Smart cities in Europe

Financing the commercialisation of smart city technology

Osborne Clarke

Understanding the challenge

Here's the problem: cities need innovative solutions to help meet the long-term challenges arising from urbanisation, be that controlling increasing traffic flows, managing ever-greater volumes of waste or meeting energy efficiency targets. However, every local authority we interviewed stated that to justify investment in 'smart' technology, cities first need to be able to point to case studies where that technology has been deployed at scale in a city and delivered tangible benefits.

At present, very few real-life examples exist. Research undertaken by the European Parliament released in January 2014 shows that only 14% of European cities with a population over 100,000 have actually launched at least one smart city initiative.

There is another issue. Some of the most innovative technology that can help cities meet their challenges is being developed by small, young companies that may have only recently been spun out of a university or perhaps secured their first round of funding. To start generating revenues, these companies need to prove their technology works at scale. However, these early-stage companies simply don't have the funding to finance a large-scale demonstration of their technology.

At first glance, the mutually beneficial solution to both these challenges seems obvious – establish a series of city-wide demonstration projects where new smart technology provided by large and small companies can be tested. This would enable businesses to tailor their solutions to meet the needs of cities, prove their technology can deliver and enable cities to identify the benefits of smart technology.

Despite the seemingly obvious benefits these demonstrations could deliver, the figures from the European Parliament cited earlier prove that cities and the private sector are not currently working together in this way.

Why is this? This report, the first of a series of white papers on smart cities written in collaboration with The Lawyer Research Service, tackles this issue head on. It looks at some successful smart city demonstration projects, analyses why they were successful, discusses why more such demonstration projects are not being launched, and provides insights on what might be done to encourage more initiatives.

To answer these questions, we looked at the structure, participants and funding models of existing smart city demonstration projects to understand what made them successful. We also interviewed seven industry leaders in the smart cities sector to understand how new smart technology can be proven at scale.

"The benefit of city-wide demonstration platforms is that they enable new technology to make that utility-scale proof-of-concept jump. They are very useful in enabling the interconnectedness of different products and approaches to be tested. There are always discussions about funding, but if you have a compelling customer proposition and a robust business model, you can create a package that is attractive for investors. One of the difficulties at the moment is that too many companies have developed a solution and are now trying to find the problem. They should be asking: what is the problem and how do we solve it?"

Simon Hobday
Partner, UK, Osborne Clarke
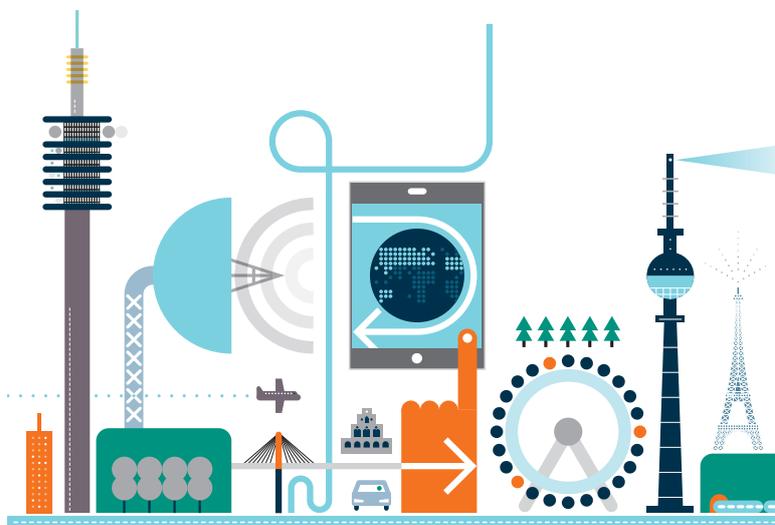
Learning from smart city trailblazers

Exploring how existing smart city demonstrations have been started, structured and funded offers some clear lessons for how future demonstrations might get off the ground. Some of the most groundbreaking smart city demonstration projects are outlined below:

Milton Keynes' Internet of Things

In early 2014, Milton Keynes was unveiled as the location for a new city-wide, open-access Internet of Things (IoT) network to demonstrate how connected devices might be utilised to provide smart solutions. It is the first city-wide, open-access IoT network in the UK. Participants include Milton Keynes Council, BT, Open University, the Future Cities Catapult and the Connected Digital Economy Catapult.

Private-sector companies are invited to develop 'smart' use cases that leverage this network. The first use case involves the installation of sensors into recycling bins across the city. The sensors inform the council via the IoT network when bins are full and ready for collection, enabling refuse collectors to provide a more efficient service. The second application involves the installation of sensors in car-parking spaces to inform motorists where vacant parking spaces are.

The initiative is funded by Innovate UK, formerly the Technology Strategy Board. It also leverages £8 million of funding provided by the Higher Education Funding Council for England (HEFCE) for a wider smart cities project in Milton Keynes called MK:Smart.

Geoff Snelson, Director of Strategy at Milton Keynes Council, provides an update on the status of the initiative. "We have now established the network and a number of use cases and are at the early stages of implementation," he said. "For example, a car parking sensor trial is underway, as is one that puts sensors into neighbourhood recycling bins. A range of other use cases are coming through including things that look at soil moisture and people movement in parks."

Philips Research – Eindhoven

Philips Research, founded in 1914, develops innovative HealthTech and Lighting solutions. A particularly unique feature of the organisation is its 'Experience Lab' located at the High Tech Campus in Eindhoven. Here, new technologies are demonstrated in a natural setting. With over 100 university and business collaborators, Philips Research is a guiding example of a large industrial company collaborating with companies and academia to develop and test new technologies. Phillips Research also collaborates with end-users at its 'Living Labs' to develop, for example, smart city technology.

"We believe that the only way to find out what really makes sense is to experiment and co-create with end-users, so that we can really improve people's lives through meaningful innovation," explains Kees van der Klauw, Senior Vice President, Philips Research. "Our Living Labs project in Eindhoven has been running for two years. Here we collaborate with various partners including government, allowing us to experiment with infrastructure, technology and use cases. It enables us to test a variety of technologies relating to lighting, audio, video, traffic and data analytics in a real city setting. For example, we have a light dimming project that enables us to save energy. We have managed to save tremendous amounts of energy without compromising on wellbeing."
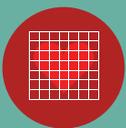
Bristol is Open

Bristol is Open is a joint venture between the University of Bristol and Bristol City Council. It involves the establishment of three ultra-fast communication networks in the centre of Bristol capable of transmitting data relating to energy consumption, air quality and traffic generated from a series of sensors. Once anonymised, the data is made public through an open-data portal. Companies and academic institutions will be invited to prototype new smart city applications and services that leverage this data.

The project commenced in spring 2015 and will run for five years. The project is funded by local, national and European governments. It also benefits from academic research funding and investment from the private sector. Part of the network platform is provided by US company Silver Spring Networks. If successful, the project will be extended to nearby cities such as Bath and parts of North Somerset and South Gloucestershire.
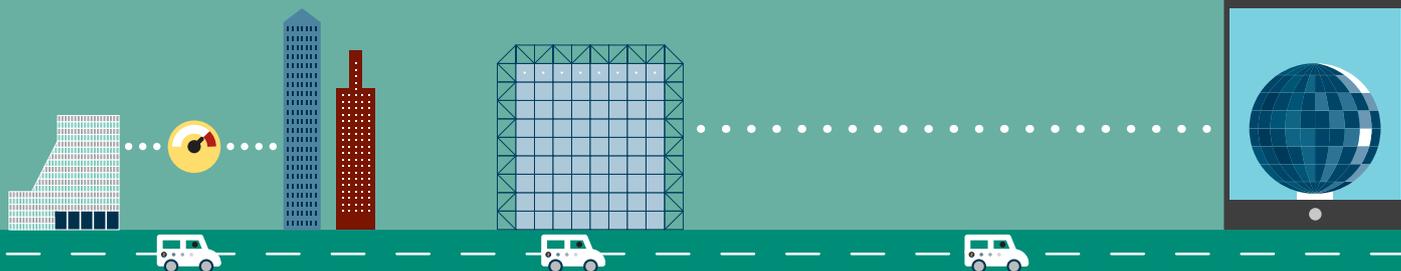
Overcoming the challenges

The three examples outlined above show that city-wide demonstration projects can be launched successfully. So why aren't more cities partnering with technology companies to test smart city solutions? Our series of interviews revealed two principal obstacles.

1. Funding rears its head again

Our first smart cities report, 'Smart cities in Europe – Enabling innovation', identified a lack of investment as one of the greatest obstacles to the roll-out of smart technology. Our survey of over three hundred technology companies, investment funds, banks, city planners and government officials, conducted in late 2014, revealed that a lack of funding was the greatest challenge to the roll-out of intelligent transport systems, the second most important obstacle to wider use of energy storage and the third most important obstacle to greater adoption of building control systems.

Our series of interviews for this report pinpoints exactly where the funding gap is. Interestingly, there appears to be plenty of funding available to fund the development of smart city technology. Venture capital and angel investors invested US$129 million through seed and Series A financing rounds in smart city

companies globally in 2014, compared with US$78 million five years ago, according to data compiled by Clean Energy Pipeline. The real funding gap emerges when companies need to prove their technology at scale, the precursor to commercial sales.

"SMEs have lots of great ideas, but if you don't have a platform or the infrastructure that allows for experimentation and demonstration, you can't get started," explains Kees van der Klauw, Senior Vice President, Philips Research. **"Also, experimenting on, for example, lighting, doesn't make sense if you just do it on five lighting poles on one street. It needs to be city-wide. Once you have a concept, you must test it on a large scale to learn how it really works. However SMEs can't afford to put a whole network in a city."**

With SMEs unlikely to be capable of funding city-wide demonstration projects themselves, the next obvious port of call is the cities themselves. However, given the significant spending cuts to local authorities across Europe over the past five years, most cities are more focused on providing basic services than investing in innovative technology demonstration projects.

Fortunately an examination of existing smart city demonstration projects provides some clues as to how the funding issue

can be resolved. By way of example, the Milton Keynes IoT project is being funded by a combination of private companies, Government grants and higher-education funding. The problem with this approach is that pooling money from a variety of different sources is a difficult task for both cities and technology companies, not least because they may be unaware of the various grant options available.

As Peter Madden, CEO of Future Cities Catapult (a Government-funded organisation tasked with promoting the use of smart technology in cities) explains, government can play an important role in not only providing grant funding to smart city demonstration projects directly, but also in amalgamating funding from multiple sources.

"Urban demonstrations help to test and prove new smart city technologies, and part of our role is to see if there is money that can be assembled to make them happen," he says. **"In some cases, like the Glasgow Future Cities Demonstrator, the £24 million was provided by Innovate UK as a single pot of money. In other instances, money might come from the EU or we might bring together a funding consortium. For example, the Milton Keynes demonstrator has funding from HEFCE, a higher-education funding institute, with contributions from ourselves, ARM, BT, and the City Council. We do need to test smart technology in urban environments at sufficient scale. To do this, a bunch of organisations are going to have to come together to collaborate."**

What do government funders want?

To stand the best chance of securing government funding, companies seeking to demonstrate their technology at scale and cities wishing to host smart city demonstration projects need to give careful consideration to government requirements. A constant message from those interviewed for this report is that open-access demonstrators, which provide a platform for multiple private-sector companies to access, stand the best chance of securing government funding.

This is certainly the basis on which both the Milton Keynes and Bristol demonstrators secured funding. **"If companies, big and small, have their own ideas and IP, they want to protect them and get a return on them,"** adds Peter Madden. **"If it is public funding coming from the EU and citizen taxpayers' money, these funders are going to want the maximum openness. Most of our projects depend on a blend of different funding and different levels of participation."**

Large industrial companies can assist SMEs

Governments can't plug the entire funding gap. Even if diverse pots of government funding can be amalgamated to fund a demonstration, businesses still need to be able to fund their own participation in the project. For large industrial companies, this is not an issue since most have R&D budgets that can be allocated to these sorts of initiatives. However, smaller companies may struggle to fund their participation, especially if they need to manufacture more equipment.

Interviewees for this report consistently indicated that large corporates are alleviating this funding gap by investing in smaller technology companies, either directly or through corporate venture funds. During the last year, large industrial companies, including ABB, Siemens, Bosch, Philips, Volvo and GE, have all invested in young innovative smart city technology companies. Examples of investments by large industrial companies in businesses developing smart solutions for cities are outlined below.

Investor	Portfolio company	Technology	Location
ABB Technology Ventures	TaKaDu	Water distribution network monitoring	Israel
Siemens technology ventures	PPC (Power Plus Communications)	Powerlines for smart metering and smart grids	Germany
Siemens Venture Capital	Sensys Networks	Wireless traffic data systems	Germany
	Sunverge Energy	Distributed energy management systems	Germany
	Tendril	Home energy management solutions	Initially North America, then expanded to European market
	Wirescan	Cable diagnosis and condition monitoring	Norway
Robert Bosch Venture Capital	Cheetah Medical	Cardiac output monitoring technology	Israel
	EpiGaN	Efficient power electronics material	Belgium
	GreenPeak Technologies	Data communication technologies	The Netherlands

"Increasingly the favoured model is for large corporates to invest in an SME to provide the necessary funding to be involved in projects," explains Nigel Stevens, CEO of Transdev UK and Ireland. **"The big companies don't want to do this directly because they realise they will immediately kill the agility and innovation that exists within a small company. So, increasingly, the model large companies adopt is to take an equity stake in a small technology company so the start-up has the funding to get motoring."**

However, SMEs should be under no illusions that securing corporate investment is a golden ticket to winning orders from, and potentially being acquired by, the investor. Every corporate and corporate venture capital fund interviewed for this report stated that their portfolio companies have to compete on a level playing field with non-portfolio companies for orders.

"We always have a plan to help our investee companies by introducing them to others within our organisation," explains an investment director at the venture capital arm of a large industrial company. **"We cannot force anyone at our company to buy anything from the companies we invest in but we can open doors and make introductions."**

While small start-ups are likely to jump at the offer of investment from a major corporate, one potential drawback frequently identified by interviewees is that it can stifle their entrepreneurial spirit. Large corporates need to ensure that start-ups are given sufficient breathing space to innovate.

"As soon you wind them (SMEs) up in a big corporate, they will struggle," explains Nigel Stevens. **"It's all about engaging at the right point in the lifecycle of the business. This relationship means that smaller companies have financial stability. It gives the entrepreneur the headroom to get on with what they are good at and not worry where the next pound is coming from. The other side, which is equally important, is that large companies can ensure start-ups keep focused on a project if they own a stake. But, again, you don't want to pound them with the large corporate mindset and scare them so they can't innovate and deliver."**

Large industrials can offer smaller companies developing innovative technology a lot more than funding. As Arif Hatip, Corporate Strategy, M&A and Strategic Business Development at Robert Bosch Car Multimedia, explains, many large companies have started to engage with smaller technology businesses in more innovative ways.

"We facilitate innovation amongst smaller companies in many ways," he says. **"At a very basic level we will pass a specification to potential suppliers and ask them to come up with a solution. We also run short hackathons where we ask companies to come in and develop solutions that can be integrated into our car infotainments systems. Furthermore, we have started collaborating with external accelerators around the world to enhance our scouting of promising start-ups**

and to support relevant new ventures. Venture companies are way more agile and quick than established automotive companies and the likes of Google and Apple, so we need to find innovative ways to collaborate more closely with start-ups and support them through exchanging capabilities and experiences."**

2. An integrated approach is essential

It's a big assumption, but assuming funding can be sourced for a smart city demonstration project, the second most important issue highlighted by interviewees is the basic fact that private companies typically only operate in a very narrow and isolated area of city infrastructure. Take the example of transport. While bus and train operators typically own or lease their modes of transport, the network on which they run is usually owned and operated by a different company or public authority.

Furthermore many rival bus and train companies will likely also run on the same network. Transport companies are, therefore, limited in the scope of smart city demonstrations they can organise. As Nigel Stevens explains, the onus is, therefore, on the transport authorities to initiate demonstration projects.

"From an urban mobility point of view, all operators are constantly bringing out a range of innovations, but we only have control over our vehicles, our transport modes and our passengers," he says. **"We rarely have control of the network on which we run and we certainly are unlikely to have control of anything that interfaces with that network. So you absolutely have to start from a position where the authorities take the lead, or at least take overall ownership. However, they should look to bring commercial parties into play early. A good partnership between an authority and an operator can be very powerful, but it has to be built on trust and be long-term."**

Unfortunately our interviewees stated that many city transport authorities across Europe are unable to trial smart technologies because they either lack the power or the funding to commit. If transport authorities are to implement smart technology in collaboration with the private sector, they need sufficient powers and resources.

Transport for London, the local Government organisation responsible for most aspects of London's transport system, including buses, tubes, cycling, river services, streets, some coaches, trams and some rail, is a case in point. As the organisation is responsible for so much of the city's transport infrastructure it is able to introduce truly innovative and smart technology and processes.

"In the UK, most authorities do not have sufficient control or budgets to drive the agenda in the way TfL do," confirms Stevens. **"It may be that recent Government announcements will increase devolved power and certainly Manchester seems to be heading in that direction."**

"There are some exceptions, but in general the largest companies struggle to innovate. That is why we are seeing huge companies acquire and partner with smaller developers of smart technology and software. Daimler's acquisition of RideScout and myTaxi is a good example. But most large companies access innovation through partnerships. Large corporations have also set up innovation labs to try to attract young companies to exchange ideas and demonstrate what they have. The majority of large German companies have one of these."

Matthias Terlau
Partner, Germany, Osborne Clarke

Cities can smarten up without vast expenditure

Establishing a smart city-wide demonstration project may seem a daunting prospect for smaller cities. EU, government or higher-education funding will be forthcoming for some cities across Europe, but certainly not all. So what can cities without access to grant funding do to encourage the demonstration of smart technology? Our interviewees stated that simply changing the way cities interact with private-sector companies that provide public services could encourage investment in smart technology, at no cost to the city at all.

"Some of the service contracts that private providers have with the city are actually configured to prevent them from implementing smart solutions," explains Matt Key, Commercial Director at Vodafone M2M. **"A good example is waste collection. In the UK a lot of waste contracts are predicated on private companies undertaking a certain number of rounds with a certain number of lorries per month for a certain numbers of years. With this type of contract, there is little incentive for private waste companies to become more efficient, innovate and invest in smart solutions. Cities should instead contract in a way that enables private-sector providers to keep any cost savings they are able to generate through innovating. This itself would promote innovation."**

Conclusion

Obtaining funding for smart city demonstration projects is difficult. But as our case studies show, governments, large corporates and small start-ups can work together to secure funding for and initiate innovative projects. OC is working hard to bring together the parties that will make our cities smarter, both in face-to-face and online discussions with key decision-makers across Europe. For more on smart cities and how OC is involved in developing smart cities, please get in touch and/or visit ocsmartcities.com.

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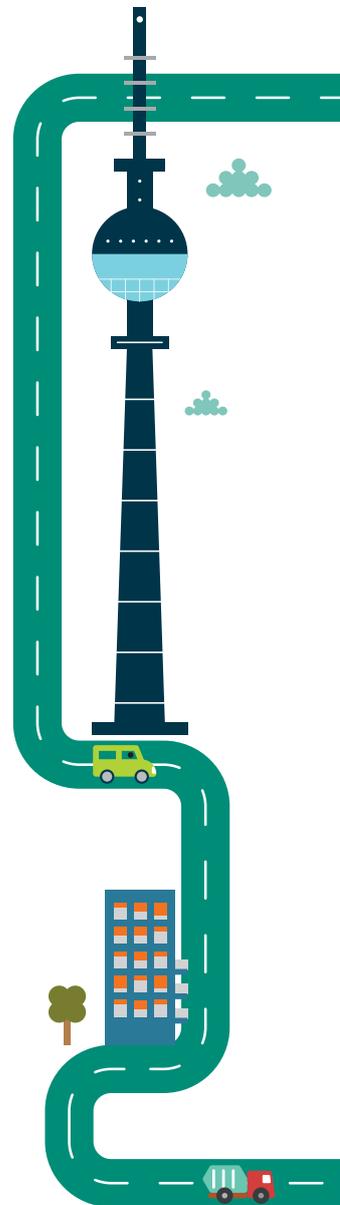
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For more on smart cities and how OC is involved in developing smart cities, please visit **ocsmartcities.com**.