Data Interoperability: The Key to Connected, Collaborative, and Profitable Construction

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The construction industry has made significant strides in technology adoption, moving from paper processes and disconnected workflows to digital tools that drive efficiencies, inform decisions, and increase profitability. Despite these efforts to digitally transform construction processes, new challenges arise when data doesn't translate well across systems.

The complexity of modern construction projects makes it difficult to share large amounts of data between different systems and teams. Projects have many stakeholders, each generating valuable data and requiring unique levels of access to information based on their role. Every stakeholder typically has a different stack of technologies, with their own data formats and validation, permissions, and security parameters. Without a way to seamlessly share data between systems, the massive shift to digital processes falls short of its full potential.

As a result, interoperability has become a critical area of focus for both vendors who provide hardware and software construction solutions and construction businesses that rely on technology to work more efficiently and grow.

THE PATH TO INTEROPERABILITY

Interoperability is about meeting people where they are and with the tools they already use. In construction, this means automatically connecting data from different software systems so that stakeholders only have to enter information once within their system of choice. When data is connected,

stakeholders can make decisions quickly and move a project forward with the confidence that the information is timely and accurate. Project visibility is enhanced, workflows are streamlined, overhead is reduced, and projects are delivered on time, more safely, and with less waste.

For example, when interoperability is in place, architects and engineers can easily — and instantly — communicate about design changes, helping to keep projects on track. Similarly, contractors and project owners can share timely updates on progress to-date and associated payments, ensuring that a project remains in the black.

Conversely, when critical information is trapped in one system and inaccessible to other stakeholders, it often leads to inefficiencies and errors. While using unified systems from a single vendor would be ideal, no one vendor can provide everything.

As a solution, many stakeholders re-enter data between systems or manually import and export files between systems, which can lead to problems when information doesn't translate well. Some construction businesses rely on self-built connections created by their development teams to send data between systems. These connections are usually designed to solve a specific workflow problem and can be costly to develop, support, and maintain because they are highly customized.

Without an in-house software development team, many construction businesses turn to third-party consultants for data integration, which combines different systems or software into a unified workflow, often through application programming interfaces (APIs). However, integrations can be challenging because they typically require some level of customization and maintenance to ensure that different tools can work together efficiently. Consultants also have high turnover rates, so it's not uncommon for someone who initially set up the system to be unavailable, requiring a rediscovery process that is both time-consuming and costly.

Fortunately, leading technology vendors are working to make their data interoperable via connected data environments and open API standards, enabling the automatic exchange of information between systems. This is happening through integrations/APIs between various solutions (ERP to project management, for example), as well as by providing tools for construction businesses to build their own integrations and interoperability when standard integrations are not available in the open market or on app marketplaces. While both integrations and interoperability are crucial to facilitate the digital transformation of construction, interoperability ensures open collaboration across various tools, while integration enables deeper, tailored connections between specific systems.

Companies have begun working to further efforts on both fronts. There are many integrations between products and with other leading solutions like Trimble, Autodesk, ProCore, and BuildOpps. These integrations are key parts of facilitating open, interoperable systems and an automated flow of data between software solutions.

Because data sharing and workflow integration are increasingly vital to operational efficiency, productivity, and safety, construction software companies are building integrations between their chosen software and their cloud-based app. Together, the integrated experience helps track tools, equipment, and consumables on jobsites and in offices.

WHAT DOES THE FUTURE HOLD?

According to a recent Trimble survey, 59% of respondents said that technology integration will be one of the biggest themes in 2025, and 25% said it is one of the biggest challenges they are currently facing. By removing barriers to information sharing, construction businesses gain transparency into risk and profit, and teams can trust the data they work with.

The free movement of data between systems and workflows is a critical step toward interoperability. Data should be accessible and interconnected, from surveying and architectural design to construction management, operations, and maintenance, regardless of location or origin. The free movement of data also largely depends on improved standardization of data formats (IFC and USD), which will help further cross-platform collaboration as it removes the friction between different formats, enabling files to more seamlessly share data with one another. Both IFC and USD are being widely adopted and integrated across architecture, engineering, and construction, helping improve data transfer and accessibility.

Interoperability will also be critical to the continued adoption of emerging technologies, such as artificial intelligence (AI). AI thrives on data and open ecosystems, which require interoperability. When accomplished at scale, interoperability could unlock data and subsequent construction workflows, enabling AI to dramatically transform the construction industry.

While the journey is far from over, the industry has made great strides in connecting people, data, and technology. As we look to the future, interoperability is critical for true digital transformation and collaborative, efficient, and profitable project delivery.

About the Author

Chris Peppler, vice president of platform and product at Trimble, Inc., is focused on integrated technology ecosystems and data interoperability for architects, engineers, and construction companies, as well as the owners and managers of public and private infrastructure projects.

About the Article

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