



WELCOME TO THE SMART CITY

The urban centres of the future are happening now.

PAUL REEVE, ECA's director of business services, explains what the 'smart city' concept means – and how it offers opportunities for contractors

Cities already house more than half of the world's inhabitants, and they are set to host three-quarters of a much bigger global population by 2050. The future is going to be about what happens in fast-growing cities, quite a few of which will be 'smart cities'.

Leading technology manufacturer Siemens, and other key industry players, have put a lot of work into assessing the possibilities for truly smart cities (SCs). Siemens' vision encompasses vital areas such as:

- **Smart energy:** Offering significant energy savings across electricity and gas distribution systems, through state-of-the-art automation and real-time information management. Energy-management services will make buildings, homes, companies, renewable energy, and electric vehicles efficient – and will be smartly connected to the energy network. Demand-response capabilities will help balance supply and demand across the energy network.
 - **Smart buildings:** Offering high-quality energy and security management, energy 'dashboards' (quick views of the current situation and trends), and active energy controls for homes and buildings. Power, ITC, process, and building and security management systems will all be integrated
 - **Smart mobility:** From traffic- and transit-management systems that deliver real-time visibility across the transport network, to efficient and safe electric-vehicle recharging infrastructure – with intelligent tolling and congestion charging, and significantly reduced travel time
 - **Smart public services:** Ranging from flexible city lighting to intelligent security measures, and weather and transport information, plus other innovative services for citizens
 - **Smart water:** Energy savings and reduced losses through water-network and loss-management systems, leak and pollution detection, and storm-water management
 - **Smart integration:** Connections between different operating systems to provide tools, dashboards and greater intelligence. These will allow a city authority to improve its services, and give citizens, visitors and companies targeted, high-quality information
- It's a very impressive list – and the technology to deliver it will rely on both powerful wireless internet connections, and the still-nascent Internet of Things (IoT – see 'Net gains the Internet of Things' box, page 39). In a smart city, masses of managed data will need to be delivered, wirelessly, to people, city authorities, and regulated service suppliers. Timely information will also be supplied to the public through social media networks (see 'How do you build a smart city' box).

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Those who are agile and have an up-skilled, multifaceted workforce will be in the best place to win the work

Increasingly, this 'big data' communication and processing will link to intelligent, automatic actuation and robotics. This will enable the IoT to make useful things happen in the city, as and when required. Service providers will also have access to real-time information – such as smart-meter data – that allows utilities to offer variable-price, time-of-use tariffs to end users.

The integration of these capabilities will need to be supported through a new wave of 'smart' communication and automation industry standards.

Energy and security – two key aspects of a smart city

Urbanisation will make cities the main focus for future energy strategies – because cities cannot run without energy. Smart cities will need a 'smart energy grid' to ensure resilient supply, improve efficiencies, and to allow coordination between the city authority, infrastructure operators, and the public. At its best, a 'smart grid' can:

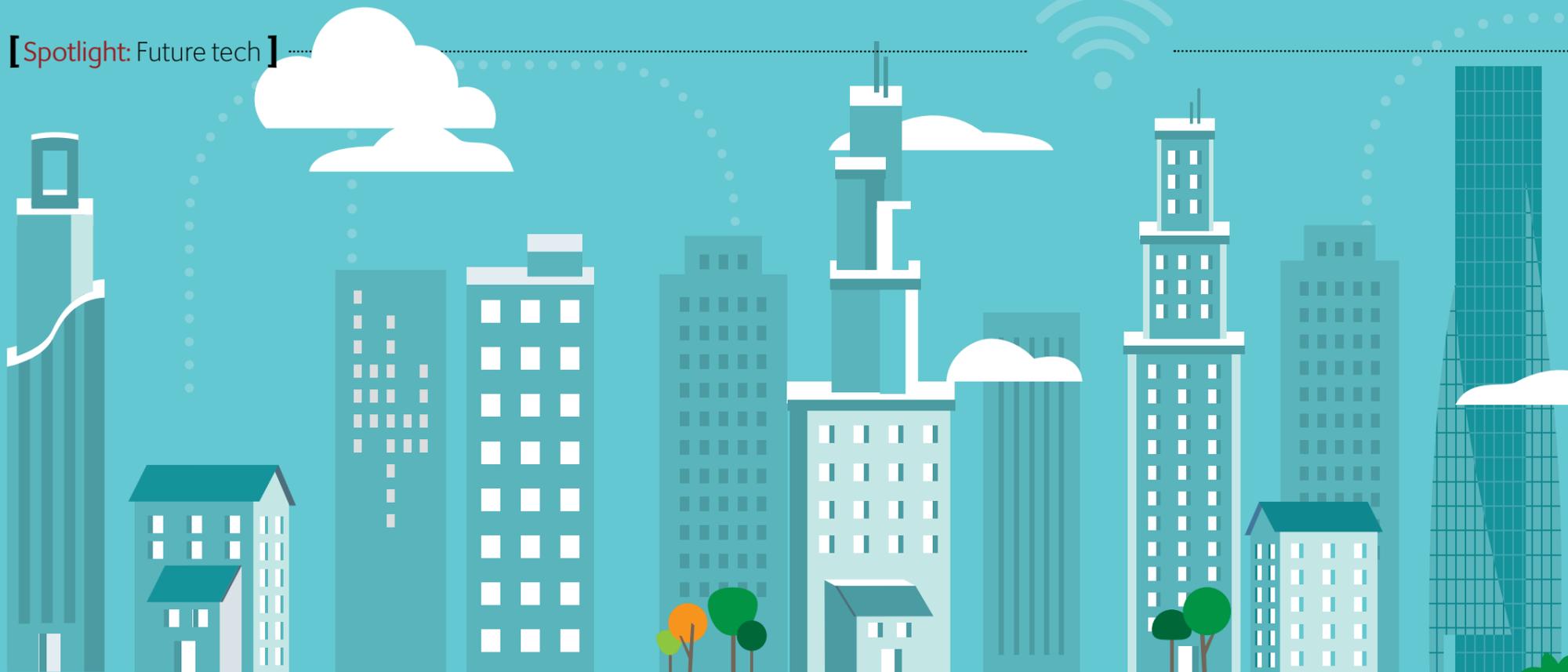
- 1) Modernise energy systems through 'self-healing' designs, automation, and remote monitoring and control, and establish local micro-grids – involving energy production and demand response
- 2) Inform and educate consumers about energy use, costs and alternatives, so they can decide how and when to use electricity (in particular)
- 3) Provide safe, secure and reliable integration of distributed and renewable energy resources.

How do you build a smart city?

Developing a smart city requires political will, extensive planning, organisation – and lots of investment. That sounds hard enough, but there are at least two routes to building a smart city. Route one is, perhaps, the most predictable, if not the easiest. It involves developing a network of sensors, transport routes, motion sensors and smart grids, which feeds into a central operating centre. Here, a civic team – or, increasingly, the Internet of Things (see box, page 39) – responds, and influences people and actions accordingly.

One of several business models that allows companies to engage with authorities and utilities is the open business model (OBM), which can foster innovation because of its flexibility and scalability. With this model, city planners allow any qualified business or organisation to build infrastructure and provide services, within a regulatory setting.

Route two might prove easier, and involves developing a smart network from the 'bottom up'. The technology comprises millions of smartphones and internet-connected homes and buildings. Apps and social networks will allow people not just to navigate, but also to influence city functions. Many people believe it is vital for a smart city to have a strong social and environmental dimension, aimed at improving quality of life across the social spectrum. This suggests there is a place for the 'bottom up' approach. In practice, many smart cities will develop using a combination of these routes.



Net gains – the Internet of Things

An interest in smart cities means you won't be the last person in tomorrow's meeting to have heard about the 'Internet of Things' (IoT). This offers advanced connectivity of devices, systems, and services that goes beyond simple machine-to-machine (M2M) communication.

The IoT describes efficient – often miniature – sensors linked to a panoply of other 'things', ranging from processors to screens and actuators. What matters is that the sensors can obtain very useful information, and then pass it on to be assessed and – if need be – make useful things happen.

In a smart city, the IoT will be able to: manage the environment in public, commercial and domestic buildings; run a smart-energy grid; deal with traffic congestion; assist with security; and more. So far, so good – but smart cities must also be resilient to failure, and even attack.

The IoT introduces new vulnerability to cyber-crime, which could lead to damage and disruption, or fraud. A new generation of security measures will be required to protect highly connected people and things – and manufacturers will have to adopt new protection measures against data interception or theft.

▶ Smart grids will include new metering infrastructures, data management and data analytics, which will gather and assess information for high-quality forecasting and optimal-load response.

In 2014, IFSEC issued a report on 'safe cities', citing this as yet another crucial feature of a smart city. Protecting people is the first requirement of any city authority, to which we can add protecting property and assets. The IoT will have plenty to offer in the areas of intelligent surveillance, providing a cost-effective security response.

The report highlighted a study, by IFSEC Global, that canvassed views from across the security industry about the growing opportunity

for safe cities. Among the roles being undertaken in these projects are manufacturers, installers, integrators and vendors of the various technologies, including smart surveillance and video analytics.

Simon Adcock, CCTV section chairman of the British Security Industry Association (BSIA), and managing director at Atec Security, said: 'From a CCTV perspective, we are seeing agencies accessing video feeds from company systems at a fraction of the cost of installing their own cameras.'

'New technology is linking disparate systems under a common platform, and offering police access and audit trails that are essential for compliance [with data protection legislation].'

Massive opportunity – and challenges

According to Steve Martin, the ECA's head of specialist groups – which covers data communications, security and other contractor opportunities – some of the major challenges facing smart cities are:

- Big data – dealing with huge amounts of information
- ITC security and resilience
- Bandwidth – issues surrounding wireless capacity
- Transferring existing systems to new ones
- Skills
- Project management
- Regulatory obstacles, including tougher data protection laws, which might vary in different places
- Justifying the return on capital and other investment
- Agreeing standards and protocols.

Martin added: 'Radical change to the traditional "siloes" approach to services and delivery beg two extremely big questions: How do we put everything together, and how do we future-proof it? These questions suggest many smart cities will develop ad hoc, until we have better answers.'

Finally, if power, internet access, and other technology fails – or is hacked – the impact could be disproportionately massive. So a sustainable smart city will also need impressive power and technology backup if 'smart' is not to become a byword for 'vulnerable' (see 'Net gains – the Internet of Things' box).



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Who should be interested?

Businesses that will benefit from smart-city development are likely to be:

- 1) Integrators – end-to-end service providers, bringing together pre-packaged smart platforms
- 2) Network service operators – offering collaborative networks, data analysis, and other solutions
- 3) Product vendors – providing the smart meters, automated switches, controllers and voltage regulators
- 4) Product installers
- 5) Managed service providers – third-party providers overseeing the management/operation of smart solutions/services, and offering 24/7 monitoring, management or support

As such, smart-city development is likely to be of interest to:

- Systems installers and other engineers working with smart technologies
- System integrators, ready for the challenges of convincing multiple stakeholders of the benefits
- Product designers and innovators
- Public sector managers responsible for planning, sustainability, security, transport, energy efficiency, and information
- Service suppliers, including utility managers and engineers working with distributed generation and localised energy systems, or on distributed security services
- Consultants and architects
- Anyone who wants to transfer their smart city know-how around the world

What a smart city near you might provide in the future

The following is a sample of the smart-city functions that are – or soon will be – available:

Smart parking – Monitoring and advising about city parking spaces

Optimising traffic – Monitoring and directing vehicle, bike and pedestrian traffic. Intelligent roads give real-time diversion advice, according to weather and congestion

Smart lighting – Environmentally adaptive street lighting

Smart grid – Energy-consumption monitoring and demand management, using various energy sources, including local energy hubs and renewables

Perimeter access control – Limiting access to restricted areas, with appropriate action

Supply-chain control – Monitoring of storage

conditions along the supply chain, and product tracking (real-time traceability). Asset location using active (for example, ZigBee) and passive tags

Fleet tracking – Controlling routes for delicate goods such as medical drugs, valuables, or dangerous items

Water management – Monitoring the quality of tap water, and measuring water volumes and pressure in pipes and containers

Remote-control appliances – Switching appliances to avoid accidents, activate security, save energy, and so on

Assistance monitoring – Help for elderly or disabled people at home

Patient surveillance – Monitoring the condition of patients inside hospitals and care homes

▶ **Conclusion**

Frost & Sullivan speculates that the smart-city market is going to be worth trillions of pounds worldwide. We should bear in mind that, in addition to the burgeoning installation opportunities, smart cities will also need to be maintained – and upgraded. In existing infrastructure and buildings, commercial interactions are likely to be with clients, utility providers and manufacturers.

This suggests big opportunities for contractors, notably those involved in wireless data communication and smart actuation. According to the ECA's Martin: 'There is likely to be a huge role for systems design and installation and, quite likely, a shortage of capacity to undertake it.'

'Specialist contractors will need to be suitably skilled, so we will need to train electricians, heating engineers, facilities managers and others, so they can connect smart systems together and – later on – maintain and enhance them. Those who are agile and have an up-skilled,



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About the author

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multifaceted workforce will be in the best place to win the work.'

A smart city can mean many things to many people, but – while the overall vision is impressive – the capabilities are not yet, entirely, there. However, much of the technology is being deployed in numerous pilot projects.

In the future, businesses and citizens will be the real arbiters of whether their cities are sufficiently 'smart', based on how well it works as a whole, and how well it copes with everyday – as well as exceptional – urban stress.

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A tale of many cities...



Frost & Sullivan has identified eight key smart-city themes:

1. Governance and education
2. Energy
3. Building
4. Mobility
5. Infrastructure/environment
6. Technology
7. Healthcare
8. Citizens

The company suggests a truly smart city needs to tackle at least five of these themes. By this measure, Frost & Sullivan anticipates there will be around 25 global smart cities by 2025. Those that only implement two or three from the list are more likely to be 'eco-friendly' cities – they will only be 'partially smart'. While the overall vision for smart cities is impressive, opinion is divided about the credentials of cities that are already being touted as 'smart'. It's a global phenomenon, but here are just a few European candidates:

AMSTERDAM: Often referred to as a budding smart city, it is said to base its governance on five themes – living, working, mobility, public facilities and open data. Amsterdam Smart City (ASC) is 'a partnership between businesses, authorities, research institutions and the people of Amsterdam'.

VIENNA: Reported to rank well on 'innovation, regional greenness, quality of life and digital governance', Vienna

has smart-city targets. With programmes such as the Smart Energy Vision 2050 and Roadmap 2020, Vienna's planners 'incorporate stakeholder consultation into building, carbon reduction, transportation and land use'.

GLASGOW: In addition to hosting the Commonwealth Games in 2014, the Scottish metropolis also won a £24m competition to be a large-scale demonstrator for a 'future city'. Glasgow's winning bid featured projects such as: an integrated operations centre; managing a new public space; CCTV network and road-management systems; and a 'city dashboard', giving real-time information on traffic flow, weather alerts, accident and emergency waiting times, rail and bus services, and so on. Some other features of the Glasgow initiative are:

- An 'intelligent operations platform', to store and analyse real-time data, accessible via an online dashboard, with widgets, smartphone apps, and visualisations
- 'Hackathons' – to allow developers to build useful apps using a wealth of civic data

Some attribute a degree of 'smartness' to London – although, perhaps, they haven't asked commuters! The UK capital will, however, host a Smart Cities research centre, at Imperial College, which will 'leverage transport, government, business, academic and consumer data to help make the city more efficient and innovative'.