

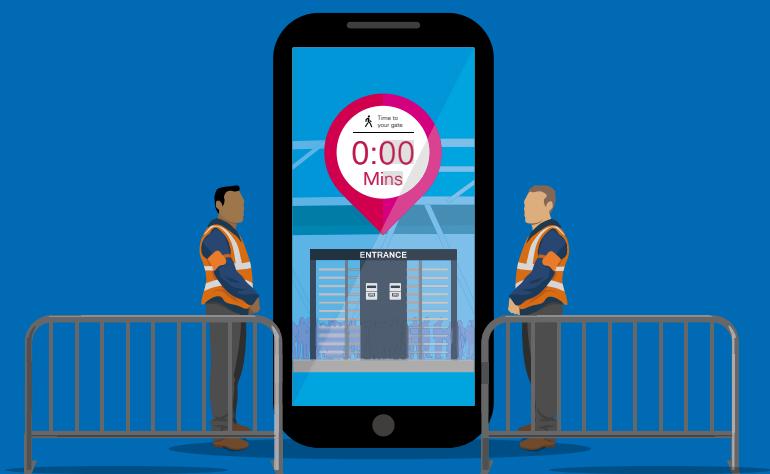


# Smart Infrastructure: managing major events

**How emerging technologies could  
radically improve safety, efficiency and  
customer experience at major events**

November 2017

[kpmg.com/uk/smartinfrastructure](http://kpmg.com/uk/smartinfrastructure)





# Table of contents

The Smart Infrastructure series	04
Introduction	05
Crowd management: A Smart Infrastructure scenario	06
Final thoughts	15
Author biography	16

# The Smart Infrastructure series



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Infrastructure is all around us and ever-present in our lives: think of schools, roads, hospitals, power stations, telecommunications networks and sports facilities, to name but a few. Picture these in your mind and they are all quite, shall we say, solid. Made of bricks and concrete and steel and glass. Infrastructure is robust and long-lasting and inflexible. Until now.

In recent years, sectors such as communications and the media have been transformed by digital technologies; now infrastructure is in the foothills of its own technological revolution. And with that revolution comes a transformation in how infrastructure serves us, becoming more agile and responsive and clever.

By gathering, analysing and sharing new forms of data, we can improve and adapt decision-making in real time. By embracing the application of new technologies – such as driverless cars, smart electricity grids and adaptable buildings – we can drive up efficiency and realise new opportunities. And by building new data management systems and more flexible assets, we can improve collaboration and responsiveness – providing benefits for customers, managers and public agencies alike.



Bespoke travel alerts



Enhanced visitor experience



Optimised travel information



Digital data to improve safety  
= SMART Infrastructure.

To help envision and promote that future, KPMG have conducted a series of thought leadership workshops – considering how we could use new technologies in infrastructure development, maintenance and operation to improve our lives, reduce costs, and create economic growth.

We imposed only a handful of rules on these workshops. All of our ideas had to be built around existing and emerging technologies; we've set our scenarios just a few years in the future. They had to have clear benefits for investors and managers as well as customers and public policy goals. And they had to be realistic and deliverable, addressing the potential concerns and challenges around matters such as privacy, security and governance.

Within those constraints, we've tried to step outside conventional thinking and test out new ideas. We want to stretch ourselves, applying new technologies and techniques to solve old problems. We want to think about how the world is changing, and how to stay ahead of that change. And then we want to bring that thinking back into today's world – mapping out the practical steps towards building a truly smart infrastructure.

# Introduction

**Digital technologies have so far made few inroads into the messy, complex business of crowd and event management. But with most adults carrying a smartphone, the potential is huge**

**Our working and home lives are evolving rapidly in this digital age – but for centuries, the problems facing the organisers of major ticketed events have remained largely unchanged.**

Crowds have always brought risks and challenges such as overcrowding and queues; opportunistic pickpockets and drunken fights; medical emergencies and lost children; sanitation and public health issues; and distributing public announcements. And to date, our tools for handling these challenges have remained largely analogue.

So whilst we're transforming the ways in which we manage information, service industries and public services, our handling of crowds – messily organic and often unpredictable, badly behaved and emotional – lags well behind the curve. Yet all the elements are in place for those organising stadium gigs, festivals, sporting events, conferences, exhibitions, and religious or political meetings to revolutionise their approach to event management.

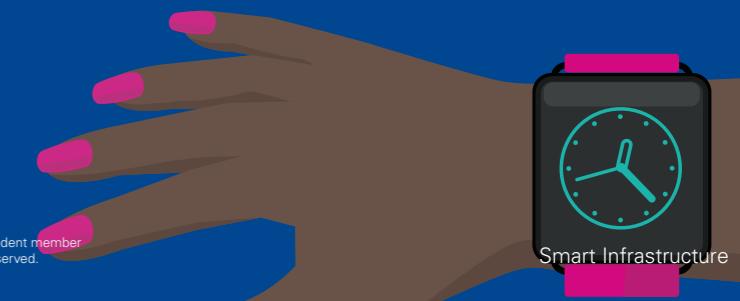
These days, infrastructure providers and event managers can gather and analyse vast quantities of data from sources such as CCTV, Oyster cards and social media, and most adults carry a smartphone – enabling them to provide as well as to receive

information. If event managers can bring together these data streams, providing new forms of information to visitors whilst using data to redeploy staff and resources in real time, crowd management will follow other sectors into the digital age. And the result will be to vastly improve public safety, emergency response, waiting times, operational efficiency and, ultimately, customer experience.

This is not science fiction. All these technological capabilities already exist; indeed, some are already being put into action by event industry operators, such as the 68,000-capacity Amsterdam Arena. But it sounds very theoretical – so let's take a practical example: a major ticketed event being held in, say, East London's Queen Elizabeth Olympic Park. Below, we explore some of the potential applications of these technologies, revealing how they could produce a better experience for customers from the moment they set off for their day out to the point they arrive back at their own front door.



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Smart Infrastructure

# Crowd management at East London's Queen Elizabeth Olympic Park: A Smart Infrastructure scenario

**How digital technologies can provide a better experience for event visitors, whilst improving safety and efficiency for operators**



## On buying tickets

1 On buying tickets, event visitors are asked whether they'd like to receive bespoke travel alerts, and given the option of naming their likely route to the Queen Elizabeth Olympic Park. Travel alerts are then generated and distributed by the event organisers in association with partners such as Transport for London, informing visitors of any disruptions on their planned journey.

Visitors facing delays are given advice on alternative ways to reach their destination – either by changing their mode of transport, or by taking a different route. Where large numbers of visitors are being warned of a single obstruction or delay, organisers provide information on a range of alternative routes – dispersing travellers so that congestion is not simply shifted to another point in the network.

The Queen Elizabeth Olympic Park is well served by public transport. But where people have said they'll be driving, local road congestion and delays are minimised by sending out updates on the remaining capacity at nearby car parks.



2 At events attracting an international audience, such as major athletics championships or football matches, much of the crowd may not have English as their first language. Where they have provided phone numbers or social media details in advance, they're given the option of receiving communications in a range of common languages.

By agreement with UK telephone service providers, this offer can even be extended to those overseas visitors who didn't purchase their own tickets, and thus haven't had the chance to submit their phone number. For telephone providers hold locational data on the overseas phones to which they're providing a service, enabling them to offer native-language communications to foreign visitors in the area.

This system opens up communications to overseas visitors with little or no English, giving them access to the full range of services whilst assisting crowd management and the distribution of public safety announcements. Those using overseas telephones can, for example, be kept informed of any disruption to flights back to their home country. And for the most widely-spoken foreign languages at a particular event, organisers can offer emergency helplines or translation services.



## Before the event begins

3 Event managers are keen to smooth the bell curve in arrival times, avoiding sudden peaks in the flow of visitors that could lead to congestion on public transport or lengthening queues at entrance gates. To assist their planning, they use data from previous events generated by smartphone tracking technology: sensors which pick up nearby phone or wifi signals, anonymise the data, and provide organisers with data on crowd movements.

Smartphone tracking monitors and CCTV cameras distributed between the public transport hubs, car parks and venue monitor crowd density and movements, providing event managers with accurate, real-time data on how many people are arriving and which gates they're heading for. So organisers can constantly alter the number of staff manning each set of access gates, staying a step ahead of changing demand to minimise both visitor queues and wasted staff time.

4 Using this information on typical travel patterns, arrival times and crowd behaviour, organisers contact ticket holders to offer them discounted on-site meals, drinks or entertainment, with starting times spread over a period after the gates open. The goal is to encourage people to arrive early, reducing the numbers reaching the gates at peak times.

To shorten waiting times still further, visitors can pre-order food and drink from any outlet in the venue – paying by card and receiving a digital receipt, an estimated walking time and a collection time. Then they don't need to queue at all: told how many minutes it's likely to tell them to walk to the vendor, they arrive just as their purchase is ready for collection, scan the receipt held on their phone, and collect their order.

5 Retailers in Westfield Stratford – through which many visitors will walk en route from the stations to the Queen Elizabeth Olympic Park – are also involved, sending participating visitors special offers on goods, services and food. By encouraging people to arrive early in Stratford, this reduces peak load at the tube, DLR, rail and HS1 stations.

Those who take the opportunity to book a slot are given the option of sending a geo-tagged message when they get close to the venue, enabling providers to ensure that a table and waiting staff are ready to serve them at the moment they arrive.

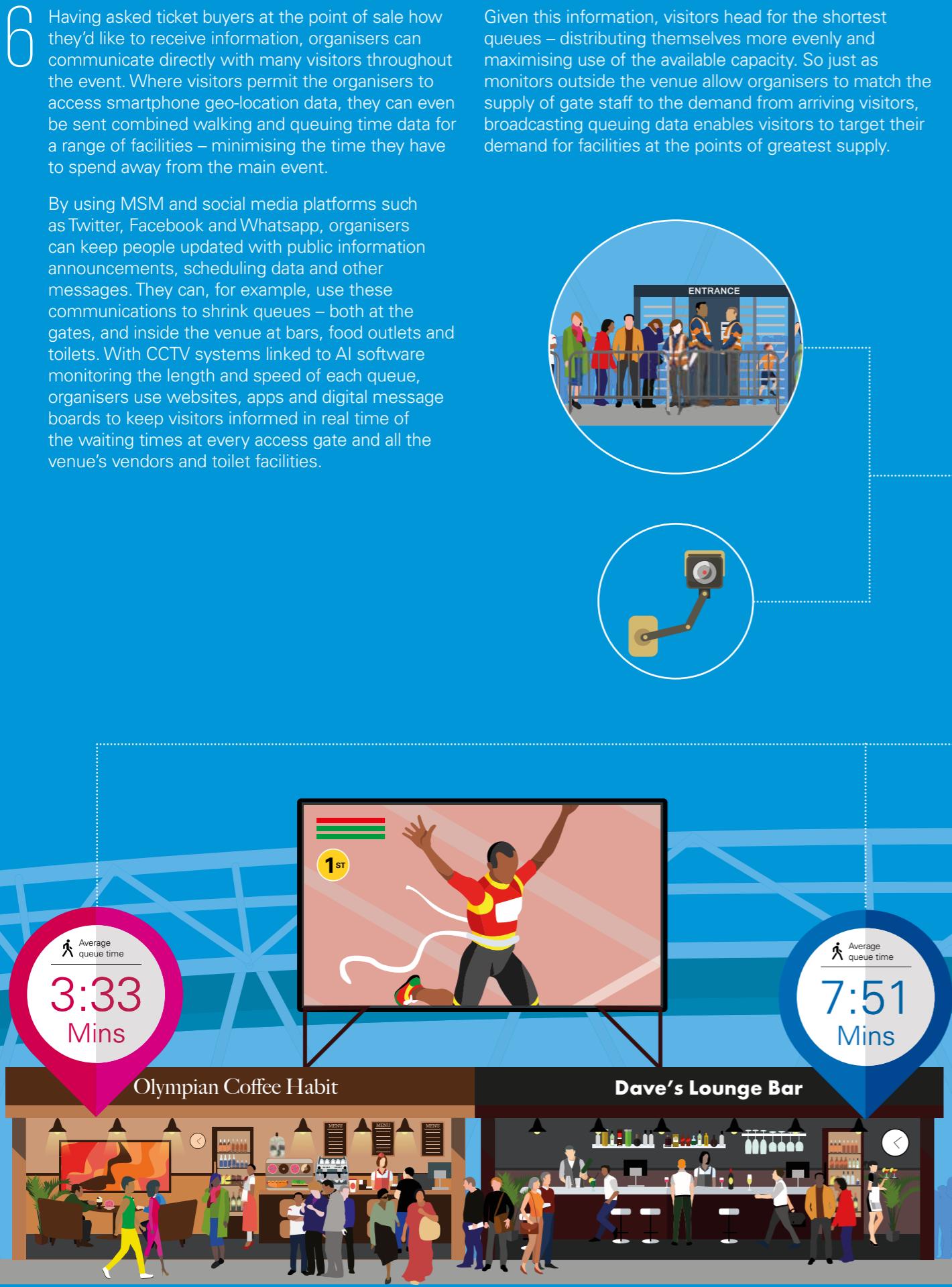


## During the event

6 Having asked ticket buyers at the point of sale how they'd like to receive information, organisers can communicate directly with many visitors throughout the event. Where visitors permit the organisers to access smartphone geo-location data, they can even be sent combined walking and queuing time data for a range of facilities – minimising the time they have to spend away from the main event.

By using MSM and social media platforms such as Twitter, Facebook and WhatsApp, organisers can keep people updated with public information announcements, scheduling data and other messages. They can, for example, use these communications to shrink queues – both at the gates, and inside the venue at bars, food outlets and toilets. With CCTV systems linked to AI software monitoring the length and speed of each queue, organisers use websites, apps and digital message boards to keep visitors informed in real time of the waiting times at every access gate and all the venue's vendors and toilet facilities.

Given this information, visitors head for the shortest queues – distributing themselves more evenly and maximising use of the available capacity. So just as monitors outside the venue allow organisers to match the supply of gate staff to the demand from arriving visitors, broadcasting queuing data enables visitors to target their demand for facilities at the points of greatest supply.



7 Even where visitors are not actively communicating with event managers, their Social media feeds provide valuable information that can help the event run more smoothly. Posts hash-tagged with the event's name or geo-tagged with its location are monitored by 'sentiment analysis' software that alerts organisers to unusual activity, highlighting complaints or negative language. So staff can respond rapidly to matters such as overflowing bins or dirty toilets, flooded or overcrowded pathways, fights, or people becoming incapacitated by illness or inebriation.



8 Another set of digital communications carry public safety and security announcements. So if a child goes missing, parents or guardians can contact the organisers with a photo and description. These are distributed immediately via smartphones to security, customer service and crowd management staff across the site, as well as the medical and police teams. Gate staff and CCTV teams are asked to monitor the exits, ensuring that the missing child does not leave the site (soon, advances in face recognition software will enable CCTV-linked AI systems to join the search). And with the approval of the police and parents, further alerts are distributed to the general public.

With so many eyes watching, the missing child is quickly located; and With links to suitable social media channels and parents' contact details embedded into these alerts, the people who first make contact can immediately summon staff can open a video link to the team waiting with the anxious parents.

## How digital technologies can assist if problems should arise

9 Similarly, if police suspect that offences have been committed and have a description or CCTV pictures of the suspects, information can be sent out to event staff and those visitors who've provided organisers with contact details. This improves the chances of offenders being identified and apprehended; improves the level of vigilance among members of the public; and deters offenders from risking criminal activity – particularly if they believe that police and security staff may be watching the exits for people matching their descriptions.



10 Digital technologies can also help safeguard people's health. It's already possible for people with heart conditions to monitor their heart rate via their phones, and for diabetics to track their blood sugar – receiving alerts if anything seems amiss.

With their permission, event managers can be alerted to their arrival on site. Then if the phone sounds an alarm, onsite medical staff can access geo-location data and race to the patient's location – providing medical assistance before a heart flutter or dipping blood sugar level turns into something more serious.

11 As the event ends, large numbers of people exit the site and head for transport interchanges. And again the phone trackers monitor crowd movements, transmitting the information to Transport for London and the Highways Agency. So TfL can alter the traffic light sequencing at nearby road junctions, giving pedestrians longer to cross and avoiding the risk of large crowds building up at pedestrian crossings.

With the event organisers keeping departing visitors informed of any transport hold-ups on their chosen routes, the audience make their way home. Attending a major event is much more straightforward these days, they reflect: remember all that time we used to waste in queues?



# Final thoughts

When attending a major event, joining a big crowd is often part of the fun – providing a sense of unity and shared experience. But crowds can also be disorientating, obstructive and – if the atmosphere sours, or criminals use them as cover – dangerous. Hemmed in by hordes of people, it's difficult for individuals to get a bird's eye view or to access information, reducing the quality of their decision-making. Data sources and digital technology enable event organisers to reverse that dynamic.

The potential here is to empower each individual within a crowd, reducing the problems borne of poor information. Give people the data to make decisions, and they'll act intelligently – matching demand with supply to minimise queues. Get a crowd involved in looking for a missing child or raising the alarm when things go wrong, and they'll help resolve the problem. Help the audience to steer round overcrowding and transport delays, and they'll jump at the chance.

And to realise these opportunities, we don't need major new infrastructure. With most adults carrying a smartphone, the communications network is already in place; organisers just need the right partnerships, IT systems, communications tools and data sources – such as CCTV and phone tracking monitors – to gather and share information with the audience.

The result is a far better experience for visitors. The time they spend queuing for entry, food, drinks and toilets is much reduced, any problems with the facilities are addressed quickly, and they're better protected against the risks of illness, crime, and losing their kids in the crowd.

When visitors are happier, so are organisers and vendors – whose reputations are enhanced. And because they can deploy resources more efficiently and address problems quickly, costs and risks are minimised.

To realise these opportunities, organisers need to work closely with partners such as transport providers, suppliers and vendors; and to build communications channels with their audience. If event managers and venues can win the engagement of partners and the trust of visitors, the experience of attending a major event will be transformed.

We have the technology. And the benefits are clear: higher customer satisfaction; less waste of time and resources; better public safety; improved emergency response. And no more waiting in the queue for the loo.



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