



Smart Cities World

Infrastructure intelligence in one place



**Smart cities:
Beyond the hype**

How far away are truly
intelligent cities that improve
quality of life for citizens?

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What makes a smart city?



Siegburg, Germany

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Executive summary: Smart cities – a journey without an endpoint

Cities around the world want to use technology to improve life for citizens as well as drive operational efficiencies to make better use of resources.

They aspire to be more sustainable, resilient, safer, greener and energy-efficient and to alleviate urban ills such as congestion, air pollution and rising crime. They are also striving to banish digital divides and create more inclusive places.

How close are cities to achieving these aims and what are the lessons learned so far?

Which approaches are proving most successful? Which vertical applications are cities prioritising and deriving most success from? What are the challenges to achieving a truly integrated smart city? And where do we go next?

These are some of the questions we explore in this report. The analysis is based on a survey of 105 respondents who fall into one of two groups: the first are city leaders and the second are executives from telecommunications companies, systems integrators and other suppliers.

Smart cities reach an inflection point

The results suggest that while advances have been made, many cities are at what can be described as an inflection or tipping point in their smart city journey. This means that the decisions and actions they take next are likely to have a significant impact on their future success.

Illustrated with real-life use cases from cities around the world, *Smart cities: Beyond the hype* aims to act as a barometer for smart city progress. We highlight noteworthy successes to date, flag up the challenges that still exist and put forward a set of recommendations to guide decision-makers.

We begin by asking: Do any truly smart cities exist yet?

Report author: Sue Weekes
News Editor, Smart Cities World

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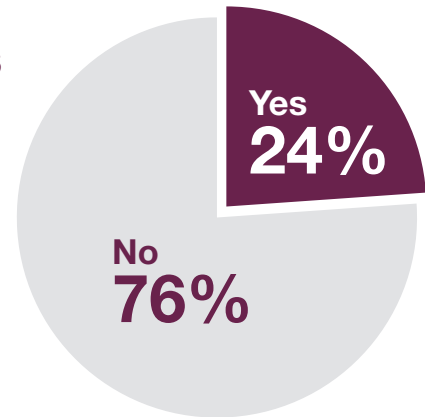
Do smart cities really exist?

The majority of respondents say no but they note there are a number which have made extremely good progress.

Three-quarters of city officials and a similar proportion of overall respondents do not believe true smart cities really exist yet.

No such thing as a smart city?

Do any truly smart cities exist yet?



It is clear from the research that there is no agreed definition of a smart city. Does a true smart city have to be built from the ground up such as Songdo in South Korea, as one respondent suggested, or can any city make the transformation?

Respondents felt that many cities have begun the journey to becoming smart but, the activity is mainly in pockets that address individual areas such as connectivity and mobility.

There was broad agreement that to be truly smart, a city must have an overarching infrastructure in place that integrates various public services and positions citizens and businesses as central to the vision. This was described as an “aspiration” and a “nirvana” rather than a reality, though.

Respondents talked about “constantly moving” goalposts when it comes to realising smart objectives. “Huge structural change” was also cited as a major challenge. Some said truly smart cities are still ten years away, while one city official declared that no city can ever reach the status of being a smart city because it has to continually evolve.

Cities looking smart

Those singled out as having achieved a high level of smartness included Austin and San Diego in the US, Barcelona in Spain, Bristol in the UK, Dubai and Singapore, which was named smart city of the year at Smart City Expo World Congress in 2018.

Cascais, in Portugal, was singled out for its success in cutting traffic congestion and the Finnish capital of Helsinki for its citizen-focused approach.

The lack of consensus over a definition led to a call for more adherence to smart city standards, such as the ISO37120 *Sustainable development of communities – Indicators for city services and quality of life*. This was

launched by the International Standards Organisation in 2014 and revised in 2018. It measures 17 city themes, including: economy, education, governance, health, safety, environment, finance, transportation and fire and emergency response.

What approaches are cities taking?

Almost a third (31 per cent) of city representatives said that they have an integrated/overarching smart city strategy. A slightly higher number overall (36 per cent) said they or their city clients have an overarching strategy.

The majority of cities, however, are not taking an integrated approach to smart city transformation. Nor do they have an overarching strategy that looks beyond individual solutions and envisions how different city verticals will one day be integrated with each other.

This aligns with the survey finding that the majority of cities are typically responding to specific drivers and challenges and therefore prioritising individual vertical applications.



Almost a third of cities say they have an integrated, overarching smart city strategy

While addressing pressing challenges is understandable, the lack of an integrated and overarching strategy could have serious implications for what a city can achieve further down the line. A more joined-up, holistic and coordinated approach at the beginning, coupled with open systems, paves the way for further vertical applications to be added more efficiently and cost-effectively.

More than two-fifths (44 per cent) of city representatives said they are prioritising vertical applications by tackling the city's biggest challenges first, compared to only a quarter of respondents overall. A quarter of city representatives also said that having infrastructure in place was a major factor (compared to 20 per cent overall) in how they prioritise verticals.

Given the budget cuts and financial pressure that some councils and municipalities are working under around the world, cost seemed less of an issue than one might have expected. Less than one in 10 overall and only 6 per cent of city respondents said they would prioritise the cheapest applications.

The need to engage with citizens

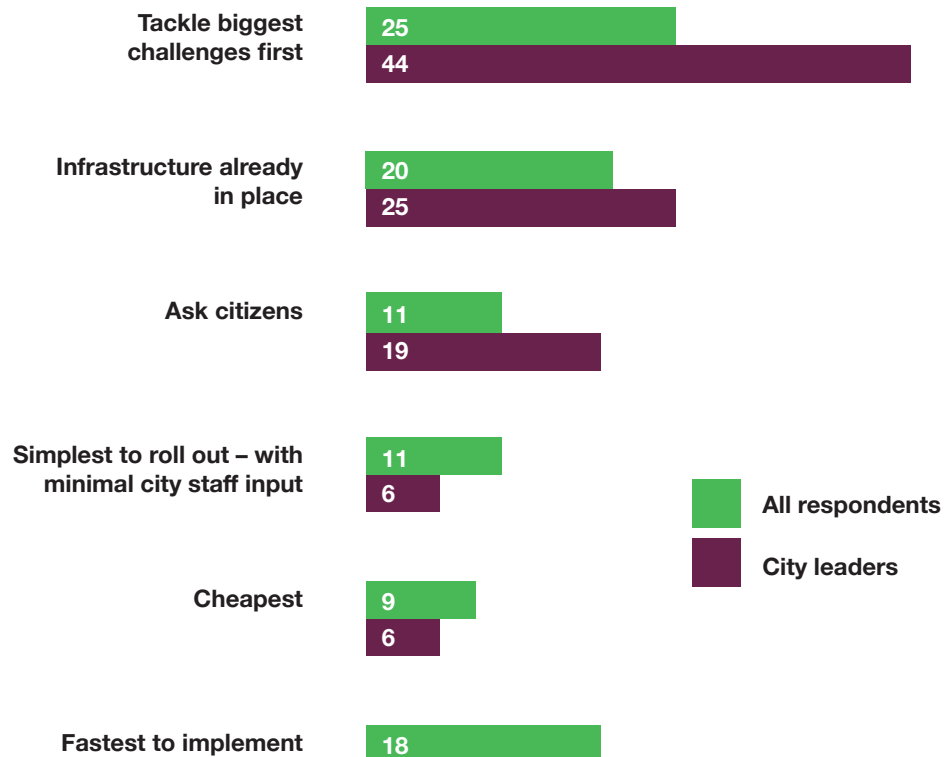
There are a number of initiatives around the world that are trying to demonstrate a citizen-led smart city approach. These include the European Innovation Partnership on Smart Cities and Communities (EIP-SCC), which is developing the Societal Engagement Toolkit (SET) to help local authorities bridge the gap between them and their citizens and enable them to co-create.

In the US, the People-Led Innovation initiative, launched by the Governance Lab (GovLab) and the Washington DC-based Bertelsmann Foundation think-

Less than a fifth of cities ask citizens what should be prioritised.

Prioritising verticals

How do you prioritise verticals to digitise and connect in the city/how do you see your customers prioritising?



Cities must find ways to engage people from all groups of society

SmartCitiesWorld, has launched a toolkit that provides city officials with methodologies for involving citizens in technology projects.

However, the research results show there is still a long way to go to scale this approach more broadly. Less than a fifth of cities (19 per cent) ask citizens what should be prioritised and this figure dropped to 11 per cent overall.

If smart cities are to deliver on their promise to improve quality of life for citizens and address their real needs, cities must find ways to engage and involve people from all groups of society.

A tale of two smart cities

Barcelona combines an overarching vision with citizen participation

Often considered one of the world's smartest cities, Barcelona began implementing smart city initiatives in 2012. It has evolved not only in progressing its vision of a smart city but also in its approach to creating one.

In 2016, Barcelona City Council created the Commissioner's Office for Technology and Digital Innovation and a Digital Innovation Office followed. This department is responsible for defining Barcelona's technology and innovation policies and for "rethinking the smart city". It is led by Francesca Bria, commissioner for digital technology and innovation, who says this isn't just about technology but putting the citizens' needs and the city's challenges at the core of the strategy.

Barcelona's approach is evolving from a top-down process to a bottom-up one, promoting "collective intelligence" and involving all citizens through its participatory democracy platform, decidim.barcelona.

Barcelona's City Council created the Barcelona Digital Plan to see how open source technology and data could solve a range of urban challenges with citizens, tech communities, tech companies and academic researchers all contributing.

Bristol, UK: Building an open, programmable city

From the outset, Bristol Is Open, a joint venture between Bristol City Council and the University of Bristol, has had an overarching aim to become an "open, programmable city".

Within this, it has established three elements: a smart city research and development platform which allows companies of all sizes to test new technology; a city operations centre that provides integrated monitoring and management of city services; and citizen-centric solutions.

Bristol wants to give citizens more ways to participate in and contribute to the way their city works. It calls the concept City Experimentation as a Service. With citizens' views and needs very much in mind, it developed the Bristol Approach that supports people to work together to identify the knowledge, technology and resources needed to tackle real-world problems in the city.

Bristol Is Open CEO Julie Snell's mantra is that it is not enough to have the technology: "You have to ask how it will make a difference to people's lives."



What's driving smart cities?

The biggest driver for smart cities is improving mobility and reducing congestion, with 56 per cent of city representatives and 49 per cent overall citing it in their top three drivers.

Transportation and mobility (including autonomous vehicles) is ranked as the highest priority vertical to digitalise or connect by more than half of respondents overall (56 per cent).

In terms of city priorities, city-wide connectivity and public broadband came at the top, given that connectivity underpins everything in a smart city. There are digital divides to be overcome but it is encouraging that more than three-fifths (62 per cent) are prioritising connectivity.

**The biggest driver
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improving mobility.**

Meeting the congestion challenge

The focus on transportation is consistent with research findings around the world, which highlight the magnitude of the problem. According to the Inrix 2017 Traffic Scorecard, the largest and most detailed study of congestion, drivers across 1,360 cities spent around nine per cent of their travel time “staring at the bumper in front of them”, with the average speed in congestion just 8.9mph.

It isn't just the economic or personal cost of congestion troubling cities, though – congestion also contributes to poor air quality due to pollutants in vehicle emissions. This issue is moving up the agenda for many cities. London is one of those leading in this area and has launched what it claims is the world's most advanced and comprehensive network of air quality monitors. In April 2019, London will also introduce the world's first Ultra Low Emission Zone.

As a vertical sector, mobility benefits from a huge amount of ongoing innovation, including better use of data, on-demand options such as ride-share and bike-share, mobile ticketing, connected and autonomous vehicles (CAV) and electric vehicles. It is also a field which can make a huge impact on citizens' quality of life on a day-to-day basis.

The move to e-gov and digital services

The second biggest driver for smart cities overall was the demand from citizens for more and better digital services, although it ranked lower among city leaders (38 per cent and 49 per cent respectively).

A third of city representatives said they are prioritising digitalisation of internal systems and processes.

Improving public services and digitalisation is fundamental to becoming a smart city and it's clear that many cities need to show more commitment and investment in this area.

The United Nations compiles a survey every two years to look at how governments can use digital services and ICT technologies to build sustainable and resilient societies. In 2018, this research included initiatives in specific cities for the first time. Moscow topped the list, followed by Cape Town and Tallinn. Muscovites have access to over 222 public digital services provided by city authorities. In 2017, citizens in Moscow used these services over 259 million times, a 31 per cent increase on 2016.

Meanwhile, Dubai is measuring its e-government initiatives by gauging their effect on citizen happiness. Smart Dubai has managed to cut its use of paper by nearly three-fifths (57 per cent) in the first phase of a paperless strategy. A Happiness Index measuring customer experience at call centres and online reveals that 90 per cent of citizens are happy with services.

Making cities attractive to talent and investors

Among city representatives, the joint second-biggest driver for smart city initiatives was the need for cities to compete when it comes to funding, talent and investment (43 per cent).

With so many city rankings in existence today, whether it be the smartest, best for tech, best for wellbeing or most liveable, there is growing competition among cities around the world. These rankings can be accompanied by a degree of cynicism in some quarters but they nevertheless make mainstream news headlines and help to bolster a city's global reputation. Hence, attracting funding, investment and talent might not seem like the most obvious smart city driver but all these factors contribute to a city's overall financial and economic health, and ultimately its ability to grow and invest in smart initiatives.

Getting behind citizen safety initiatives

The joint second-biggest driver for more than two-fifths of city representatives is to improve citizen safety. However, the research suggests that some cities aren't mirroring this with actions, given public safety is only prioritised as a vertical by just over a third (35 per cent) of respondents overall and a quarter of the city representatives.

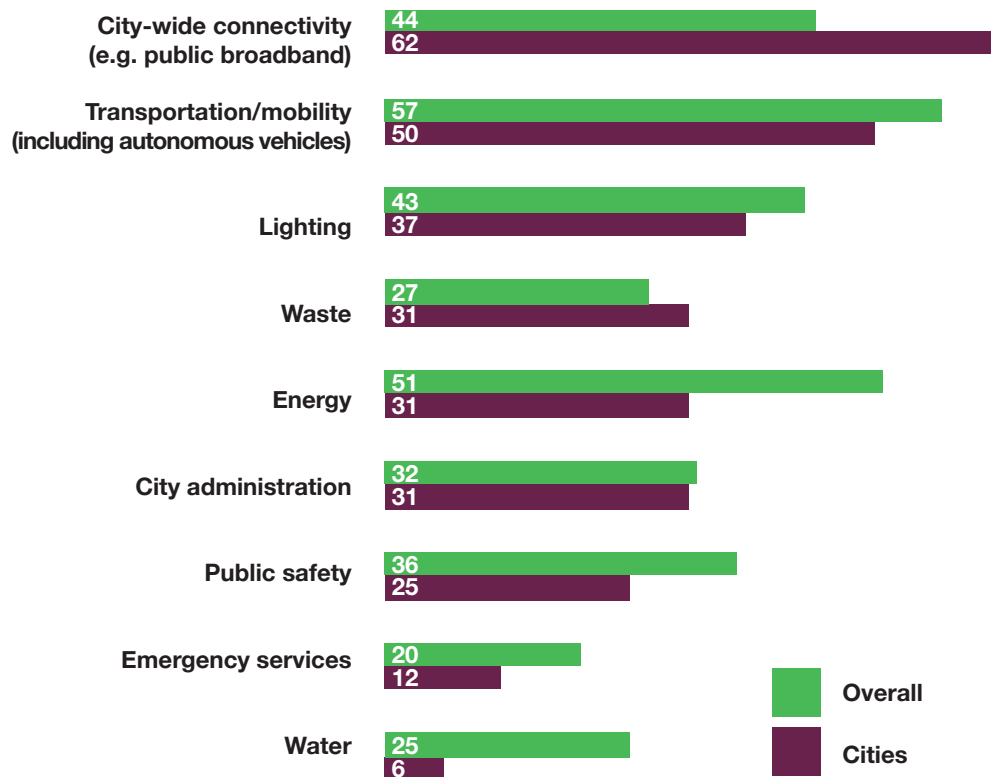
While video surveillance systems and emerging technologies in areas such as facial recognition and predictive policing raise privacy concerns, they are increasing efficiencies. The Australian city of Ipswich has reduced the time it takes police to review information by using a deep learning platform that transforms video into searchable and actionable intelligence in minutes compared to hours. Elsewhere, numerous cities have put infrastructure in place that enables streetlights to automatically brighten at the scene of an accident and which can also send an alert to first responders.

City competition heats up

	Smartest city	Best tech City	Most liveable
1st	New York	New York	Vienna
2nd	London	San Francisco	Melbourne
3rd	Paris	London	Osaka
	IESE Cities in Motion Index	Savills Tech Cities 2019	Economist Intelligence Unit's Global Liveability Index 2018

Smart city priorities:

Which city verticals are you prioritising/seeing your customers prioritise to digitise and connect?



Cities need to get behind climate action

Like it or not, cities must step up to the plate when it comes to climate action as they are seen as key agents of change. The authors of a summary of key findings from the Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C, said cities “offer a unique opportunity” to limit global temperature rise.

There was more emphasis on the part cities must play in achieving climate and environmental objectives in the overall sample than from the cities themselves.

More than a third (36 per cent) said adhering to climate goals/targets was among their biggest drivers, compared to only an eighth of city representatives.

Achieving sustainability and improving resilience was noted as a priority by 37 per cent of city representatives and 41 per cent overall.

Increasingly, there are incentives and support in place for cities that include climate action in their smart city goals. The Bloomberg Foundation’s \$70 million American Cities Climate Challenge, for example, offers technical assistance and a support package of up to \$2.5 million to help cities achieve their carbon reduction goals.

A number of cities are setting themselves ambitious carbon reduction targets. Boston in the US and the Finnish capital of Helsinki, for instance, are aiming to be carbon-neutral by 2050 and 2035 respectively.

By setting climate action and environmental goals, cities are also helping to improve public health but disappointingly this ranked relatively low as a driver for city representatives at less than a fifth (marginally higher in the overall sample at 22 per cent).

Why lighting can show the way

Streetlighting is an ideal starting point for many smart city strategies. It was ranked as the third most popular vertical by city representatives but trailed behind connectivity and transportation by a significant margin, with more than two-fifths citing it (compared to 43 per cent in the overall sample).

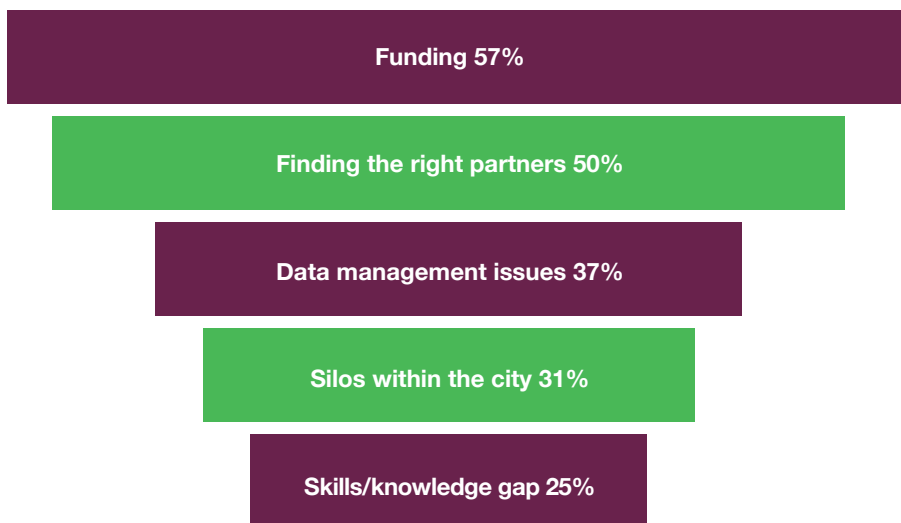
A survey undertaken by the Northeast Group found that smart streetlights are well on their way to becoming the backbone for many smart city initiatives.

Given that having infrastructure already in place was the second biggest determining factor for how smart city verticals are prioritised, city authorities should perhaps consider moving lighting up the agenda in terms of verticals.


Creating an integrated smart city strategy

Funding is by far the biggest challenge to taking an integrated smart cities approach, and was cited by more than half in both groups. Clearly, many cities lack the budget to do anything other than address their immediate priorities. This explains why the majority of smart city projects have focused on specific areas such as connectivity and transportation.

Challenges to an integrated smart city strategy



Streetlighting is an ideal starting point for many smart city strategies.



There is clearly a need for fresh thinking when it comes to financing models – particularly if cities are to scale up and roll out pilot projects more widely.

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These new models are likely to emerge over the coming years. In the meantime, in a report entitled *The Challenge of Paying for Smart City Projects*, professional services firm Deloitte has put forward a new financial framework for smart cities comprising a number of elements, including: a robust business model, a creative revenue model, identifying value capture and asset recycling upfront, innovative funding options and private sector participation.

Private-public partnerships

Public-private partnerships (PPPs), where cities and private enterprises share both the risk and the reward involved in smart city projects, are likely to continue as a popular option.

A number of smart city labs are also popping up, backed by a private-public partnership, with one of the newest in downtown Montgomery, Alabama, USA. The City of Montgomery, is working with the Area Chamber of Commerce and others through the Montgomery Smart Community Alliance. The PPP is focused on building a smart city from the ground up.

The Thailand Board of Investment (BOI) has also announced a PPP plan for Digital Park Thailand, a key component of the Thai Government's Eastern Economic Corridor development initiative.

Finding the right partner

Half of city representatives cited finding the right partner as an obstacle to achieving an integrated strategy. The myriad of smart city application and service providers means it can be a difficult market to navigate.

Further, where these relationships are in place, they're not always delivering the best results at this stage. More than half of cities said they had experience of private-public partnerships but none classed them as 'very successful'. Two-fifths of cities (40 per cent) say they were 'less successful' than they hoped. Three-fifths described them as 'quite successful'.

In the survey overall, only around an eighth described such partnerships as 'very successful' and almost half as 'quite successful' but this still leaves a large portion of the sample feeling the PPP approach didn't deliver.

The reasons for failure included:

- lack of clear objectives and priorities from the outset;
- limited scope and inability for cities to be flexible;
- political issues;
- lack of knowledge on the part of cities;
- lack of investment and lack of money for pilot projects;
- too much focus on austerity to look forward;
- not a priority for the city and time-consuming for the supplier;
- lack of alignment across departments.

The Portuguese city of Lisbon was highlighted as a success story because it was able to create a close relationship with an ecosystem of private partners. Being able to work with "city visionaries" was also given as one of the key ingredients required for success

Data management and skills could become a major issue

Data management issues seem less of a concern when it comes to implementing an integrated smart city strategy than might have been expected (at 37 per cent for cities and 28 per cent overall), given the siloed approach many cities are still taking.

Similarly, skills and knowledge gaps in the city organisation are currently cited as less of a challenge, with only a quarter of cities flagging them as a barrier to integration.

It may actually be that neither have yet materialised as problem areas because cities are still in the early days of the smart city journey. Certainly, as time goes on, cities will need to bring in expertise in areas such as data analytics and data science if they are to succeed.

There were some key differences in the two groups of respondents when it came to the challenges of implementing an integrated smart city strategy. City representatives saw standards and creating a measurable smart city roadmap as less of a challenge to the integrated approach, cited by just six and 19 per cent of respondents, respectively. This compares to just under a quarter and more than a third in the overall sample. This may be because city representatives haven't yet considered creating a roadmap and are less concerned about smart city standards than the more pressing issues of funding.

Some of the most successful integrated smart city approaches have begun with a roadmap. Crucially, an overarching vision provides a way of keeping projects on track and measuring success. London's chief digital officer, Theo Blackwell, has launched a report card to help citizens to chart the actions of the Smarter London Together roadmap. The Smart Cities Council also provides guidance on creating a roadmap in its *Smart City Readiness Guide*.

Smart city benefits, realised

Despite some of the challenges we have raised, there are good reasons to keep the faith. Many of our respondents said they are already seeing the difference that smart technology can make to quality of life.

For city representatives, the top smart city benefit that is already being realised is that the city is more attractive to visitors and businesses (56 per cent). This is followed by citizens feeling more connected to their city and cities saving energy. In the overall sample, the biggest benefit was saving energy (45 per cent), followed by being more attractive to visitors and businesses and citizens feeling more connected.

It would be fair to assume that underneath the banner of "attractiveness", cleaner, healthier and safer cities are making a big contribution. However, when considered as individual factors, all of these ranked lower in the city representatives' sample, with only 12 per cent stating that smart initiatives are making their cities tangibly safer. Further work is required for cities to understand which smart applications have increased attractiveness and how they can measure this.

Although almost all smart city applications will naturally contribute to a city's attractiveness to visitors and businesses, some cities are putting specific measures in place to achieve this aim.

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Helsinki is working on a virtual city experience project in a bid to become the “virtual capital of the world”, helping to grow its tourism industry and build on its significant start-up culture. Mayor Jan Vapaavuori said that he wants Helsinki to be seen as the city that “best capitalises on digitalisation”.

Make the business case

Only a quarter of city representatives and a similar number from the overall sample said that they were achieving cost-savings through their smart city initiatives.

This could be due to being at the early adopter stage. As we discussed in the earlier section on what’s driving smart city initiatives, funding is typically not the priority in the early days. However, as funding was also flagged as the overriding challenge to putting an integrated smart city strategy in place, it will become more important for city officials to be able to build a business case for their future projects. This will almost certainly go beyond cold, hard cash alone but cities will need to find ways to demonstrate return on investment (ROI).

Energy and mobility

Energy is one of the smart city verticals being prioritised by most respondents so it is encouraging that these initiatives are paying off. Saving energy features strongly as an early benefit in both groups. Progress in this area is aided by the fact that energy savings are one of the easiest benefits to measure, and therefore to make a business case for.

Given the importance of mobility as a priority for survey respondents, you might expect that more cities would be seeing the benefit from the work done in this field. However, less than a third overall and under two-fifths of cities say that they are already seeing notable results. This is most likely due to the complex nature of the issues and the number of different factors involved in reducing congestion. Here, we expect results to emerge more gradually.

Copenhagen, for example, has one of the lowest congestion rates in Scandinavia but its smart mobility initiatives began just under 10 years ago.

Room for improvement

City safety is undoubtedly an area in which cities have to work harder to bring improvements. There is no shortage of technology to help them to do this and more than a third of city representatives said it is one of the vertical applications they are prioritising. With only 12 per cent registering it as one of the benefits realised, city authorities need to look closely at why initiatives aren’t proving as effective as they could.

Only a quarter of city representatives are achieving cost-savings from their smart city initiatives.

Now what? Conclusions and recommendations

There is no endpoint

The majority of cities are still at a relatively early stage on their smart city transformation in terms of both strategy and the benefits they are realising. All cities are on a lengthy and often complex journey. There will be no endpoint but rather a constant evolution. However, it is still important to set clear objectives and milestones to monitor progress and refocus where necessary.

Stay open

Many cities are at an inflection point and what they decide today will have a huge impact on what they can achieve tomorrow. Open digital architectures and an ecosystem approach are therefore recommended so that data and commands can be shared between systems.

Appoint a smart city champion

With the majority of cities lacking an overarching smart city strategy, there is a danger of both siloed thinking and actions. This approach makes it impossible for cities to extract maximum value from their systems and data. The most successful smart cities typically have a champion or visionary in place, such as a chief innovation, digital or technology officer. This leader will take a holistic view when it comes procuring systems and applications, and will drive a cross-departmental and collaborative culture in the city.

Start with the citizen

Many cities are better at talking about how important citizen engagement and participation is than actually proving it. It is important to put formal strategies, programmes and mechanisms in place not only to canvas citizens' views but also to enable people to practically engage in smart city programmes.

Explore funding options

Funding was cited as the biggest barrier to implementing an integrated smart city strategy and respondents also noted a lack of investment for pilot projects. There is no way that cities can afford to do everything themselves. It is important to explore alternative financing arrangements and models, and pick the right partners.

Use what you've got

Having infrastructure already in place can help cities save money and demonstrate early ROI. Street lighting, for example, is ubiquitous in most cities and can act as a foundation for a broader smart city strategy.

Look for and share best practices

Cities and their ecosystem of suppliers must share best practices, as everyone is still on a learning curve. It's crucial for city leaders to impart what they learn from their own initiatives and to seek out collaboration with peers across the world.

What cities decide today will have a direct impact on what they can achieve tomorrow.

