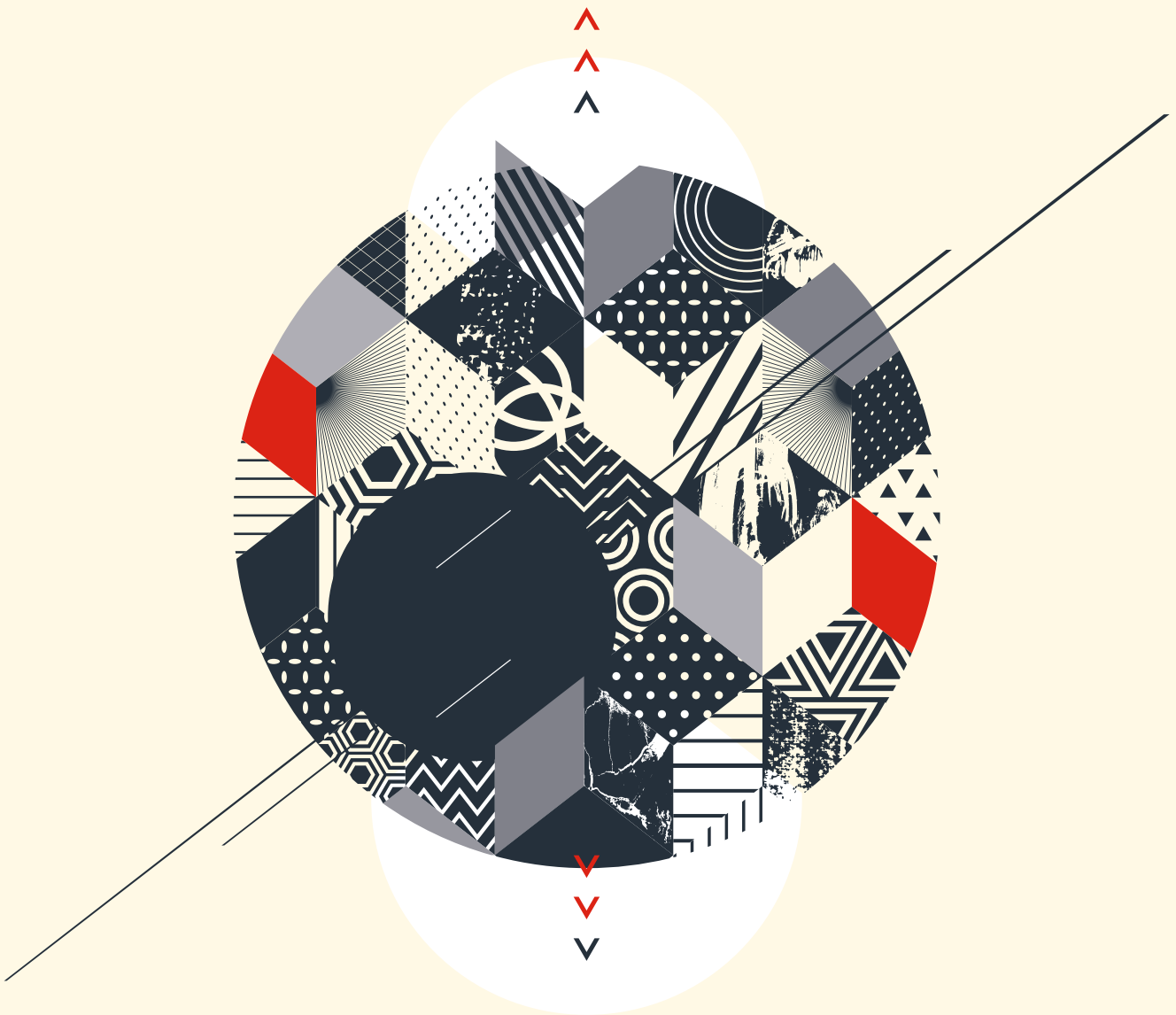


CAMBRIDGE 23 FEBRUARY, 2017
GUEST SPEAKER **Dr JENNIFER SCHOOLING** PRESENTED:

“THE ROLE OF SENSORS AND DATA IN THE BUILT ENVIRONMENT”



EXECUTIVE SUMMARY

Ageing and inadequate infrastructure, which fails to meet our society's changing demographics and lifestyle needs presents an increasing challenge for the future of our UK cities.

Kim Vernau, CEO, BLP Insurance highlights the key points raised at an interactive discussion organised for industry peers on the role of sensors and data in informing sustainable design and management decisions within the built environment. Guest speaker Jennifer Schooling, director of the Centre for Smart Infrastructure and Construction at the University Cambridge, provided an engaging insight into the world of engineering and advances being made to harness information more effectively in infrastructure projects.

INTRODUCTION

Modern infrastructure must be robust, resilient and adaptable to change, but it also needs to be optimised in terms of efficiency and cost. To do this we need to harness information more effectively in infrastructure projects, and use this to help inform better decisions about the way in which we build.

Emerging technologies in sensor and data management provide a compelling solution to transform infrastructure through smarter information. The potential for reduced costs and efficiencies are game changing, but it all comes down to our potential to harness this data to get the most out of our infrastructure now and in the future.

THE INFRASTRUCTURE CHALLENGE

The UK's ageing infrastructure is facing huge challenges. A large proportion was originally built by the Victorians, with no expectation that we would still be relying on it as the backbone to UK infrastructure 150 years on. The more recent construction boom of the 1960s can also be commended for having all the right intentions, but a lot of the assumptions that were made about how people would want to live and use those built assets turned out not to be right.

The problem lies in the fact that infrastructure by its very nature is subject to a lot of change. Shifts in demographics and the impact of climate change will all affect the requirements on the built asset and its ability to respond over time. The reality is that infrastructure in the UK is under far more pressure than it was ever designed to be, and we don't yet know what the impact will be on the current condition of the asset and the length of its residual life. It stands to reason that loading something more and more will inevitably have an adverse effect on increasing its degradation date.

Shifting factors will also lead to changes in how we design our infrastructure, how we build it, how we operate it and how it is maintained. It opens up a pressing need for innovation. We need to be cleverer, not only in the way that we use our built assets, but also in adapting a more targeted approach to how we construct new ones going forward. We can't simply build our way out of a capacity constraint.

BARRIERS TO INNOVATION

There are a number of key barriers to innovation in the construction industry, the first being that as a group we are inherently conservative. Against a backdrop of low margins and heavy regulation, you can see why we would not challenge the status quo and it would take a brave person to stick their neck on the line and say we're going to do something completely different.

In construction we also see a race to the bottom in terms of pricing, so that the environment we are operating in is one where things are procured for the lowest cost rather than the best value for money.

Another challenge lies in the complex and fragmented nature of the industry. The supply chain has multiple layers from the design through to the construction phase, and that's before you even consider operating the assets and ongoing maintenance. The result is that no one organisation or individual has a responsibility for driving forward innovation.

There is also limited incentive to invest in innovation because the asset will inherently be built, managed, owned and maintained by different organisations throughout its lifespan. On top of that, when we're looking at the whole life value of the asset, it could potentially span several professional careers, let alone several organisational contracts. The challenge then becomes how you incentivise someone to invest in something now which will only reap the benefits 20 years down the line.

One of the key hurdles to overcome is getting clients to ask for what they want from the supply chain. In our fragmented industry, if the client doesn't ask for a change in how things are done, it's very difficult for the industry to deliver because of the high level of investment required. In a world of low margins there needs to be strong business case for investing in new technology.

We therefore need to think carefully, not just about the infrastructure and data challenges that we're currently facing as an industry, but also the commercial and contractual backdrop and how it needs to be adapted to work in the current environment.



SMARTER CONSTRUCTION

The onset of the so-called fourth industrial revolution brings with it a huge opportunity for using sensor technology and digital information to better understand our assets at every stage of their life cycle. This is the concept of smart infrastructure and in essence it comes down to using the digital to better manage and maintain the physical asset.

There are an increasing range of data sources, but crucially it's what you do with that data that will allow you to get the best value out of it as an asset. Reducing costs of sensors as well as the generation and storage of data represents an amazing potential resource. The challenge we are currently facing is that given the volumes of data we need to get much better at how we curate and manage that data.

We also need to consider how we can use advances in technology to help make sense of that data in a way that a decision maker can use it. While increasingly decisions are being made by machines, more complex decision making will always need to be done by humans. The opportunity comes from being able to make better decisions. In effect if we have better information based on better data, we can make better informed decisions.

DIGITAL BUILT BRITAIN

Building Information Modelling (BIM) tools are no longer confined to the collaboration and design of an asset, but it's also being used in the construction of that asset. As we move into BIM Level 3, or Digital Built Britain, we're going a step further by using the digital data to manage the physical asset through its whole life cycle. The complexity lies in understanding how you manage the inevitable growth in data and growth in complexity as the infrastructure ages.

The progress of digital imagery techniques presents a real opportunity to capture an accurate representation of what was built. It represents a real game changer for the industry and provides a reassurance that when the digital asset is handed over it accurately reflects what was built and be taken forward with confidence. Using the data from sensors, can not only be used to inform the construction process, but it

can also feed back into the design process. The idea being that if you are building something over and over again you can actually look at how the asset performs during construction and during use and take that information and feed it back into the design process to design it better next time.

This is, however, an inherent tension in the construction industry when it comes to the reluctance of market participants to give away too much information, versus that information actually being something that is helpful to the industry. We need to move to a much more collaborative approach in the sense that we're confident to share information and data with each other for the greater good.

CONCLUSION

The lifecycle of infrastructure is being extended and optimised through the smarter use of data. For construction professionals, the implications and cost efficiencies are game changing.

The way in which sensor technology can be deployed and integrated through the construction process, from design through to operation, will enable better and more informed decisions. Most importantly it will enable increased whole-life value; using the information around the condition of the built asset to deliver higher quality performance, at best value, over the lifetime of the asset.

Data continues to give value throughout the life of the physical built asset. This is a concept that as an industry we have been slow to take up and it will require a big culture shift within the industry if we are to appreciate the true value of data in transforming our infrastructure.

Dr Jennifer Schooling CEng, MIMMM, is Director of the Centre for Smart Infrastructure and Construction (CSIC), at the University of Cambridge. CSIC aims to transform infrastructure through smarter information. Jennifer and her team work with a wide range of industry partners to develop commercial technologies, tools for data analysis and asset management, best practice guidance codes and specifications for scale-up and standardisation.



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IMAGES FROM 23 FEBRUARY, 2017, AT THE SALTMARSH ROOMS, KING'S COLLEGE, CAMBRIDGE



An interactive discussion on the role of sensors and data in informing sustainable design, construction and management decisions within the built environment.

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