic objectives

New York’s smart city strategy has three key objectives:

#### 1. Education

Ensuring that city workers understand the complexity of smart city solutions and what it takes to deploy them effectively and responsibly;

#### 2. Enabling

Effectively leveraging technological tools, procedures and processes as well as community engagement;

#### 3. Economic development

Enabling the city to use these technologies to promote the city-as-a-platform and thus grow the local economy. There is an aim that this will also attract businesses to the city.

More specifically, the smart city strategy is broken up into various components, which have different processes. The strategy acts as an umbrella for a series of initiatives, each of which is targeted at various challenges associated and inherent within the smart city agenda.

Each component addresses a specific need:

#### 1. Educating about complexity

This led to the creation of IoT guidelines and then Tools & Resources that include sample contract language, checklist, inventory of IoT systems, etc.

#### 2. Marketplace

A recognition of the challenge that government is not fully aware of what smart city technologies are available

#### 3. Neighbourhood Innovation Lab

Addressing government failure to do effective piloting and testing of these technologies

#### 4. Calls for Innovation

A recognition that current procurement process did not enable government to procure the right types of technology; this stream of work aims to tackle the challenges with regards to the operationalisation of these technologies, i.e. procurement, private sector engagement, government capacity and knowledge, the way of testing and making decisions about technology.

### HOW WAS THE STRATEGY CREATED?

New York's current smart city strategy is an evolution of the Digital Roadmap that the city published in 2013. This was a high-level document, recognising that technology is now playing a bigger role in government. However, it was not a strategy outlining how technology could be leveraged by government.

The Mayor's Office of Technology and Innovation led the creation of New York's smart city strategy in its current form. The consultation process around the creation and updating of the smart city strategy is part of a much broader public engagement programme that takes place annually to refresh and update the city's overarching strategy – OneNYC.

### HOW IS THE STRATEGY IMPLEMENTED?

The key to implementing any city strategy is to understand where different city visions and objectives overlap and cut across siloes, rather than duplicate actions. According to Jeff Merritt, this has been an important focus of the De Blasio administration – strong effort to cut across traditional silos and take a holistic view. In 2014, Mayor De Blasio created an executive level document that explains where technology and innovation touch government regardless of agency or team. This was followed by weekly technology coordination meetings in which key figures representing different departments get together to give updates on technological developments within their work. Each quarter a high-level principal, e.g. Deputy Mayor or Commissioner, would also attend the meetings to ensure that they are in the loop.

The main challenge to coordination is scale – the City currently has 350,000 employees, it is therefore difficult to keep track of everybody who is working on the plan at all times. Smart city tools also need to be deployed to make sure that knowledge is spread and actions are coordinated. Each department has metrics for tracking and defining the goals within each plan. These are then incorporated into OneNYC.

### HOW ARE SMART CITY PROJECTS FINANCED?

Smart city projects are mostly financed from the overall city budget, presented by the Mayor and approved by the City Council. A series of non-profit organisations also raise additional external funding. Public-private partnerships (PPPs) are also common, e.g. through contractual relationships, franchise of public assets use. However, any money that enters the City budget cannot be earmarked for specific purposes, and there is no smart cities revolving budget. There are a variety of mechanisms to incentivise companies to enter into cost-sharing and revenue-sharing agreements with the city.

The City has a \$85bn budget, which is focussed on growing the economy. Each agency has its own budget and they are required to define how they might achieve their individual goals, e.g. technology costs, personnel costs and adaptation over time. Once these costs have been set, all requests are sent to the Budget Office. City Hall can only set high-level goals and vision; but agencies make operational decisions on how best to achieve these within their budget constraints, e.g. whether they would deploy smart bins, or optimise processes.

### PROCUREMENT

The City currently has a process for carving out budget for trialling a new technology or new approach. This is an attempt to formalise the piloting process in procurement by setting up a demo project for up to 3 years without going through the normal RFPs or open competitions. Pilots are evaluated based on measured progress, and if successful, undergo the traditional procurement process.

# APPENDIX B: SÃO PAULO<sup>66</sup>

<b>Main ambition</b>	Economic: Technology for service efficiency
<b>Drivers</b>	Quality of life, Empowerment
<b>Approach</b>	Collaborative
<b>Key enabler</b>	ICT infrastructure improvement
<b>Governance</b>	Smart city unit / Technology office
<b>Strategy type</b>	Embedded



## WHY CREATE A SMART CITY STRATEGY?

In early 2017, São Paulo's new municipal administration created the Municipal Secretariat for Innovation and Technology (SMIT). The purpose of the new department is to develop and implement new methods, instruments and information and communication technologies (ICTs) to enhance the quality of citizen services and promote social participation in the development of a smart city. SMIT is responsible for some of the "Economic Development and Management" goals within the Municipal Strategic Plan 2017-2020.

Following our written interview with city representatives, the key drivers that influenced the São Paulo current public administration in establishing a smart city strategy were identified as Efficiency (reducing costs of infrastructure and service provision, understanding city dynamics in real time), Citizen empowerment (increasing transparency, citizen engagement and governance, digital skills, innovation, creativity), and Economic (creating jobs and attracting investment).

## WHAT IS AT THE CORE OF THE STRATEGY?

SMIT was created to connect different public and private stakeholders in

order to advance creative partnerships between government, civil society and the public sector. It also aims to simplify administrative processes and promote e-services as a means to reduce the bureaucratic workload of the municipal government enabling the delivery of better services to citizens.

In practical terms, this means projects to provide digital public services such as online company registration. The city is also pushing ahead with digitisation of education, and more surveillance equipment for security.<sup>67</sup>

## Key strategic objectives

The strategy reflects the unique factors of São Paulo by addressing:

- The accessibility of technology to all city residents
- The integration of all services provided by municipal bodies
- The multiplicity and complexity of interests of public and private stakeholders
- The establishment of rules for ICT Governance
- The decentralised nature of the municipality
- The need to strengthen the cultural and creative activities already taking place in São Paulo to generate new economic opportunities and diversify the city's economy.

In order to respond to these needs, the city has set the following objectives in its smart city strategy:

- To ensure public authorities' responsiveness to citizens' needs by adopting an evidence-based decision making process for public policies
- To articulate and integrate the different governmental stakeholders to implement multi-sectoral citizen-centred projects
- To develop open data platforms enabling a diversity of solutions for public problems
- To establish partnerships between the government, private sector and the innovation ecosystem for implementing innovative solutions in service delivery and creating new businesses
- To raise citizens' and public officials' awareness of innovation – including from a technological perspective – so they can engage actively in the construction of a smarter city.

## HOW WAS THE STRATEGY CREATED?

Creating a smart city strategy received considerable political support by the current Mayor. This agenda received wider political backing in search for greater efficiency in public management and economic competitiveness for the city.

The implementation of innovative technologies and smart city projects is being advocated and led by SMIT, which is responsible for the inclusion of the smart city agenda into the city's strategy (*Programa de Metas*) and leads the consultation with other departments and city stakeholders.

SMIT is helping and guiding the initiatives that already exist within the municipal administration and is in charge of establishing new multi-sectoral collaboration and projects for fostering innovation in São Paulo.

### HOW IS THE STRATEGY IMPLEMENTED?

SMIT is responsible for gathering all policies aiming at improving IT and innovation in the city, establishing guidelines and a common vision for those policies in order to create synergies and avoid the fragmentation of efforts in the implementation of strategic projects for a smart city. Thus, SMIT shall be responsible for strengthening governance arrangements that already exist – such as the Municipal Council for Science, Technology and Innovation – and for creating new forums to align initiatives and projects undertaken by multiple public stakeholders – such as a committee for the city's innovation labs.

SMIT innovation units engage with technology companies, the entrepreneurship ecosystem, cultural collectives and makers.

In order to ensure the implementation of the strategy, the following principles have been adopted:

#### 1. Government as a platform

The municipal government has to provide the enabling conditions and mobilise society to innovate in a collaborative way while ensuring transparency of the processes. It has to make its activities and resources available to the society so people can contribute in the search of new solutions.

#### 2. One citizen = one government

The municipal administration has to integrate its different databases and digital platforms in a whole-of-

government approach as a means to offer customised services that can respond to citizens' real demands leading to a more efficient use of public resources.

#### 3. Responsive Government

The municipal government has to act in an efficient and rapid way to respond to the requests and real needs of its citizens. It also has to develop strategic intelligence – through technological and organisational innovation – in order to anticipate its actions.

#### 4. Government as an innovation hub

The municipal administration has to bring together the different stakeholders in the innovation ecosystem as a means to provide solutions and new opportunities for economic development.

In order to monitor the programme's progress, the development of innovation indicators for the city of São Paulo is foreseen amidst the activities to be undertaken by SMIT's innovation units. Those indicators include: openness to technological innovations, citizens empowerment resulting from innovations, the strengthening of the entrepreneurial ecosystem, efficiency rate of citizen service regarding public services.

### HOW ARE SMART CITY PROJECTS FINANCED?

The total budget committed from 2014 to 2016 for projects commenced under the previous municipal administration amounts to \$115m.

Further funding sources include central government's fund for the Renovation of the Municipal Public Schools' ICT equipment, public agency funding through innovation challenges, and partnerships with research institutions for developing pilot projects are foreseen as well.

São Paulo is enjoying investment from large private partners like Cisco, which is donating \$90m to the city to go towards digitisation in schools.<sup>66</sup>

<sup>66</sup> The content of this appendix is largely based on a written interview via e-mail with São Paulo representatives.

<sup>67</sup> <http://www.zdnet.com/article/sao-paulo-mayor-outlines-smart-city-plan/>

<sup>68</sup> *ibid*

# APPENDIX C: BERLIN

<b>Main ambition</b>	Economic: Technology for service efficiency
<b>Drivers</b>	Quality of Life
<b>Approach</b>	Collaborative
<b>Key enabler</b>	ICT infrastructure improvement
<b>Governance</b>	Arm's length org / PPP
<b>Strategy type</b>	Separate



## WHY CREATE A SMART CITY STRATEGY?

Berlin is a fast-growing city with the population increasing by 50,000 people per year<sup>71</sup>. Such growth requires the city to adapt to its new infrastructure needs in order to maintain a high quality of life for its residents. The key objective behind creating a smart city strategy was to deliver cost-savings and improve the efficiency and usability of services. This calls for the city to create a strategy for the use of digital initiatives across departments. The city has therefore created an overarching smart city strategy whilst integrating smart city elements within wider city strategies, including the Energy Concept 2020, Urban Development Strategy 2030, Innovation Strategy, and Berlin Open Data Strategy.

Within this context, Peter Siebert, Project Manager of the Smart City Unit within Berlin Partner, explained that the key drivers behind creating a smart city strategy for Berlin were: (1) Quality of Life; (2) Environment; (3) Connectivity due to digitisation; and (4) Safety & Security.

## WHAT IS AT THE CORE OF THE STRATEGY?

The strategy aims to achieve higher quality of life by delivering better, more efficient services through technology.

It is about using the competences of innovators and citizens in the city and benefiting from the opportunities of digitisation. Berlin is a fast-growing, young, creative city with start-up capital and is aiming for a post-fossil fuel future. This context underpins Berlin's smart city strategy and opens up smart city opportunities such as test-beds for innovative technologies, especially around smart mobility.

## Key strategic objectives

The smart city strategy is underpinned by five areas of action:

1. Smart administration and urban society
2. Smart housing
3. Smart economy
4. Smart mobility
5. Smart infrastructure

## HOW WAS THE STRATEGY CREATED?

Berlin undertook a comprehensive consultation process to create its smart city strategy. In 2013, a smaller group from the city authority came together to discuss the benefits of a smart city strategy, how to start the process of creating it and position Berlin as a smart city. This is also when the idea to create a separate strategy emerged.

In 2014, 100 stakeholders were involved in interviews and workshop to define the major issues and challenge for Berlin as well as what the city's 'unique selling point' is. A year later, in April 2015, the city published its smart city strategy, which was also submitted as part of a successful Lighthouse project application to attract EU funding.

The result of this bottom-up approach for creating the strategy saw the growth of a Smart City Network, reaching over 100 stakeholders.

## HOW IS THE STRATEGY IMPLEMENTED?

The Smart City Berlin Network, within Berlin Partner for Business and Technology, leads the coordination of smart city initiatives across multiple departments, in conjunction with the Senate departments for Economic Affairs and for Urban Development. Berlin Partner is a public-private partnership owned by private companies and the Senate for Economic Affairs (responsible for coordinating the network) and the Senate for Urban Development (responsible for implementing the strategy).

This collaborative delivery approach ensures strong coordination across multiple departments. As an overarching

organisation, Berlin Partner is responsible for managing smart city projects, making them visible and connecting them across sectors and departments.

### Delivery channels

The Smart City Network Berlin works in collaboration with six working groups, aligned with the six focus areas of the smart city strategy. The Network identifies integrated projects that are aligned with the objectives of the strategy.

As part of the city's smart city efforts, the Mayor has established the Centre for Knowledge & Innovation Conference. Fifty professors globally are invited to set up new digitisation qualifications and R&D at the Einstein Foundation

Projects include the Smart City Districts, Urban Platform, 5G Testbed, and EURES. The 5G testbed is a consortium between the Berlin Senate, Cisco, university, telecoms and technology companies. 3D-printed autonomous buses are being tested at the 5G testbed. These were procured through an open challenge on future public transport. A Living Lab in Aldershof also demonstrates, in collaboration with technical universities, how to live together while using new technologies such as e-mobility.

EURES is a science park with a smart city focus; members of the Senate are engaged, with a continuous dialogue taking place between industrial and R&D players, e.g. eGovernment law.

### HOW ARE SMART CITY PROJECTS FINANCED?

The smart city projects are funded through a variety of sources. Berlin Partner has budget to run the Smart City Network, organise workshops, meetings, and complete studies.<sup>72</sup> Members of the Smart City Network contribute with their time and resources, including Cisco, Oracle, utilities, and SMEs. Specific budgets are dedicated to Digitalisation, 5G, and other initiatives. National funding is available through different Calls from the Ministry for Economic Development, as well EU funding and public agency funding. Berlin Partner is responsible for identifying further possible budget lines, as well as potential PPP projects.

# APPENDIX D: MANCHESTER<sup>69</sup>

<b>Main ambition</b>	Unformalised
<b>Drivers</b>	Quality of life; promoting & attracting investment
<b>Approach</b>	Unformalised - pragmatic
<b>Key enabler</b>	Innovation ecosystem
<b>Governance</b>	Technology Office
<b>Strategy type</b>	Unwritten



Manchester does not have a formalised, stand-alone smart city strategy, and while the city has adopted smart city principles, the city is largely operating as a smart city through action, rather than on paper. Manchester is home to many smart city projects with national and European scale, such as CityVerve, SMARTImpact and Triangulum. The city's success in bidding for and running these projects reflects the strength of Manchester's legacy, ecosystem and leadership, which was able to take a pragmatic approach to getting results on the ground.

## WHY CREATE A SMART CITY STRATEGY?

For Manchester, 'smart city' is a natural extension of the city's focus and enthusiasm for the knowledge economy and digital transformation. The city is recognised as a hub for the digital creative sector and sees the digital agenda as a route to economic growth. The smart city agenda takes this further, by offering Manchester a way of addressing big issues like urban mobility, demographic change and climate change.

## WHAT IS AT THE CORE OF THE STRATEGY?

Harnessing the local innovation ecosystem is the core enabler for

Manchester. That means building and procuring locally rather than buying off the shelf or through expensive service offers. This is consistent with Manchester underlying drive to support local economic growth. Enabling the ecosystem requires taking a collaborative approach across the city. As the city seeks collaboration with neighbouring local authorities, a more formalised smart city strategy is seen as a desirable next step.

## Key strategic objectives

In the absence of a formalised strategy, Manchester is guided by its community strategy, which sets an overarching vision for the city. Out of the strategy's many objectives, those that relate closely to the smart city agenda are:

1. Digital skills
2. Digital infrastructure investment
3. Citizen centred services

## HOW WAS THE STRATEGY CREATED?

As described, Manchester has been operating a large smart city programme without a formally adopted strategy, through pragmatically delivering large projects. This has served the council well as a way of quickly getting results that build on the city's legacy and strengths in the digital sector. However there is a recognition that the city could benefit

from a smart city strategy that ties to the wider agenda of the Greater Manchester region, and builds a coherence around existing and new projects. To this end, Manchester is currently lead partner in the EU's SMARTImpact project, which is expected to generate the beginnings of a smart city strategy for the city

## HOW IS THE STRATEGY IMPLEMENTED?

In keeping with the city's lean, pragmatic approach, Manchester's smart city agenda has been pursued as part of the city council's programme management, as part of business as usual. That has given smart city project managers easy access to levers within the council.

However, without a city-wide strategy, it can be difficult to have the same leverage among external stakeholders. External partnering and collaboration is likely to be made easier by the formation of working groups at the Greater Manchester level.

## Delivery channels

At a project level, Manchester City Council works in partnership with national and European partners. As an example, the UK's large scale IoT demonstrator, CityVerve, is operated as a consortium of 21 organisations.



### HOW ARE SMART CITY PROJECTS FINANCED?

The majority of funding for smart city projects in Manchester has come from external funding, either EU (e.g. SMARTImpact) or from the UK Government (e.g. CityVerve). This funding mix reflects the resource constraints facing local governments across the UK. Going forward, this mix may shift as devolution brings more budget to the local level.

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<sup>69</sup> The content of this appendix is largely based on an interview with Adrian Slatcher, Principal Resource and Programmes Officer at Manchester City Council.

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We bring together businesses, universities and city leaders to solve the problems that cities face.

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