



The new Crossrail station at Custom House built off-site in Derbyshire

## Smarter infrastructure: A solution to the productivity puzzle?

What elements lay the groundwork for “smart infrastructure,” and how can the public sector drive them?



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Infrastructure has the ability to change lives. It helps us travel, communicate, and prosper. It powers our homes and businesses, supporting growth, boosting productivity, and improving our competitiveness. But is our infrastructure smart? Are we embracing the manifold opportunities presented by technology in how we plan, deliver, and operate our infrastructure systems and networks? Are we learning fast enough from innovation and best practice at home and internationally? Can we articulate clearly what we mean by smarter infrastructure and can we describe what high-performing infrastructure looks like?

The short answer to these questions is “*Not yet – but we do have a plan.*”

Building on previous efforts, this past December the Infrastructure and Projects Authority (IPA) published an ambitious ten-year plan—*Transforming Infrastructure Performance (TIP)*—aimed at improving the delivery of economic and social infrastructure. The plan defines how the government will work with the construction industry to design, build, and operate our transport, energy networks, schools, prisons, hospitals, and other public works. By focusing on effectiveness rather than volume, we aim to close the construction productivity gap, representing an opportunity of £15 billion a year, and ensure our infrastructure serves our communities in both the near and long term. We believe this plan can serve as an example to other nations seeking to improve efficiency and return on the massive investment we make each year on infrastructure.

### **The state of infrastructure**

Like many other developed nations, the United Kingdom has mature construction systems and networks. The public and private sectors together invest around £60 billion per year (2.5 to 3 percent of GDP—similar to spending levels in the United States, Canada, and Western Europe) in projects and

programs across economic and social infrastructure. This is a huge commitment both in scale and ambition, but we need to invest not just to create but also to improve.

A significant share of this investment is devoted to major projects—Government’s largest and most complex. Construction and infrastructure projects represent the largest growth area in the Government Major Projects Portfolio (GMPP); in 2016–17 alone, the government was engaged in 37 infrastructure and construction projects with a whole-life cost exceeding £222.5 billion—almost half of the GMPP total of £455.5 billion.<sup>1</sup>

And like other nations, our approach to infrastructure needs to evolve. This is not simply about delivering the same projects more efficiently; it’s about delivering more ambitious social, economic, and environmental outcomes. It is about building skills, driving growth, supporting decarbonization, improving performance, and boosting productivity. It is about making smart infrastructure investments.

Of course, making these investments can be difficult. Construction as a sector is characterized by low profitability and productivity compared with other sectors. With low margins, it’s not possible to compete to deliver cheaper solutions. This is where technology will play an increasingly crucial role—not only helping us build smarter new infrastructure but also improving how our current operational assets perform.

### **The elements of smarter infrastructure**

TIP is intended to improve the way the United Kingdom’s infrastructure is planned, procured, delivered, and operated, thus boosting national productivity. Other sectors have made similar transformative changes and have seen huge productivity leaps as a result. For example, auto manufacturing has made large investments in a

standard, automated manufacturing platform that can be used across vehicle types but that also enables user mass customization. Applied to infrastructure, such standardization could enable designs that are useful in a variety of contexts. For example, hospital and school buildings both need functional spaces, which require similar building pieces. If we could standardize these parts, we could use them time and again. Such innovations are not yet endemic, and technology is not used widely nor consistently.

To this end, rather than focusing on capital efficiency of individual projects, TIP encourages government departments and leaders in the industry to take a higher-level, portfolio view of projects, prioritizing the whole life of the asset as well as the performance of the entire system. By working together, they can better benchmark performance, choose the right projects, improve planning across sectors, support commercial relationships, and increase use of new technologies—ultimately leading to an increase in the sector’s efficiency.

Before beginning this change program, we have to envision what harnessing smarter infrastructure will look like across the sector. We see opportunities in five specific areas.

#### Data

Data will drive effective decisions, prioritizing investment in schemes that meet the needs of users and maximize the wider socioeconomic and environmental outcomes for society. Benchmarks will measure whole-life costs, schedule, in-service performance, and the delivery of benefits.

#### Commercial models

These models will be collaborative, supporting innovation and boosting the competitiveness of UK supply chains to deliver safely and predictably. Procurement will focus on whole-life outcomes, and contracting strategies will deliver rapid payment to all levels of the supply chain.

#### Delivery

Delivery will be more productive, exploiting digital technology in design to enable smarter manufacturing and construction techniques that speed delivery, minimize disruption, and maximize efficiency, helping to build new skills in the economy.

#### Infrastructure assets

These assets will be intelligent, producing and using data to perform measurably better through their whole life, meeting exacting standards of sustainability, resilience, and availability.

#### Productivity and competitiveness

Both the infrastructure industry’s and the wider economy’s productivity and competitiveness will be boosted with investment delivering better services and driving growth. Both qualitative and quantitative measures would place UK infrastructure at the top of international rankings.

#### Making smarter strides

So how do we get there? With these goals in mind, the UK has made moves to improve its infrastructure. Certain projects and programs, leaning on innovation and best practice, are starting to make a difference. Some parts of our networks are already intelligent—for example, Highways England’s smart motorways program—but overall we could be smarter.

The TIP program is under way, and helping us reach these goals in diverse ways.

#### Benchmarks

We are developing benchmarks that measure not just cost but also performance. With these benchmarks, we can gauge performance at a network level, in how it reduces congestion, and at the system level, in terms of how productive the economy is. Thus, these benchmarks enable us to look beyond just a single project and to map operational success.

### International collaborations

We are collaborating internationally to ensure world-leading best practice helps to shape our strategies. We will be using these benchmarks to make investment decisions, inform procurement choices, and measure performance.

### Innovative incentives

The construction industry has long been fragmented, underinvested in, and operated on wafer-thin margins. These are not the conditions that support innovation and enable productive growth. We are looking at new commercial models that incentivize industry to innovate, invest in more productive skills, such as digital and manufacturing, and deliver value in the long term.

### Government participation

As the largest client to the construction sector, government must also play a key role. How we specify, produce, and contract must create the right conditions for transformative change. Within the Autumn Budget 2017, the government announced that five of its departments—the Department for Transport, the Department of Health and Social Care, the Department for Education, the Ministry of Justice, and the Ministry of Defense—would adopt a presumption in favor of off-site construction by 2019. We believe bringing manufacturing processes off-site will drive huge productivity gains into construction. By working together, these departments, which are responsible for £20 billion per year in building and transportation projects, can drive scale and standardization in manufacturing. This collaboration also stimulates demand, because the collective, larger-sum budget is attractive to investors.



We must remember that TIP is a change program, not a magic switch, and that the IPA cannot deliver this alone. Only by continuing to work with

innovation leaders across the public and private sectors will we be able to make the transformational change to smarter infrastructure and boost our nation's productivity. As we start on this journey, I will always welcome the input from innovators who can support us on this path to smarter infrastructure. ■

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<sup>1</sup> *Annual report on major projects 2016–17*, Infrastructure and Projects Authority, July 18, 2017, gov.uk/IPA.

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