



GETTING SMARTER

New technology offers the chance to put PPPs at the forefront of future infrastructure developments by encouraging a whole life view of assets. **Paul Jarvis** investigates

Smart infrastructure can mean different things to different people. For some, it will be the exciting, flashy concepts of autonomous vehicles that conjure images of sci-fi films. For others, it will be less obvious technologies, such as sensors in buildings to alert owners to degradation.

Both are valid, but as yet none of these concepts and ideas have truly rooted themselves in the infrastructure industry's day-to-day working. "We don't yet have a perfect model," says Judah Gluckman, principal consultant in the WSP USA advisory services team. "We have had some baby steps, but none have definitively captured what 'smart infrastructure' could be."

In 2020, the smart infrastructure - and

specifically smart cities - concept took a hit, when Google affiliate Sidewalk Labs pulled out of its high profile project to redevelop the Toronto Waterfront area as a 'smart' destination. The company blamed the Covid-19 pandemic for making the project unviable, but for many in the industry, the change is symbolic of a wider shift.

"It is good to see people moving away from the idea of 'smart cities' to 'smart infrastructure' more broadly," says Luke Houghton, partner and global infrastructure & capital projects lead at Deloitte. "That makes it a more manageable task: if you take a city approach, you can easily be overwhelmed by the enormity of the opportunity and the risk that goes with that."

As technology develops at bewildering speed,

companies are creating an ever-widening array of tools and bringing this together to help clients will be key. "We have been working with various different platforms to bring together the widely available smart technologies into one package that gives the client real added value," says Robert Marr, director of asset management at technical advisory Artelia.

On the public sector client side, there is the same focus on outcomes, rather than on technology for its own sake. "We think of technology as a tool by which we can accomplish our larger goals better or faster," says Joshua Schank, chief innovation officer at LA Metro. "'Smart cities' implies the answer to problems is technology, but we start with what we are trying to achieve."

Smart thinking

Dr Jennifer Schooling OBE is chair of the Research Strategy Advisory Group for the Centre for Digital Built Britain and director of the Centre for Smart Infrastructure and Construction (CSIC), University of Cambridge. She explains the role of smart infrastructure today

Smart infrastructure is all about data: using data to improve decision-making. I am keen to see a shift from viewing maintenance as an operational expenditure to capital expenditure, because it is important to take a whole life perspective of an asset.

Smart infrastructure needs to be driven not by the technology, but by the need. Whether it is an HVAC system or a railway, you need to know and be able to monitor what the critical elements of that asset are that allow it to perform.

Most of the time, you don't want to design something that doesn't need attention for 100 years, because you don't know what we will want from that asset in 100 years' time. So you need to manage data gathering on an asset in the same way as, for example, you manage tyres on a car. No-one buys a car without tyres, but also there is an expectation and understanding that these will degrade over time faster than the car itself and will need to be replaced.

There is an increasing appetite to use data better and an increasing understanding of the value of data through the life of an asset.

A lot of the barriers to smart infrastructure progress are organisational and cultural. Smart infrastructure requires everyone to understand the value of data and it needs to be recognised as part of the day job, not an added extra.

Cost can sometimes be a barrier, but if you understand the purpose, you can often justify the cost. Investing in some level of continuous monitoring from relatively early in the asset's life has benefits, but it must be value driven and not technology driven. It is about working out how you might fund it, and deciding over what period you want to see the benefits, and that will depend on how long you want the asset to last.

Kusha, group head of business development & partnering at Plenary Group. "As the market continues to evolve, we believe the ability of the private sector to continue to innovate and for private finance to be leveraged to deliver projects faster will benefit everybody involved."

PPP potential

There is also a belief that the development of smart infrastructure will go hand-in-hand with the use of PPPs.

"Smart infrastructure plays directly into the notion of infrastructure lifecycle," says Mike Schneider, managing principal of technical advisory InfraStrategies. "We have to make a generational shift in the way we look at infrastructure investment."

For Schank, the key here is the risk-reward ratio. He points to a bus rapid transit unsolicited proposal received by LA Metro which was rejected on the basis that the additional technologies involved - including some autonomous features - represented too big a risk for the reward being offered to passengers. While the private sector had agreed to take the risk under a PPP model, as Schank points out, the public sector still pays for that additional risk through its repayments.

There is confidence, though, that these technologies will lead to significant new opportunities. "We are bullish," says Sia





“If you are taking an overall lifecycle approach, that will germinate a focus on new technology that the private sector will develop because it makes economic sense to do so. PPP is perhaps one of the best incubators of new technology.”

“Smart technology is not cheap: the private sector is willing and able to make the upfront investment because of the long-term savings it can achieve,” agrees Seth Miller Gabriel, director for infrastructure at advisory BDO, and who previously worked with Gluckman on the DC smart streetlighting programme when they were both part of the district’s PPP office (DCOP3). “The public sector may not have that flexibility in their budgets.”

However, can issues of flexibility be negotiated in long-term deals, where the potential for technology to grow and change is significant?

“People are moving towards more of a partnership approach than the old PFI model,” says Marr. “There was nothing in a PFI contract that said you had to be a flexible partner. The difficulty is developing a partnering contract that allows for future development and does so in such a way as to promote innovation.”

Kusha agrees, adding that it is not just brand new contracts that can deliver the required flexibility. He points to the Communications Security Establishment Canada (CSEC) Long-Term Accommodation Project that Plenary is delivering, having signed the 30-year contract in 2011.

“The owner recognised the need to keep the electronic components and IT elements of the

PPP is perhaps one of the best incubators of new technology

project more robust and up-to-date than would typically be required in other social infrastructure assets,” he says. “There was an understanding that the asset needed to be constructed, operated, and maintained in a fashion that would allow the owner to benefit from the latest technological advances at a much more rapid pace than, for example, replacing other mechanical and/or electrical functional elements of the asset.

“When talking about PPP contracts’ ‘inflexibility’, the point that gets overlooked is that, the beauty of a PPP contract centres around the recognition of lifecycle impacts of the decisions over the life of the asset. A well-defined PPP project agreement can and should incorporate all the elements that can be defined at the time of the execution and allow for future accommodations of unknowns.”

“A performance-based contract is a really helpful method for having some of the risk

reduced on new technology,” adds Schank. “The key is that the new technology has to be worth it.”

So how can smart infrastructure be used to the greatest benefit?

Monitoring usage, whatever the sector, will be an important place to start. “Millions are spent by authorities on traffic monitoring before deciding on a major road project,” says Gluckman. “If you had that data to hand, through cameras on every corner, but with data aggregated and anonymised for privacy protections, for example, it would save millions.”

“We are going to see a great deal of emphasis on improving sensor technology in buildings over the next few years as a result of what happened in Miami,” says Schneider, pointing to the need to use data to avoid tragedies such as the collapse of the Champlain Towers South building in June 2021.

“From my experience in DC, street poles became very important, not just for lighting but also for building out a 5G network,” says Miller Gabriel.

“For cars to become self-driving, there is an infrastructure that needs to be built out and which needs to take up space in the physical world. That will inevitably be PPP because the physical infrastructure needs to be in the public realm.”

For the public sector, it may be that assets such as street poles will become more valuable if they are in high demand from technology providers, giving procurers more leverage to deliver new infrastructure as part of a smart technology initiative.

Smart invasion?

One of the biggest concerns usually raised when discussing smart infrastructure is data security and privacy. The public will always be suspicious of the way their data is collected and potentially used by the public sector, with phrases like ‘Big Brother’ easily bandied about by privacy groups. When you add in projects where the private sector is involved, suspicions will often rise even further.

“The ability to collect data and manage assets on that basis brings social issues that have to be dealt with at a policy level,” says Kusha, who suggests robust answers have not yet been given to tackle those legitimate concerns.

However, these problems may not be insurmountable. “Legislative leaders in the US and Canada are beginning to recognise that the old traditional methodologies won’t survive, and so they need to introduce new legislation, policies, and procedures that are broad based and data-focused,” he says.

There is a growing understanding, too, that this needs to be a global effort and cannot be achieved in silos. “Connected infrastructure that ends at a border will create data gaps resulting in an inefficient process to manage smart infrastructure,” explains Kusha.

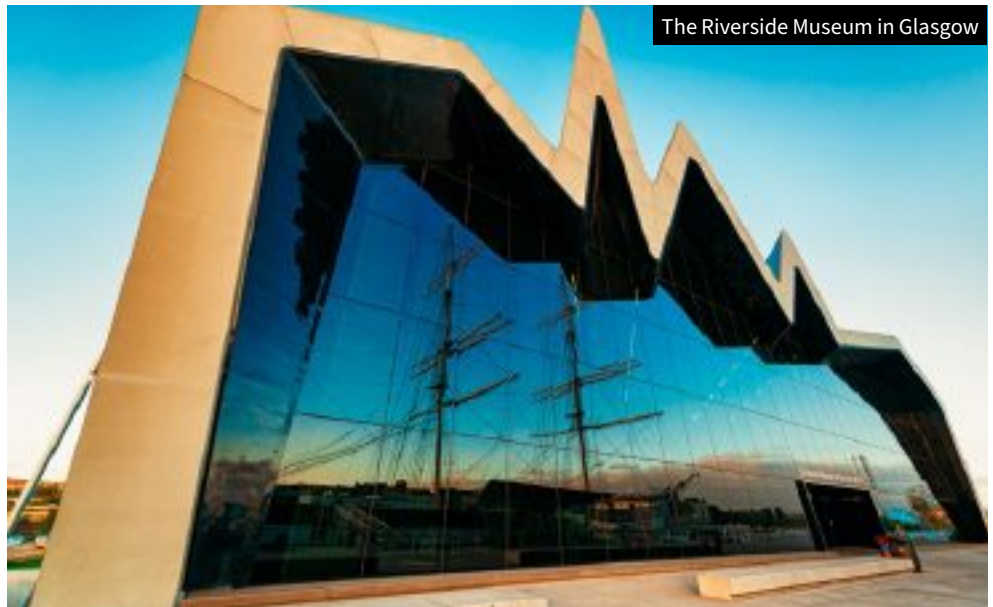
Many in the industry point to the inherent contradiction of a population that freely provides location data via mobile phones every day without thinking about it, but balks at the idea of similar technology being used to tax their car journeys instead of paying tax on their fuel. There is a hope and belief that as people become increasingly comfortable with some data sharing - and begin to see the benefits from early projects in the smart infrastructure world - concerns around privacy will be abated.

Gluckman suggests that in his experience, privacy was not the major factor in slowing progress of the DC smart lighting project. “The project is primarily a lighting project with the smart side being a test portion. The concerns weren’t around privacy,” he says. “It was interagency coordination and protests with incumbent contractors that slowed progress.”

Perhaps the biggest barrier to smart infrastructure development, however, will come from the public sector itself. Despite a desire to be innovative, many authorities recognise that being a first mover will put them out on a limb.

“Given political realities and social pressures, most public sector owners would rather not be the first to implement something that hasn’t been implemented elsewhere,” admits Kusha. Nonetheless, he remains positive that there is interest in doing things differently and harnessing the opportunity that technology can bring.

“From the private sector perspective, as technology continues to develop, there is excitement about being the first to deliver a better solution. A good example is recent advances in the alternative transit networks



The Riverside Museum in Glasgow

A public sector perspective

Paul Dodds heads the Scottish Futures Trust’s infrastructure technology division. He explains what the agency is doing to stay smart

We lead the Scottish government’s Building Information Management (BIM) policy. That is the starting point for us in our journey. The challenge we have is to enable the design, construction and FM sectors to become more effective at managing data.

For us, the foundations are the key building blocks: how do you manage and name the information? If you can get that right, you can start to build-in new technology on top of that.

We are focusing on developing our client side requirements that the industry can respond to. We are starting to push the industry into a more productive way of working.

Our work has now expanded to look at wider technology in infrastructure. It has

a key role as a driver to improve whole life performance: where and how can technology help an asset become more effective through its lifecycle?

In July 2020, we launched our standard information management plan to bring a national approach to having information in the right format. It is now being deployed within the estate learning programme in Scotland. It is about creating guidance and tools to provide the right framework with both the public sector and industry. Bringing a standardised approach can help manage risk and understand what public bodies need and when they need it.

The Riverside Museum in Glasgow has worked with local company IES, which brought a technology and methodology to better understand energy consumption. That project reduced electricity usage by 18%.

This is a constantly evolving space. We have one eye on frontier technology, but we are equally trying to bring the majority of organisations into an area of established technology.

Investors and developers are investing in research & development, and we see lots of examples in the industry. We are always looking at what is going on in the industry.

solutions, where AV/EV/CV could potentially replace traditional rail based transit systems with much lower environmental, social and economic impacts.”

Miller Gabriel agrees that there can be reluctance on the public sector’s part, but also warns that it shouldn’t look to smart infrastructure as a financial cure. “I would caution the public sector that it’s not in itself necessarily going to be a huge revenue driver,” he explains. “The upside is the savings it will create.”

Underpinning everything in the smart infrastructure space, meanwhile, is one key

ingredient: high quality internet access.

“The number one prerequisite for all this is for broadband to become ubiquitous,” says Schneider.

Miller Gabriel is confident that we are on the right path here. “You have to have broadband as the backbone to build smart infrastructure. There is now a real focus on building out the broadband network, whether that’s in rural or urban settings.

“Once that is built out, we will see the rollout of smart infrastructure.” **PB**