



UCL INSIGHTS: RESEARCH BRIEFING

Infrastructure and the Industrial Strategy: digital infrastructure and productivity in the UK

On 19 September 2017 UCL convened a roundtable bringing together expertise from academia, policy and industry to address a number of questions around the role of digital infrastructure in driving productivity across the UK and in particular within the construction industry.

The discussion was considered within the broader context of the existing productivity gap across the UK and between industry sectors, and the ongoing development of the government's Industrial Strategy.

How can we drive UK productivity through digital connectivity?

There is a clear global trend towards digitalisation. Digital connectivity is a requirement of strong business growth and it is therefore critical that the UK considers digital infrastructure as a key component of the Industrial Strategy.

There are longstanding productivity problems in the UK, including regional disparities, a 30-year period of infrastructure privatisation and fragmentation of the sector. A focus on short-term finance has undermined consideration of how to drive long-term economic, social and environmental gains. There needs to be greater recognition of the value residing in public good, rather than pure financial gains, and appropriate incentives to promote this approach across all sectors.

Priority should be given to areas that offer the best long-term return for investment; that is a positive contribution to the economy, society and the environment, but investment in digital infrastructure must also be balanced with support for other areas of need, such as skills development and improving wellbeing, which have been shown to reduce demand on public services (such as health) and in turn increase economic productivity.

What technologies will drive the fourth Industrial Revolution?

There are a number of key technologies which are likely to drive the fourth Industrial Revolution, including:

- Effective, universal, **high-speed internet connections**, including on major rail and road routes
- Infrastructure to deliver new technologies such as **visual communications**
- **Sensors**, including retrofitting existing infrastructure to support new technologies
- **Blockchain, AI, Virtual Reality/Augmented Reality**
- **Building Information Modelling (BIM)**
- **Offsite manufacturing**, Design for Manufacture and Assembly (DfMA) and **robotics** in the construction site
- **Drones, Photogrammetry and 3D Imaging**
- **Web services** to facilitate online collaboration
- **e-Procurement** and **digital marketplaces**

Can digital connectivity drive productivity in the construction sector?

Digital connectivity may be a double-edged sword, offering efficiencies in speed of communication, co-ordination, remote operating and problems solving on one hand, but centralisation and the loss of human decision-making skills and power on the other. Within the construction industry for example, digital engineering and Building Information Modelling (BIM) can help to drive energy and environmental efficiencies, reduce both initial costs and those incurred over the life of the project, and help develop and commercialise new off-site manufacturing techniques.

However, there is still a lack of examples, applications and commercial solutions for BIM for management of existing infrastructure, and ongoing management of new projects once the initial design and building phases are completed.

There are other barriers which currently limit the uptake of digital technologies within the construction sector. The highly privatised nature of the industry creates a key challenge for the adoption and dissemination of enabling technologies, reducing incentives to share data, and resulting in a lack of basic cross-sector standards for data and metadata. This is compounded by out-of-date industry regulation.

Whilst digital technologies also have the potential to drive productivity in the delivery of the construction pipeline, this currently consists of capital projects only and there is no

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pipeline for investment in existing infrastructure assets, which tend to be preferred by institutional investors, owing to the return on investment and reduced risk.

These secondary markets are also larger drivers of the construction sector in the UK and key assets in both the take up and dissemination of digital technologies across the industry, and may be more important than the design/build phase within the UK context.

Recommendations

- **Develop 'missions' for investment:** Investment in infrastructure, including digital infrastructure, should be predicated on the basis of improving wellbeing and driving social and environmental, as well as economic benefits. Provide long-term, stable support for R&D, including tax credits at the city level to encourage collaboration between universities and local industry
- **Digital literacy and connectivity to improve wellbeing:** Government should invest in capacity building to increase digital connectivity (which can improve social wellbeing, and in turn lead to productivity gains) and overall digital literacy in order to improve use of connectivity. This should include skills development and education in particular sectors or geographies that would most benefit from digital investment.
- **Align stakeholders around common goals:** Identifying clear missions or common goals can help to align different stakeholders towards a shared purpose. This should also include increasing public participation in the development of, and discourse around, the national digital agenda. In the case of the construction industry, Government should encourage a bottom-up industry approach to generating data standards supporting interoperability and facilitating data sharing.
- **Improve governance and regulation:** Regulation in the construction sector should be revised to meet the needs of the current private sector. In addition, greater consideration of regulation around cyber security and ethics in the use of data is needed.
- **Learn from best practice:** Government and industry should work together to develop case studies to identify which packages of projects within the construction pipeline could create the best financial and public good value in the project chain.

THE ROLE OF THE STATE

- **Long-term investment:** the state is central to underwriting long-term investment in technology, critical in driving the development of digital infrastructure across the UK.
- **Infrastructure development:** Despite privatisation, the state still commands a large proportion of UK infrastructure, as demonstrated in the infrastructure pipeline; consequently the state's ambitions and needs should drive innovation in these areas.
- **Addressing disparity:** The state also has a role to play in recognising and tackling regional inequalities in digital infrastructure development, as well as balancing support for digital industry with support for other areas of need such as welfare.
- **Incentives:** The state can enable the uptake of digital technology through incentivising collaboration and efficient business models in the private sector, and encouraging the sector to develop data sharing practices and robust data standards, including more innovative use of existing data sources.

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