

TIES LIVING LAB PROGRAMME

Infrastructure intelligence at your fingertips
(IP11)

October 2022





INTRODUCTION

The infrastructure sector collates vast quantities of data, including cost data, carbon data, safety data and commercial data. Much of this data is siloed within organisations and is held in a variety of formats. This means that analysis takes place in a disjointed, sub-optimal manner, if it happens at all. Estimates suggest that only 17% of available data is analysed to inform portfolio-level decisions.

Construction engineering specialist Costain recognised the considerable potential for bringing together data from disparate sources and analysing it to help identify productivity and efficiency gains across the infrastructure sector. Its concept, the Intelligent Infrastructure Control Centre (IICC), combines advanced analytics (already used in the finance sector), for usability and accessibility of data with the capacity to gain insight through voice to transform the use of platforms for portfolio management.

The IICC not only collates and interrogates “traditional” project management data, but it also gives users access to crucial sustainability metrics such as carbon emissions and social value assessments.

This information paper describes the IICC developed by Costain and its partners SAP and Keytree (now Deloitte), which was chosen to be one of three AI demonstrator projects tested “live” under the Government-funded Transport Infrastructure Efficiency Strategy (TIES) Living Lab Programme.

BACKGROUND

The TIES Living Lab Programme brings together 25 key infrastructure sector collaborators with the aim of accelerating the adoption of modern methods of construction (MMC).

The programme was established in the context of wider UK Government initiatives, such as the Industrial Strategy, the *Construction Playbook* (2020) and the

Transforming Infrastructure Performance: Roadmap to 2030 (Infrastructure and Projects Authority, 2021).

The TIES Living Lab Programme was launched in 2018 and comprises ten projects, of which three were digital demonstrators under the guidance of the Analytical Consortium (comprising technical experts from the TIES Partners, industry experts and academic partners).



Large infrastructure projects, such as HS2 and East West Rail, accumulate significant amounts of cost and commercial data as well as data covering health and safety, carbon, resource utilisation and other metrics. By enabling analysis (and “deep dives”) of these datasets, various trends and opportunities for cost savings and efficiencies can be identified. In turn, these will enable a series of efficiency measures to be put into practice. These can also be rolled out across many different types of infrastructure projects and will be applicable to the TIES Partners.

The Analytical Consortium was tasked with “turning theory into practice” – testing techniques and tools using live data to prove the many benefits of adopting novel technologies and MMC, and the value of harnessing the vast quantities of information generated by UK infrastructure projects.

Data in the cloud

The IICC represents a step-change compared with today’s situation where project operational data is typically interrogated only to a limited extent. Any efficiencies identified or lessons learned are not being shared or communicated beyond the confines of the project where they were originally generated.

The IICC is a cloud-based digital platform that connects real-time, complex engineering data sources to business-level decision-making processes. The platform is a way of bringing together many different aspects of data management through a common suite of analytical tools. It offers a dashboard of results and a series of forecast reports, addressing many of the current shortfalls of infrastructure control management systems.

Costain estimated that the economic impacts of the IICC would be considerable, and set out

with the TIES Living Lab collaborators to test the new system on the demonstrator projects that use MMC and advanced logistics.

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CHALLENGES

Several key challenges are currently slowing the pace of progress within infrastructure delivery:

- The burden of timely, accurate reporting
- Version control in relation to information that has been gathered
- Many process steps, with the potential for errors when file sharing or communicating by email
- Data and information stored in organisational “siloes”, meaning that innovation and best practice are lost, and there are interoperability issues due to data being gathered from various sources
- Translation of raw asset data into data that can inform organisational operations
- High latency to understand initiative impact, meaning that analysis is delayed
- Decisions being made based on data and information that is not comparable, inaccurate, incomplete or already out of date.

The TIES Partners decided to use the IICC to solve specific problems within the UK infrastructure sector, as follows:

- To establish within months a digital data centre that can digest terabytes of



infrastructure data in real time, and that has the potential to be rapidly scaled

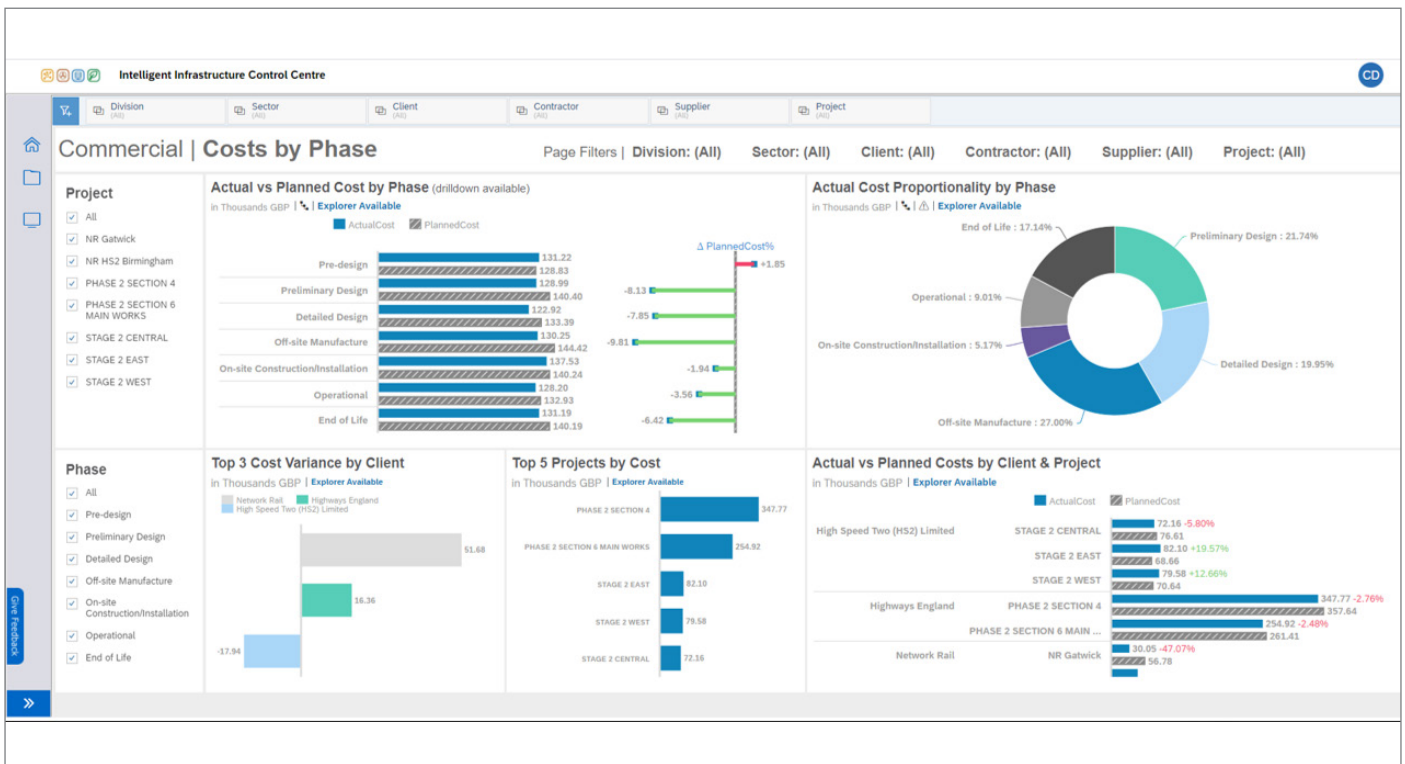
- To provide infrastructure clients with a virtual facility (the IICC) to allow collaborative exchange of infrastructure investment and innovation to drive efficiencies
- To demonstrate the social value benefits in the economic illustration of the insights arising from the IICC demonstrator projects.

DEMONSTRATING THE IICC PLATFORM

Data for the IICC was gathered from other TIES Living Lab demonstrator projects, which included the construction of modular equipment rooms, cooling panels for underground networks, and a footbridge, as well as data-driven projects such as the automated design of cable routing.

The IICC is an integrated, industry-wide technology platform that consolidates infrastructure project data from disparate, siloed and non-user focused sources. It can automatically feed data for visualisation and analysis of major design and construction activity across the demonstrator projects for the DfT and TIES Partners. The real-time data insights are aimed at informing strategic decisions and improving enterprise performance at a macro level. The platform acts as a single window through which to view all of the data for an infrastructure project. IICC data will be used to test AI approaches to mine and interact with the data to improve the end user experience.

The platform provides a data-driven analytical approach to achieving sustainable development across an entire enterprise. This is done through six modules, outlined below.





Commercial modules

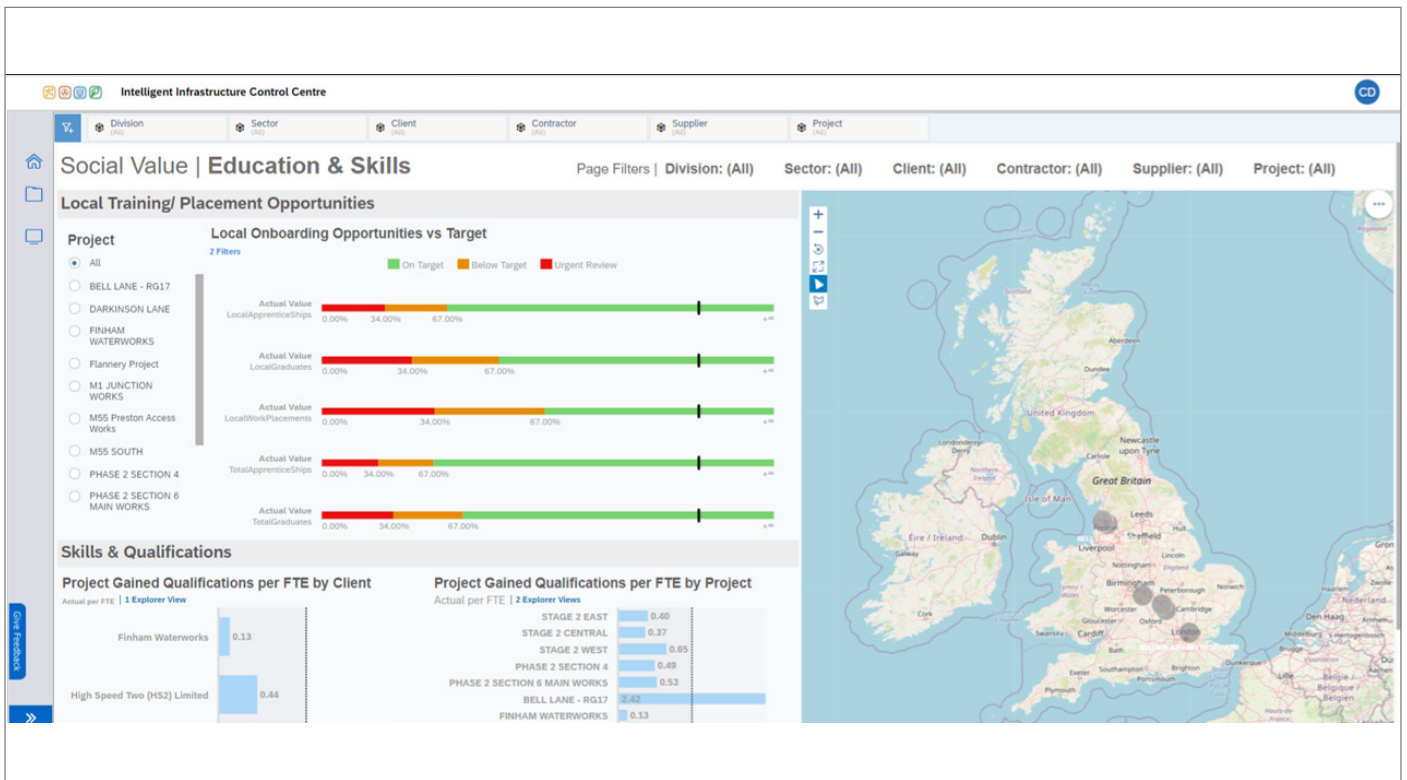
- 1 **Commercial** – This enables the capture of real-time and near real-time commercial reporting metrics to understand deviations and provide leading indicators for proactive portfolio management. The environmental, social and governance (ESG) impact on cost can be realised through a one-stop shop approach.
- 2 **Programme** – This enables aggregation across multiple modes for a single source of truth around project timelines. Project progress is reported quickly (low latency), with standardised metrics for understanding estimation accuracy in comparison to live project control outputs. There are benchmarks and baselines for assets to capture innovation and efficiency.

Environmental modules

- 3 **Carbon** – There is a whole life approach to carbon emissions data management in accordance with PAS 2080 for full emissions transparency across a portfolio. This makes it more likely that net zero timelines will be met.
- 4 **Environment** – The platform captures biodiversity, air quality, waste, noise and utilities data all in one place from the Internet of Things (IoT), reporting systems and supply chain management systems. The portfolio approach captures best practice to be transferred across projects.

Social modules

- 5 **Social value** – This provides insights on employment, wellbeing and community engagement all in one place by plugging into HR systems, digital surveys and engagement platforms. There is direct





access to employees through automated wellbeing updates.

- 6 **Telemetry** – This has been developed using ISO/TS 15143-3:2020 telematics data standards. It integrates telemetry data from multiple plant suppliers and acts as a single-point source. Data from multiple suppliers and plants is then analysed for informed insights into productivity, efficiency, safety and operational hours.

BENEFITS OF USING THE IICC

Using the IICC for collating and analysing data from both construction and data-driven infrastructure projects should provide the following long-term benefits for optimisation and improvement.

It will help make projects:

- **Safer** – Real-time monitoring of safety and speed infringements using the Internet of Things (IoT) will centrally capture performance and best practice, with an estimated eight times faster transfer of improvements across a portfolio.
- **Better** – Higher-fidelity data will realise estimated time savings of up to six months, with measurable impacts on initiatives for reducing carbon emissions, supporting the UK Government's net zero ambitions.
- **Faster** – An estimated 99% reduction in ESG and financial performance reporting will lead to reduced decision-making time, speeding up the spread of efficiency and decreasing risk, to improve project timelines and benefit relevant communities more quickly.
- **Greener** – The aim is for a 37% reduction of carbon emissions with 83% improved carbon emissions visibility across capital infrastructure portfolios.

- **More efficient** – This technology enables more efficient delivery – estimated to be 10% in plant management alone – meaning that infrastructure delivery for communities can be accelerated.

LESSONS LEARNED

Throughout the initial rollout of the platform, its technological development proceeded at pace. The approach to design, development, testing and iteration was tightly controlled to get the platform into a functional state as quickly as possible.

This development became much more complex and difficult once real, operational data began to be fed into the platform. This brought new challenges for the team, both from a data point of view (collating and managing data from a wide range of disparate sources) and in terms of a cultural shift, with the move to a more collaborative data sharing scenario.

The three takeaways from the IICC project in relation to the TIES Living Lab Programme were as follows:

- Stakeholder engagement was vital from the outset, to provide a unified vision across the project and ensure all partners involved benefited.
- Being open and flexible to change was crucial, to diversify ways of working and data management processes. Innovation will make it possible to find efficiencies in all areas of infrastructure portfolio management.
- Trust in the technology and the process was the key to success. The technology has already been proven in finance and manufacturing sectors, and must now be embraced in the infrastructure sector.



LEAVING A LEGACY

The IICC platform is already providing a hub for digitisation and innovation to drive better, faster and greener outcomes in the infrastructure sector. It played a pivotal role in the TIES Living Lab Programme, where it was shown to harmonise the vast quantities of intelligence generated by UK transport infrastructure projects, drive insights to support collaboration, and enable greater productivity and resilience through the capture of efficiency, best practice and innovation data.

Future IICCs will lead to a more advanced, efficient system of managing and controlling

infrastructure projects. Without them, the present methods of infrastructure management are likely to remain sub-optimal.

Going forward, the IICC model can be tailored to provide a versatile and widely available infrastructure data management tool. Its users will be empowered to achieve optimal value, efficiency and impact from infrastructure projects, as a key part of creating a more sustainable future.

The IICC is available to access globally through [Intelligent Infrastructure Control Centre | Analytics \(sap.com\)](https://www.sap.com/topics/infrastructure-control-centre).

The Intelligent Infrastructure Control Centre (IICC) is a data sharing platform led by Costain working with the Department for Transport (DfT) and a consortium consisting of Transport for London (TfL), East West Rail Company, HS2 and Network Rail.

Living Lab



Transport Infrastructure Efficiency Strategy

The TIES Living Lab is a transformative collaboration of 25 partners together with Government, i3P and the Construction Innovation Hub that use data, technology and Modern Methods of Construction within live transport infrastructure projects to deliver significant value-adding benefits across the transport infrastructure sector. The programme is funded via a grant from Innovate UK through the Transforming Construction programme, plus contributions from the Department for Transport, HS2, Transport for London, Network Rail and National Highways.

The four strategic outcomes of the collaboration are to:

1. Improve the way Transport Infrastructure projects are set up to maximise value
2. Achieve better assurance of project and programme value and what assets should cost (benchmarking)
3. Accelerate the wider adoption of MMC
4. Establish the TIES Living Lab as a catalyst for long term cultural change across sectors by making a compelling case for long term HM Treasury funding to scale this facility.

Project led by:



Project sponsored by:



Published by RICS on behalf of TIES Living Lab (IPT1)

Project led by NSAR, with programme management support from Limberger Associates