AUTODESK

Reimagine rail: From fragmented delivery to intelligent infrastructure



Better rail outcomes through connected digital foundations



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Introduction

The rail industry is entering a new phase of transformation.

As public-sector demand grows to decarbonize transportation and move more people and goods with less environmental impact, rail is playing a critical role due to its lower emissions compared to other transport modes. With annual rail pipeline spending projected to reach US$731.8 billion in 2027, investment is accelerating globally.

But scaling rail capacity requires more than new infrastructure. It means modernizing aging networks, maintaining live assets, ensuring safety, and reducing disruption. At the same time, tighter budgets, limited workforce capacity, compressed schedules, and scrutiny over public investment make the challenge for rail organizations clear: Deliver more with less.

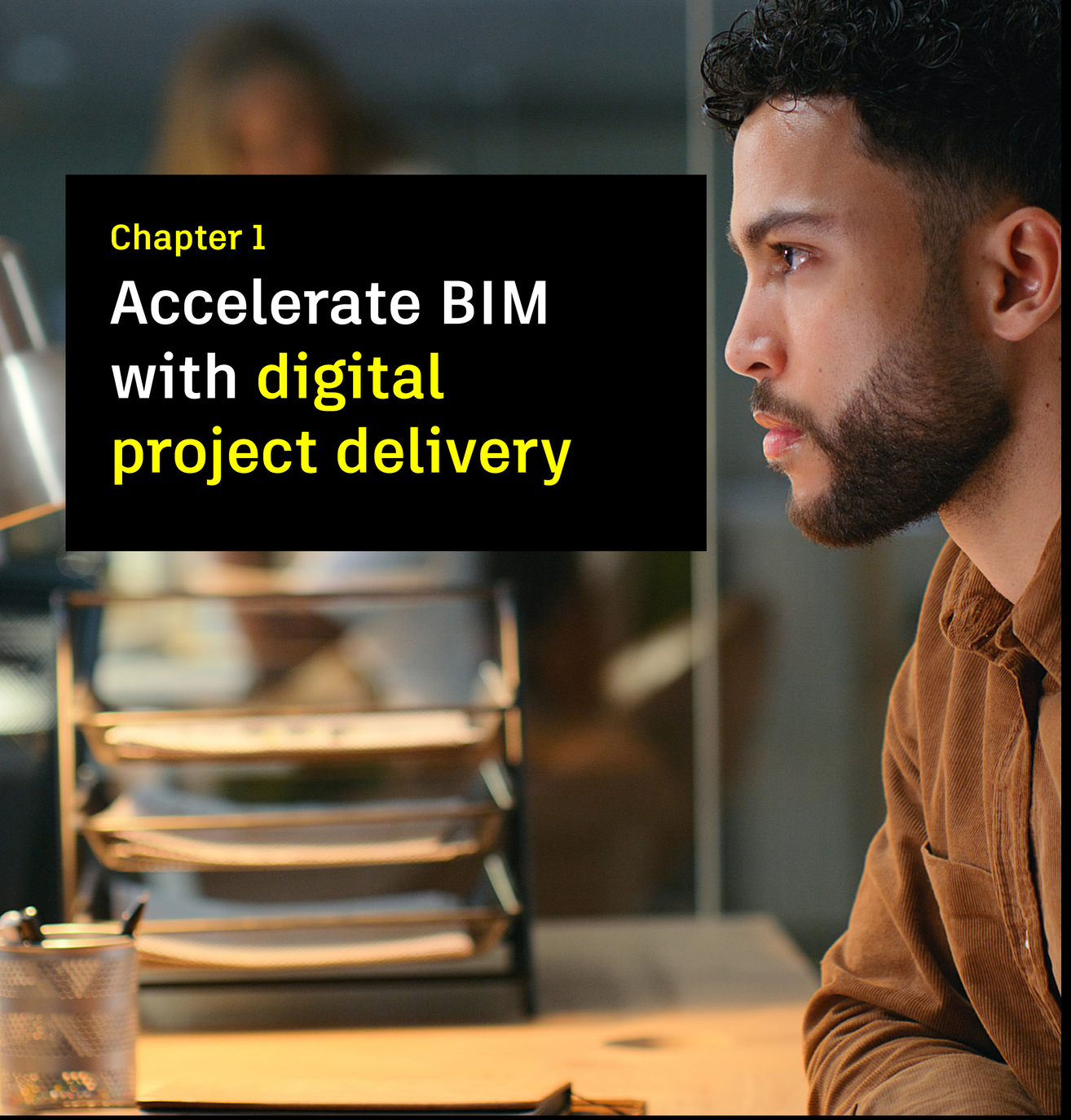
Fragmented delivery models cannot work in this environment. Rail is more complex than other transport systems, with multi-disciplinary programs spanning hundreds of projects. Legacy data, fragmented systems, and siloed workflows increase risk across delivery and operations. Even small maintenance projects can significantly impact live operations, public safety, and network reliability.

This e-book explores how rail organizations are adopting connected, data-driven delivery approaches to manage complexity, reduce risk, and improve coordination.

Each chapter explores a key stage of rail delivery and is supported by real-world examples, showing how leading rail organizations are applying these approaches in practice.

The projects featured in this e-book were presented by global rail leaders at **Autodesk Rail Summit**, an annual forum where industry experts share proven use cases and real-world strategies for transforming rail delivery.





Chapter 1

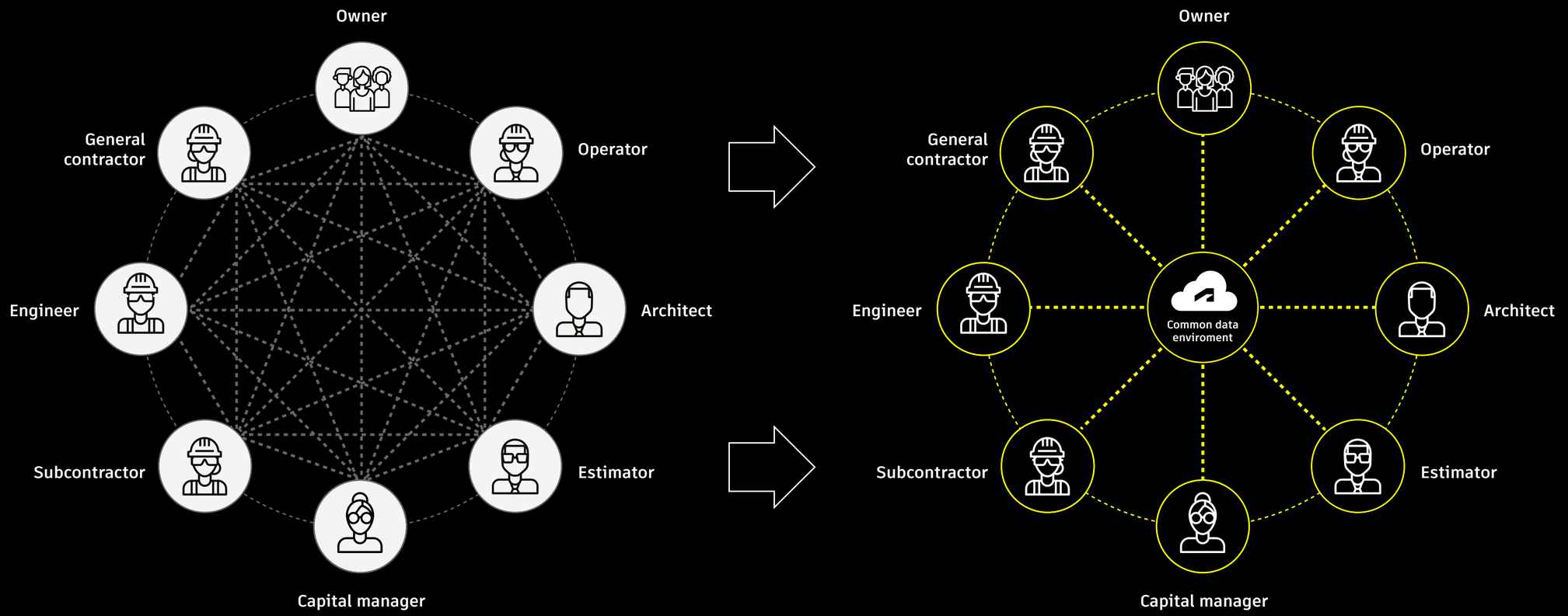
Accelerate BIM with digital project delivery

Given the number of stakeholders involved, rail projects require a strong focus on safety, cost control, and risk mitigation.

At the same time, projects must move quickly to minimize service disruption. Accelerating delivery depends on reducing information friction so teams can make faster, safer, and better-coordinated decisions.

This is where connected BIM becomes most valuable—as a program-wide coordination method enabled through a Common Data Environment (CDE), not just a modeling activity. Centralizing models, issues, files, workflows, and approvals creates a single source of truth, improving coordination, transparency, and governance across complex, multi-stakeholder programs.

The power of connected data



Design collaboration and management workflows connect project data in the same environment, while timeline views and dashboards help teams track progress and coordinate information across disciplines. When aligned with ISO 19650 information management standards, these processes provide consistency and control at scale.

Consistently managed BIM data lays the foundation for digital twins across the asset lifecycle. The following examples show how leading rail organizations are using connected BIM and digital project delivery to coordinate large programs, reduce rework, and strengthen long-term asset performance.

Case study: ADIF, TYPSA

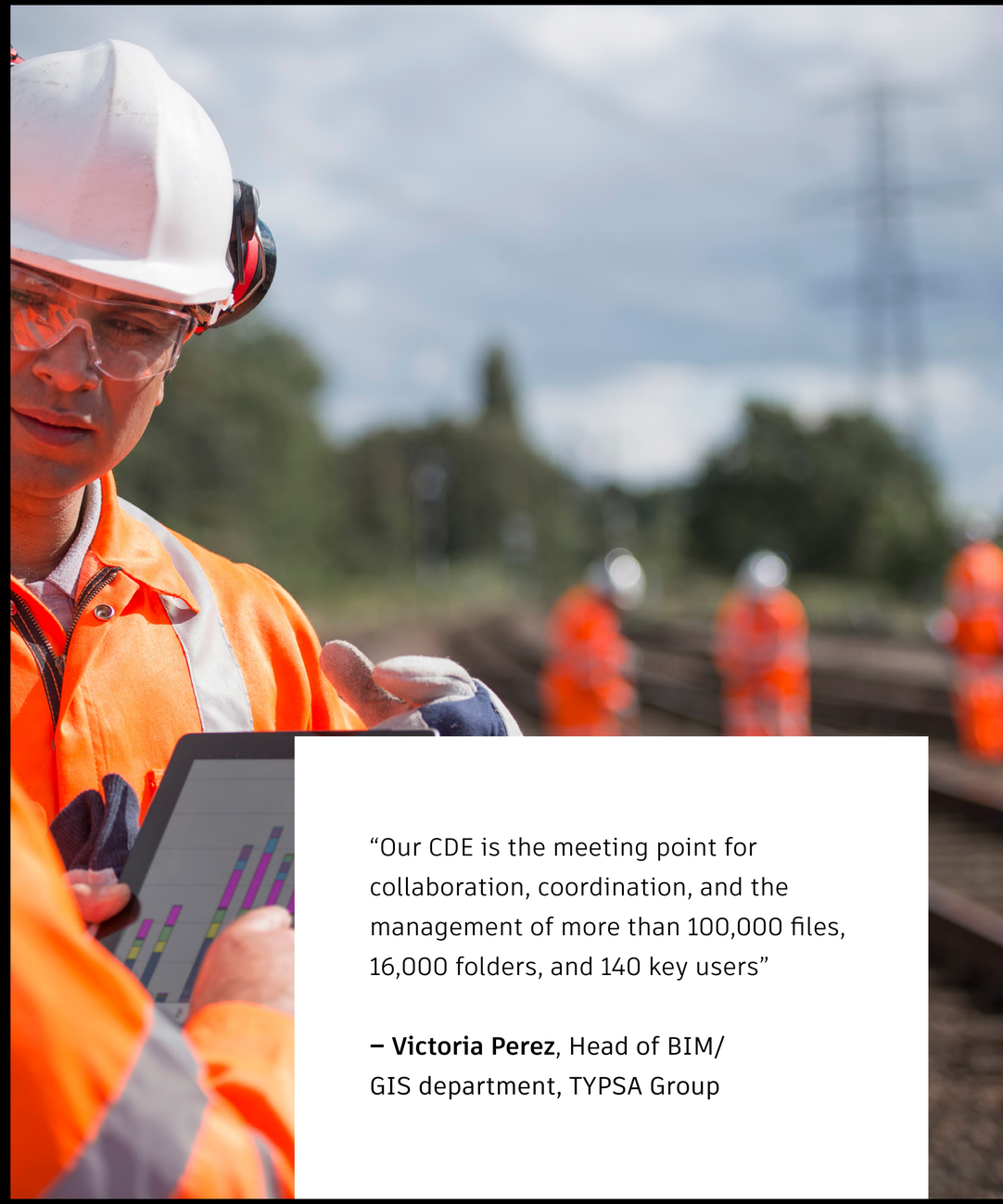
Turning fragmented rail programs into coordinated delivery

A CDE can become the coordination backbone for a dense, live, multi-project rail modernization program.

ADIF, Spain's state-owned railway infrastructure manager, is leading the transformation of the Atocha–Chamartín corridor as one of Europe's most complex rail modernization programs. By adopting BIM and digital project delivery as a program-wide coordination approach, ADIF established a CDE for their ecosystem to manage dozens of parallel interventions, stakeholders, and delivery stages. This digital backbone enables consistent information flow, stronger governance, and clearer oversight across design, construction, and long-term asset planning.

As technical coordinator at Chamartín–Clara Campoamor, TYPSA operates at the center of this complexity—managing over 70 concurrent projects, hundreds of models, and millions of data points. Through rigorous information management, interoperability of workflows, and automated coordination, TYPSA demonstrates how BIM enables control, quality, and collaboration at scale in live rail environments.

Learn more



"Our CDE is the meeting point for collaboration, coordination, and the management of more than 100,000 files, 16,000 folders, and 140 key users"

– Victoria Perez, Head of BIM/ GIS department, TYPSA Group



“With a CDE approach, it’s really specifying how each contractor is going to work in their own environment, setting up the shared folder structure and then bridging that information to the owner’s CDE, in this case, Sound Transit”

– Jay Mezher, Vice president, Digital delivery, Mott MacDonald

Case study: Sound Transit, Mott MacDonald

Laying the foundations for scalable digital rail delivery

A CDE strategy can scale across contractors, designers, and owner environments in a major long-term capital expansion program.

Sound Transit, the regional public transit authority serving the Seattle metropolitan area, along with Mott MacDonald, implemented a CDE strategy to support one of the largest transit expansions in the United States—a US$60+ billion capital program delivering 97 kilometers of new rail and 29 stations over two decades. Moving beyond fragmented, document-based workflows, the CDE connects contractors, designers, and owners while reducing manual handoffs and data loss.

By standardizing information management and reducing manual handoffs, Sound Transit and Mott MacDonald have strengthened coordination across complex contract packages. The result is clearer interfaces, more reliable reviews, and a digital foundation that scales from design through construction and into long-term operations.

Learn more

Case study: East Japan Railway Company

Reducing rail rework and coordination by 80% with connected BIM

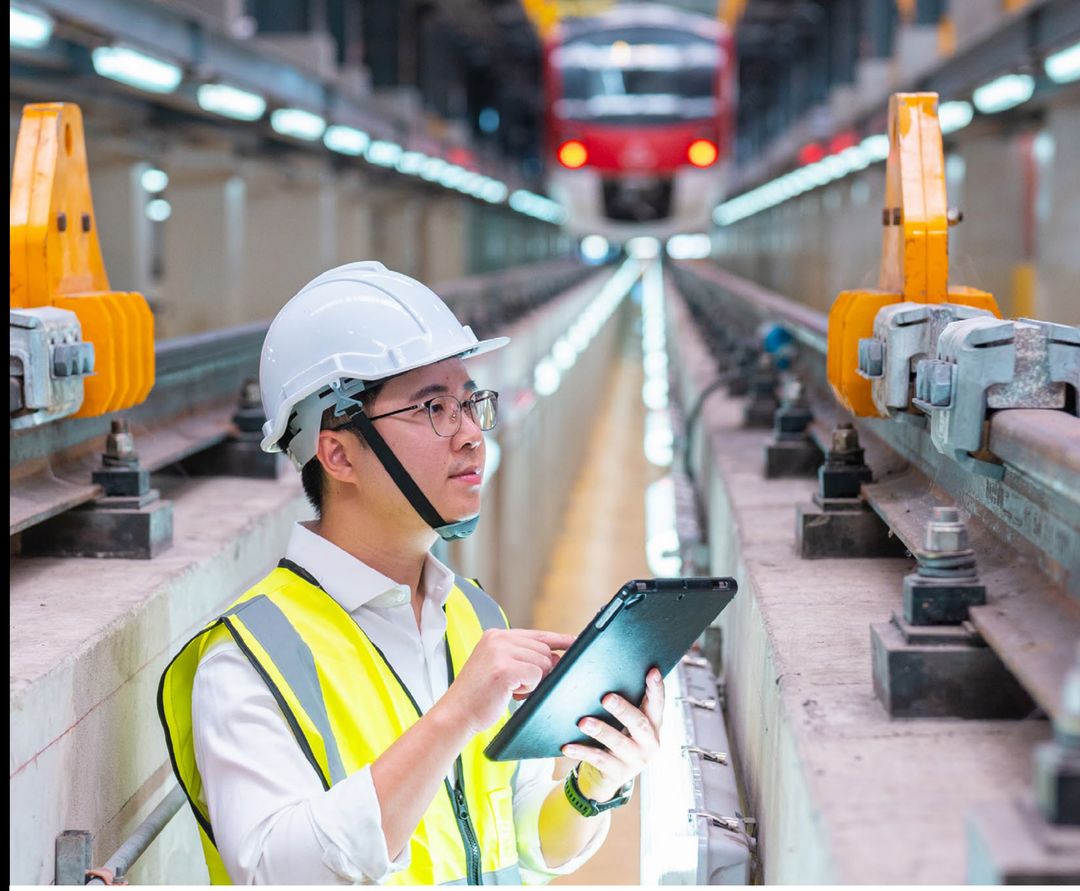
Connected BIM can move beyond pilots and reduce unnecessary work and consistency-check time when integrated into operational workflows.

Confronted with shrinking workforces, complex asset portfolios, and siloed contracts, JR East embarked on a decade-long transformation to connect the entire railway lifecycle through BIM and a CDE.

By combining Revit models with point cloud data, its pilot projects revealed how design clashes can be eliminated early, construction checks automated, and maintenance decisions accelerated when data flows seamlessly from planning to operations.

Now, with the integration of JRE Cloud and Autodesk Forma (formerly Autodesk Construction Cloud), JR East is moving beyond pilots, cutting rework, reducing coordination effort by up to 80%, and redefining how data-driven rail delivery can scale.

Learn more



"About 10 years ago we launched JRE BIM and set up a CDE and over the years it has evolved from a private server-based system to a cloud-based platform integrated with ACC*. Through ongoing latest and future upgrades, we plan to reduce unnecessary work by 50% and consistency check time by 80%"

– Kosuke Yamamoto, Assistant manager, East Japan Railway Company

*Autodesk Construction Cloud (ACC) is now Autodesk Forma



Chapter 2

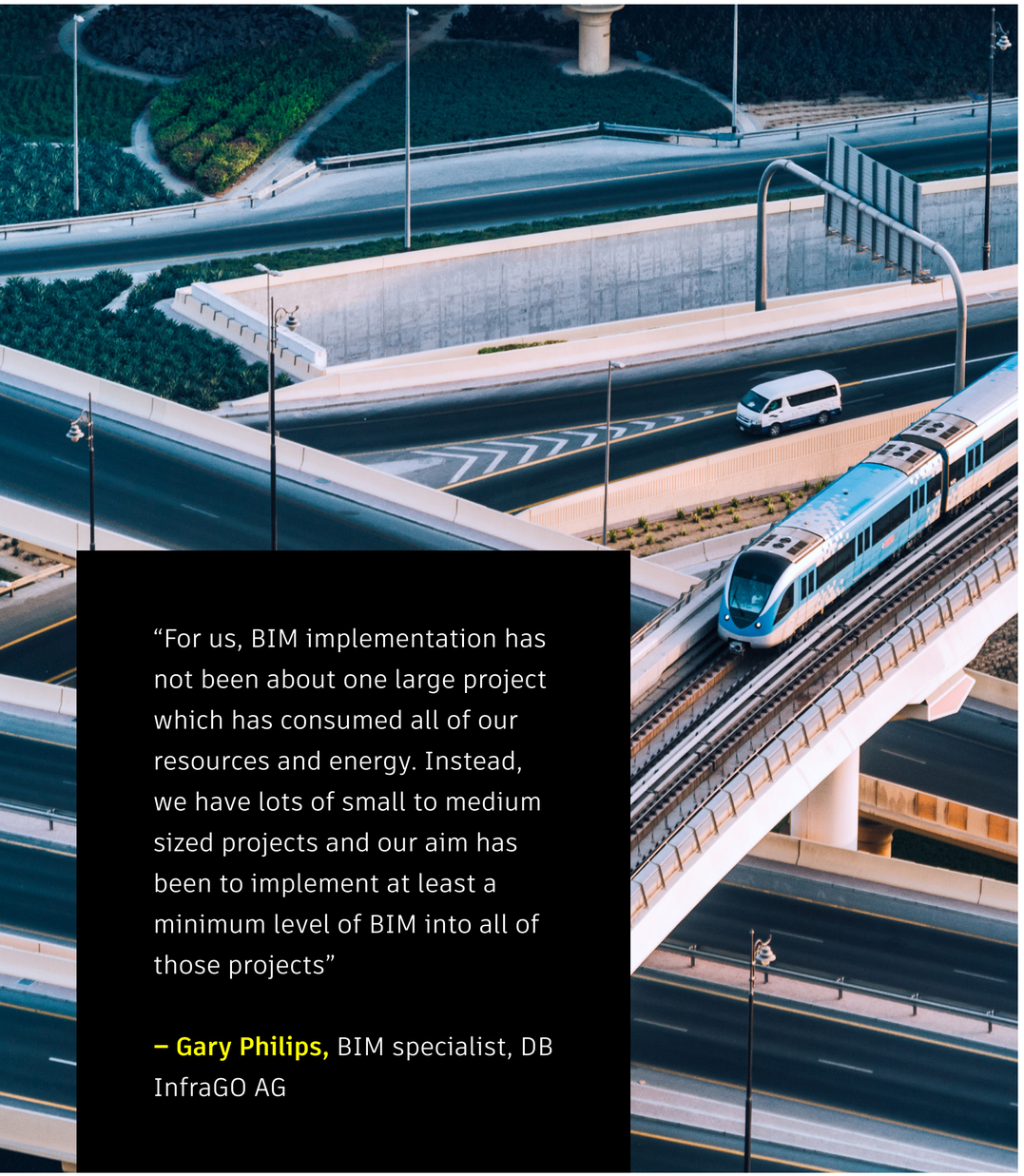
Optimize design processes and deliverables

Rail projects average **~44.7%** cost overruns. With predictive intelligence and data-driven maintenance strategies, digital twins can reduce maintenance costs by **20%–30%.**

With digital project delivery in place, attention turns to optimizing design workflows and the production of deliverables. Rail project teams often begin with fragmented information about existing conditions and in active corridors, that uncertainty quickly becomes cost, schedule, and safety risk.

Reality capture, model-based design, automation, and AI-assisted workflows help teams shift effort upstream, resolving issues in the model before they become problems on site. Scan-to-BIM workflows accelerate modeling by converting site data into digital models in hours, while design automation improves speed, consistency, and accuracy across tracks, stations, and systems. Because drainage and water systems are critical in rail infrastructure, teams can design, simulate, and test them directly within the model before work begins. This is where digital delivery becomes operational productivity—faster modeling, more consistent outputs, better quantities, fewer errors, and more reliable deliverables across the design process.

The following examples show how rail organizations are scaling BIM standards, automating design, and connecting workflows to produce higher-quality deliverables faster.



> “For us, BIM implementation has not been about one large project which has consumed all of our resources and energy. Instead, we have lots of small to medium sized projects and our aim has been to implement at least a minimum level of BIM into all of those projects”
>
> **– Gary Philips,** BIM specialist, DB InfraGO AG

Case study: DB InfraGO AG

1,000 station projects: Scaling BIM and piloting digital twins

Rail organizations can scale BIM across large portfolios by establishing consistent standards, quality controls, and measurable performance.

To optimize design delivery at scale, Deutsche Bahn, Germany’s national railway company, has adopted a pragmatic, portfolio-wide approach to BIM adoption across more than 1,000 station projects impacting their ecosystem of designers and contractors. Instead of focusing on a small number of flagship initiatives, the team defined a consistent minimum BIM standard and applied it across projects of all sizes. Standardized federated models, structured quality checks, and regular coordination, supported by tools such as Navisworks, helped improve clarity, reduce errors, and accelerate decision-making.

By reinforcing BIM standards through contractual requirements, monitoring, and performance metrics, Deutsche Bahn embedded it into everyday design practice. This scalable approach has transformed BIM from an isolated exercise into an operational discipline in their ecosystem, laying the groundwork for digital twins and more intelligent asset management.

Learn more

Case study: Colas Rail

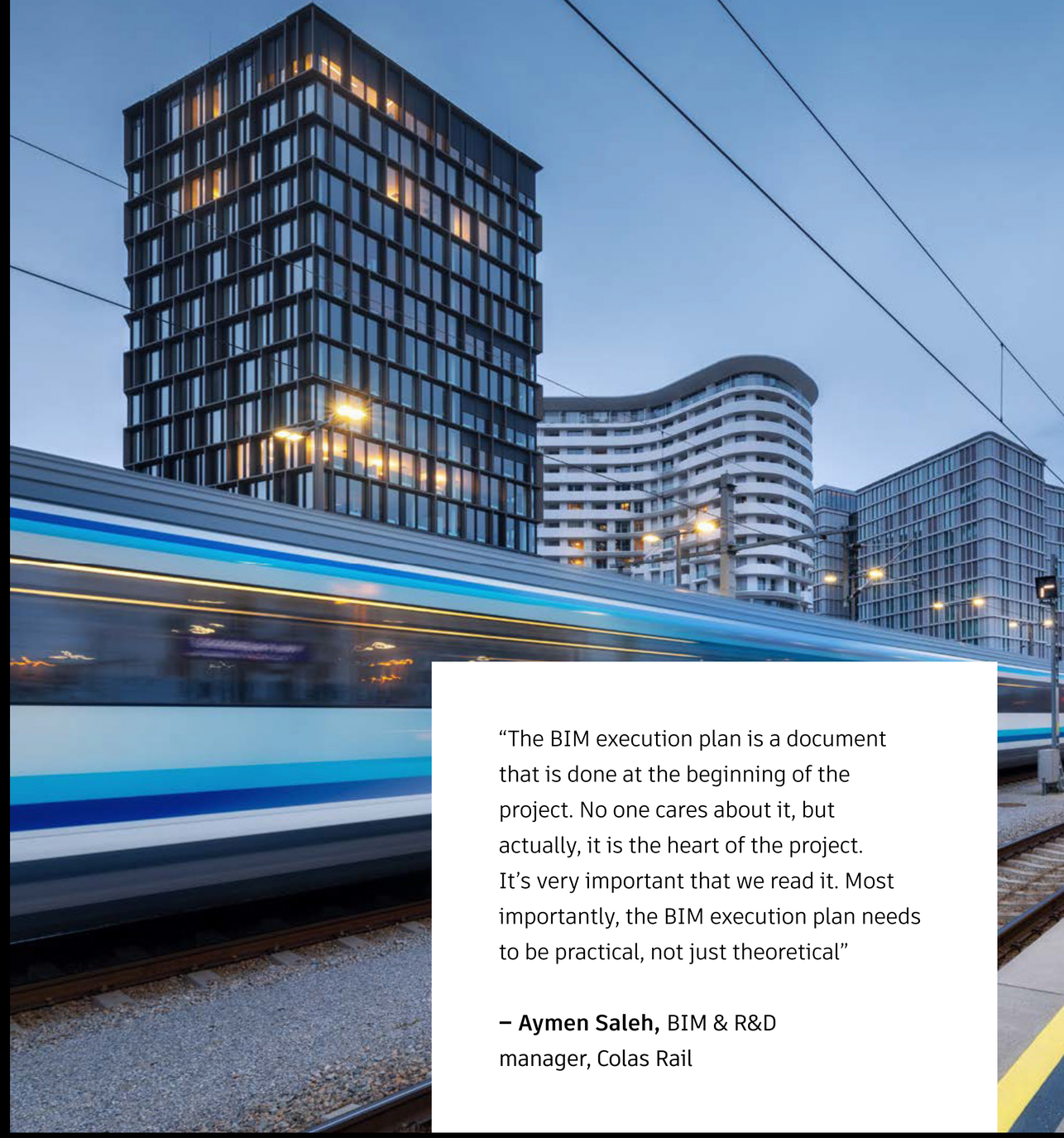
Smart catenary: Parametric OLE/OCS modeling with Dynamo and adaptive families

Design automation can reduce manual OLE/OCS modeling, improve quantities, and accelerate drawing production from months to weeks.

Under pressure to deliver increasingly complex catenary systems faster and with greater accuracy, Colas Rail set out to replace manual, mast-by-mast design with an automated, data-driven approach. Using Autodesk Revit and Civil 3D with Dynamo-based custom plugins and adaptive parametric families, the team automated the modeling, configuration, and documentation of overhead line equipment.

The solution dynamically generates coordinated 3D models, detailed material quantities, and ready-to-issue drawings, while allowing rapid updates when alignments change. This shift shortened design timelines from several months to a matter of weeks, reduced downstream rework, and strengthened confidence in quantities and pricing across design, tendering, and delivery.

Learn more



"The BIM execution plan is a document that is done at the beginning of the project. No one cares about it, but actually, it is the heart of the project. It's very important that we read it. Most importantly, the BIM execution plan needs to be practical, not just theoretical"

– Aymen Saleh, BIM & R&D manager, Colas Rail



Case study: Parsons

Advanced structural workflow for elevated guideway: AR & digital delivery innovation

A connected model-based workflow can replace traditional handoffs and help multidisciplinary teams produce deliverables faster and with greater consistency.

On a major elevated rail program in Hawaii, Parsons set out to optimize guideway design by replacing traditional handoffs with a fully digital, model-based workflow.

In collaboration with Autodesk, the team connected alignment, structural geometry, and detailed design using Civil 3D, InfraWorks, Inventor, Revit, and Autodesk Forma (formerly Autodesk Construction Cloud). Rather than relying on a single tool, Parsons deliberately orchestrated multiple Autodesk platforms, each serving a defined purpose within a unified design workflow.

Parametric bridge models, spreadsheet-driven edits, and federated environments replaced static drawings with living design data. As a result, multidisciplinary teams coordinated in real time, design changes propagated instantly, and deliverables were produced faster and with greater consistency.

Learn more



Chapter 3

Enable an open, connected platform

83% of transportation leaders say interoperability improves collaboration.

Rail delivery does not happen in one tool, one discipline, or one data environment. Track, signaling, stations, structures, utilities, geospatial data, field observations, and asset information must connect across the lifecycle.

In this environment, fragmentation breaks data continuity, leading to delays, rework, and uncertainty. An open and connected platform enables teams to work across BIM, GIS, reality capture, field data, and downstream systems without losing context. This improves coordination during delivery and creates a stronger foundation for digital handover, operations, and long-term asset management. Open standards such as IFC provide a vendor-neutral format for coordinated model exchange, handover, and accountability, while secure platform connectivity and APIs connect design tools, analytics, and downstream systems. Autodesk supports this interoperability through several partnerships, such as with Esri to combine BIM and GIS, Fugro for advanced geo-data, and ORIS for carbon assessment.

The following examples show how rail organizations are using open, connected platforms to manage complexity across large, multi-contract environments.

Case study: INECO

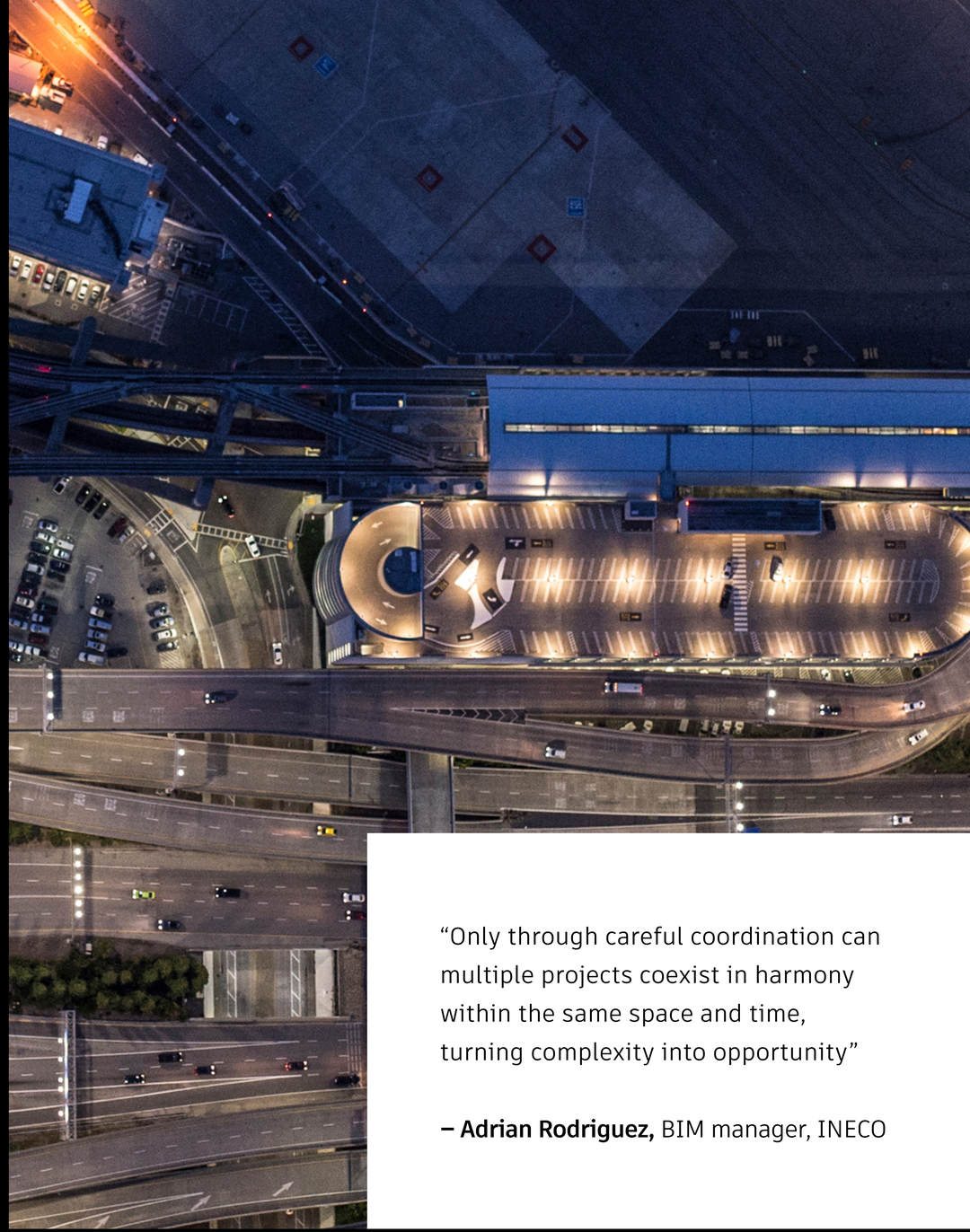
Coordinating a mega rail hub through open, interoperable platforms

Open standards and CDE workflows are essential for coordinating dense, overlapping works at a major rail hub.

At Madrid's Atocha railway complex, INECO is supporting ADIF with a digital coordination strategy designed for extreme scale and complexity. The long-running, multi-phase program involves overlapping construction contracts, hundreds of stakeholders, and millions of data points. By establishing a CDE and enforcing open standards such as IFC for model exchange, the team created a shared, continuously updated view of works across all projects.

Centralized workflows, standardized data structures, and integrated model coordination enabled secure information exchange, issue synchronization, and real-time construction monitoring across disciplines. This approach demonstrates how open, interoperable digital platforms are essential for managing dense, multi-contract rail environments while maintaining alignment, control, and transparency.

Learn more



"Only through careful coordination can multiple projects coexist in harmony within the same space and time, turning complexity into opportunity"

– Adrian Rodriguez, BIM manager, INECO

Case study: Oriental Consultants Global

Enabling BIM and GIS interoperability for national rail connectivity

BIM-GIS integration can align design, construction, land acquisition, utilities, environmental data, dashboards, and compliance across a 160-km national-scale rail program.

On the North–South Commuter Railway in the Philippines, Oriental Consultants Global (One Rail) is using BIM and GIS integration to manage delivery at national scale. The 160-kilometer program spans multiple segments, operators, contractors, and data environments—making interoperability a central challenge. By establishing a CDE and connecting BIM models with geospatial platforms, the team created a shared, location-based view of design, construction, land acquisition, utilities, and environmental data.

This connected approach enabled transparent collaboration across government agencies, contractors, and financiers, while supporting real-time dashboards for progress, risk, and compliance. By aligning data across previously disconnected systems, One Rail demonstrated how open, interoperable platforms are essential for coordinating complex rail programs and supporting long-term operations and digital handover.

Learn more



"With Autodesk, we resolved 1,380 clashes, managed over 689,000 documents, coordinated 400 team models, and achieved nearly US$890,000 in cost savings with BIM technology, just in the design phase."

– Jose Lorenzo Afable, BIM Director, OC Global

Case study: OHLA

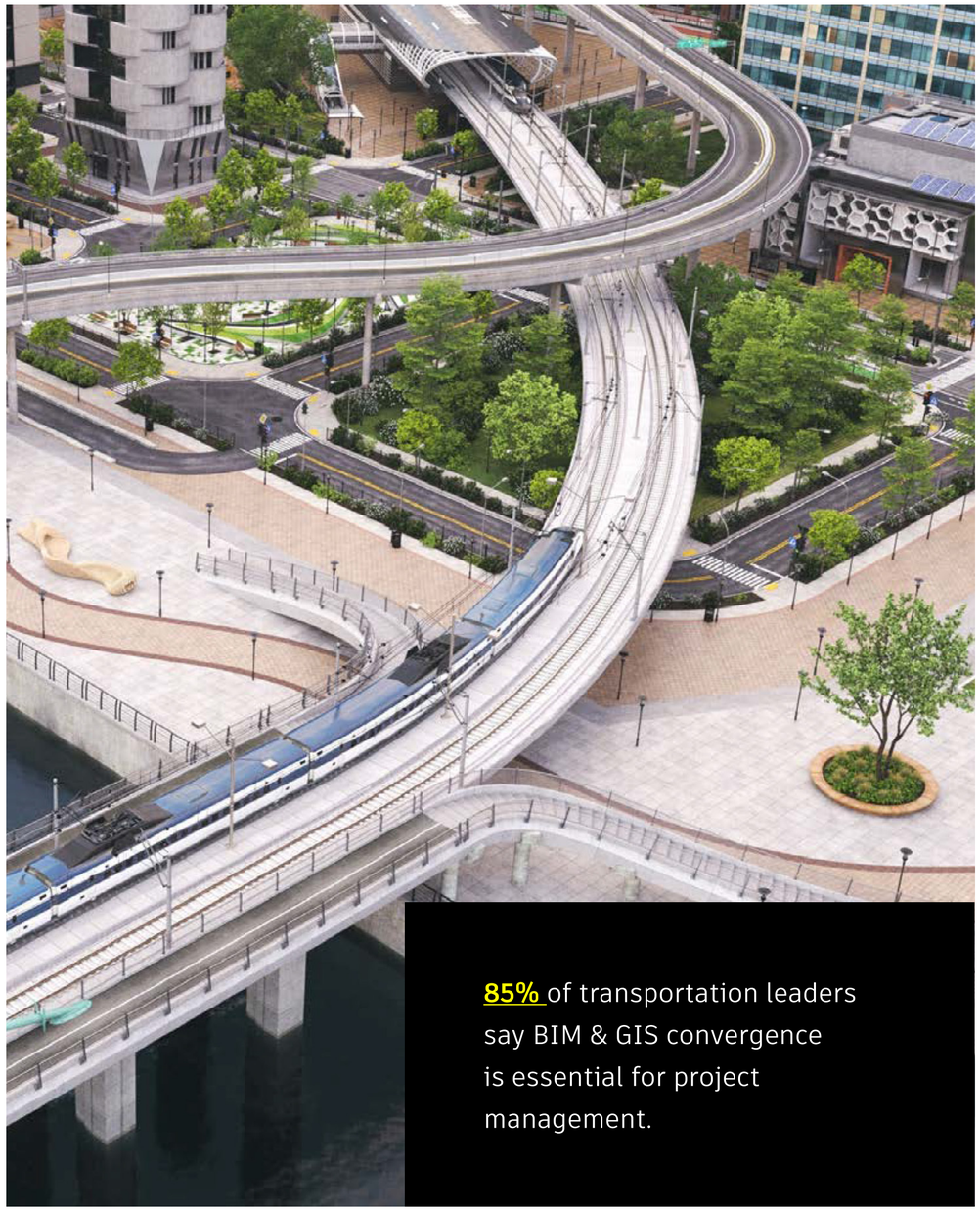
Connecting BIM, GIS, and field data for smarter rail delivery

Connecting BIM, GIS, drone, and field data supports live dashboards, better coordination, and more informed decision-making in complex rail delivery.

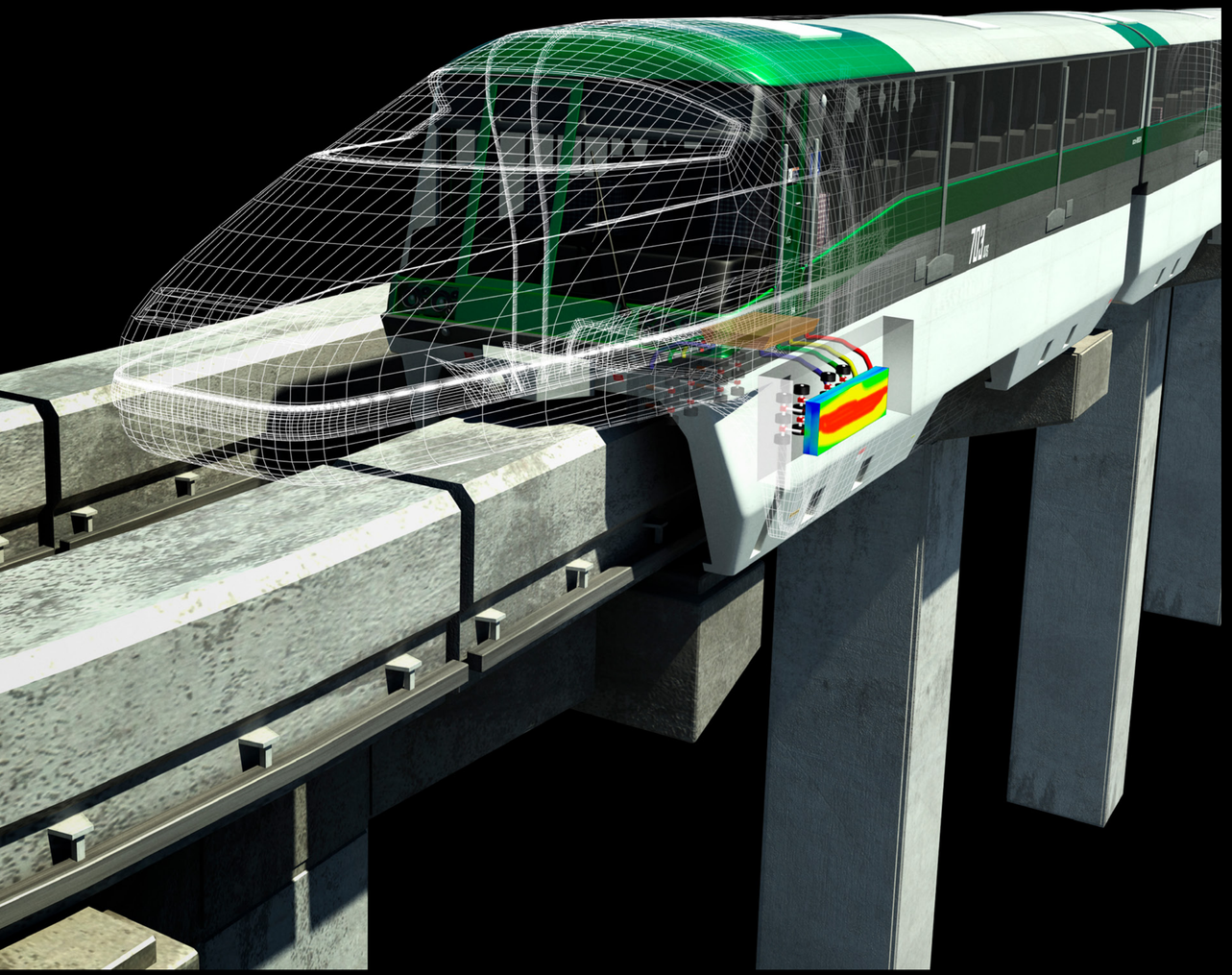
OHLA is advancing connected digital twins by integrating BIM, GIS, drone, and field data into a unified delivery and digital handover approach.
Since 2019, the company has standardized workflows that connect design, construction, and site data through a CDE and geospatial platforms, enabling seamless information flow across project stages.

On major rail programs such as Sweden's East Link high-speed corridor, OHLA combines federated BIM models with geospatial context, reality capture, and site observations to create live dashboards that reflect real-world conditions. This connected approach improves multidisciplinary coordination, keeps data accurately located and up to date, and supports more informed decision-making across complex rail projects.

Learn more



85% of transportation leaders say BIM & GIS convergence is essential for project management.



From fragmented delivery to intelligent infrastructure

Across these examples, a clear pattern emerges: global rail leaders are not digitizing for the sake of technology. They are building the delivery foundations needed to manage larger programs, tighter constraints, and more demanding asset lifecycles.

Connected BIM helps teams coordinate complex, multi-stakeholder programs. Optimized design workflows improve the production of consistent, reliable deliverables. Open, connected platforms extend data continuity across disciplines, systems, and lifecycle stages.

Together, these capabilities enable rail organizations to move from fragmented delivery to intelligent infrastructure—improving control, reducing risk, and creating a stronger foundation for long-term operations.

Take the next step in your rail transformation journey

If these challenges reflect your current rail priorities, the next step is not more tools—it is understanding where connected digital delivery can create the greatest impact across your projects, teams, and assets.

Explore how digital solutions can help advance your rail priorities.

Talk to an expert



About Autodesk Rail Summit

For many years, Autodesk has brought together rail professionals from around the world to exchange best practices and explore digital transformation in railway infrastructure. Over time, the Rail Summit has evolved into a well-established, go-to platform for the global railway community – a trusted hub for thought leadership, cross-disciplinary collaboration, and high-value networking.

Learn more about Rail Summit and watch on-demand sessions here.