The Future of Common Data Environments:

Open ecosystems or single system alignment?

The Infrastructure Client Group has assessed whether interoperable data ecosystems, based on standards such as ISO 19650, can outperform single-platform common data environments in ensuring that all project stakeholders can access accurate information when they need it. Here are its findings.

Introduction

In November 2025, members and friends of the Infrastructure Client Group's Data and Digital Task Group met to discuss a topic high on their agenda: common data environments (CDEs).

The 2020 UK Building Information Modelling Framework (via ISO 19650-1:2018) describes a CDE as an agreed source of information for any given project or asset, for collecting, managing and disseminating each information container through a managed process.

This paper shares the key insights arising from the expert discussion and makes best-practice recommendations based on them.

Executive summary

In the built environment sector, no single collaborative platform can realistically serve all stakeholders and project phases. Many large projects end up using several unconnected systems, despite efforts to standardise on one. Mandating a single client-owned CDE can enforce consistency, but this often limits flexibility and burdens the delivery partner, which is obliged to duplicate data and/or adapt to each of its clients' systems.

Part of this problem can be attributed to the sector's focus on systems, rather than on how information is shared across complex organisational and technological boundaries.

Recognising this, the sector is moving towards common data *ecosystems*. These are where several data environments are integrated via shared information standards and ontologies that seek to preserve a "single source of truth" without forcing one system on everyone.

By converging on open data structures and workflows, not on one vendor's platform, organisations can decouple the value of information from any specific tool, ensuring that information always flows smoothly across the project. Standards such as ISO 19650 (for managing building information modelling data) and the new ISO 55013:2024 (treating data as an asset) offer a neutral framework for achieving such interoperability and governance, but adopters must still interpret and apply these correctly.

Key insights from the discussion

A CDE is designed to foster genuine **collaboration based on shared data**, enabling better decisions to be made more quickly about an asset throughout its life. It requires all partners to commit to information-sharing in the best interests of the project. But most CDEs remain document-centric, with static uploads based on non-specific rules. This makes the transition to data-centric collaboration a challenge.

A CDE is not a single software product but a **federation of connected platforms**. For instance, one project's ecosystem might link to a document management system, a modelling platform, an issue-tracking tool and a geographic information system portal. Each of these is used for what it does best, but together they form the project's unified data environment.

Interoperability between CDEs and systems such as asset management platforms helps to eliminate data silos, enabling seamless information-sharing. By agreeing on data structures and requirements, and using technology to automate and streamline the exchange of data, organisations can simplify their collaboration.

CDE requirements should be **embedded in contracts**, ensuring that all supply chain partners are fully aware of system obligations and licensing needs. **Regular reporting** is needed, both to verify that these requirements are being met and to identify areas where further support and improvement are necessary. The discussion also highlighted the need for future-proofing, particularly in long-term framework agreements. This should allow for contractual and reporting flexibility as requirements evolve.

Recommendations

1. Don't make a binary choice – prioritise adaptability instead

Although mandating a single client-side CDE can improve control and security, it can also restrict flexibility and innovation in the supply chain. Open ecosystems allow for a wider range of tools, but they make integration and governance more complex.

Rather than choosing either of these two extremes, match your level of adaptability with your organisation's capabilities and the strength of its partner relationships. Tailor your approach to your organisation's current strengths and build in room for growth, while cultivating robust relationships with strategic partners.

2. Establish robust data governance

Adopt open standards – e.g. OpenBIM, IFC, BCF, COBie or REST/JSON APIs – and standardised classification systems – e.g. Uniclass 2015 or OmniClass – to ensure seamless data exchange and consistent information management across tools and platforms.

Maintain master data in neutral, non-proprietary formats and routinely extract material from siloed systems. Invest in dedicated data governance roles to oversee these practices, preserving the long-term accessibility and value of information about an asset as the technology evolves.

3. Conduct a 'stakeholder rehearsal' for your CDE

While you may not be able to involve every stakeholder directly, you can simulate the perspectives and workflows of various CDE user groups – e.g. designers, contractors and asset managers – by gathering feedback from representative users. Use this to map out their information requirements and how they interact with the CDE.

"Rehearsing" in this way will help you to detect potential workflow mismatches or problems that stakeholders may have with using systems and/or accessing data. This proactive approach will help to ensure that the CDE is robust and inclusive, truly supporting collaboration throughout your project.

4. Treat your data's lifecycle like your project's lifecycle

Just as a project requires careful planning and coordination, with smooth handovers at each phase, so does its data. Develop a structured approach to managing data from the earliest stages, ensuring that it is captured, validated, maintained and transferred systematically as the project progresses. Define clear data requirements at the start; review the data's quality and relevance; and plan for seamless transitions of data across the project's stages and stakeholders. By embedding data lifecycle management into delivery processes, you maximise the long-term accessibility and value of asset information.

5. Include performance-based information management clauses in contracts

NEC X10 clauses can be used alongside references to exchange information requirements, project information requirements and functional information requirements – a school of thought that extends beyond ISO 19650. For instance, you might state: "This project will use a CDE enabling all partners to access and share information in accordance with ISO 19650. All models must be provided in IFC format and all documents must meet agreed naming conventions and metadata standards."

Contracts should also require that project data – including models, documents and databases – be handed over at the end of the project in a structured, non-proprietary format for the client's use. If several systems have been used, include configuration or mapping details to show how their data fits together. This ensures its portability and protects the client's interests.

6. Establish federated governance

The interfaces of organisations' systems need to be outlined clearly, delineating the boundaries of liability and responsibility. For instance, protocols should specify which party would be responsible for rectifying a data transfer failure. While control remains distributed across several entities, governance rules such as those applying to permissions and audit logs must be enforced consistently throughout integrated systems. When implemented effectively, an open CDE can offer better security and auditability than a closed system, because all data exchanges are deliberate and carefully monitored.

Conclusion

The future of CDEs in infrastructure will be less about choosing the "one perfect system" and more about creating the right ecosystem. Projects are becoming more complex, involving ever increasing volumes of data produced by sources ranging from smart sensors to digital twins. This means that connectivity and openness will become non-negotiable.

A single closed system simply cannot keep up with all the interfaces required, so open ecosystems – underpinned by common information standards and robust integration – are the path forward for enabling flexibility without sacrificing the "single source of truth" ideal.

Crucially, this doesn't mean reverting to an anarchic state of ungoverned and inconsistent data-handling practices. It means moving the nexus of standardisation from software to data structures and governance.

By standardising how we manage and exchange information (via ISO 19650, for instance) and treating data as a first-class asset (via ISO 55013 principles), we can ensure that any platform or combination of platforms can deliver value.

The CDE of the future might not resemble a single website or database. Rather, it may look like a web of connected services, each optimised for a purpose, but collectively providing accurate and comprehensive information about a project whenever the participants need it.

Contributors

Ashleigh Rastall (ICG Data and Digital Task Group chair), Allora Infrastructure
Karen Alford, Environment Agency
Roy Dahl, Scottish Water
Robin Dickenson, Mott MacDonald
Mark Enzer, Mott MacDonald
Ivan Mactaggart, East West Rail
Lee McKeever, United Utilities
Marta Mroczka, National Grid
Patrick Owen, Tideway London
James Redhead, Allora Infrastructure
Pete Shellard, Scottish Water
Nigel Stroud, Heathrow Airport
Ian Taylor, Stantec

About the Infrastructure Client Group

The Infrastructure Client Group (ICG) brings together UK economic infrastructure clients in partnership with government and industry. Its key purpose is to lead the acceleration of improvement and alignment in the delivery and development of UK infrastructure, for the benefit of society, the economy and the environment.

The ICG is sponsored by the Institution of Civil Engineers – the home of infrastructure. It is a professional institution with 97,000 members and over 200 years of history. It qualifies civil and infrastructure engineers, promotes lifelong learning and provides trusted, impartial expert advice to decision-makers. Its vision is a world where infrastructure enables people and planet to thrive. Its global membership designs, builds and maintains trustworthy and sustainable infrastructure.

For enquiries about the ICG, please email alice.courteney-harris@ice.org.uk.