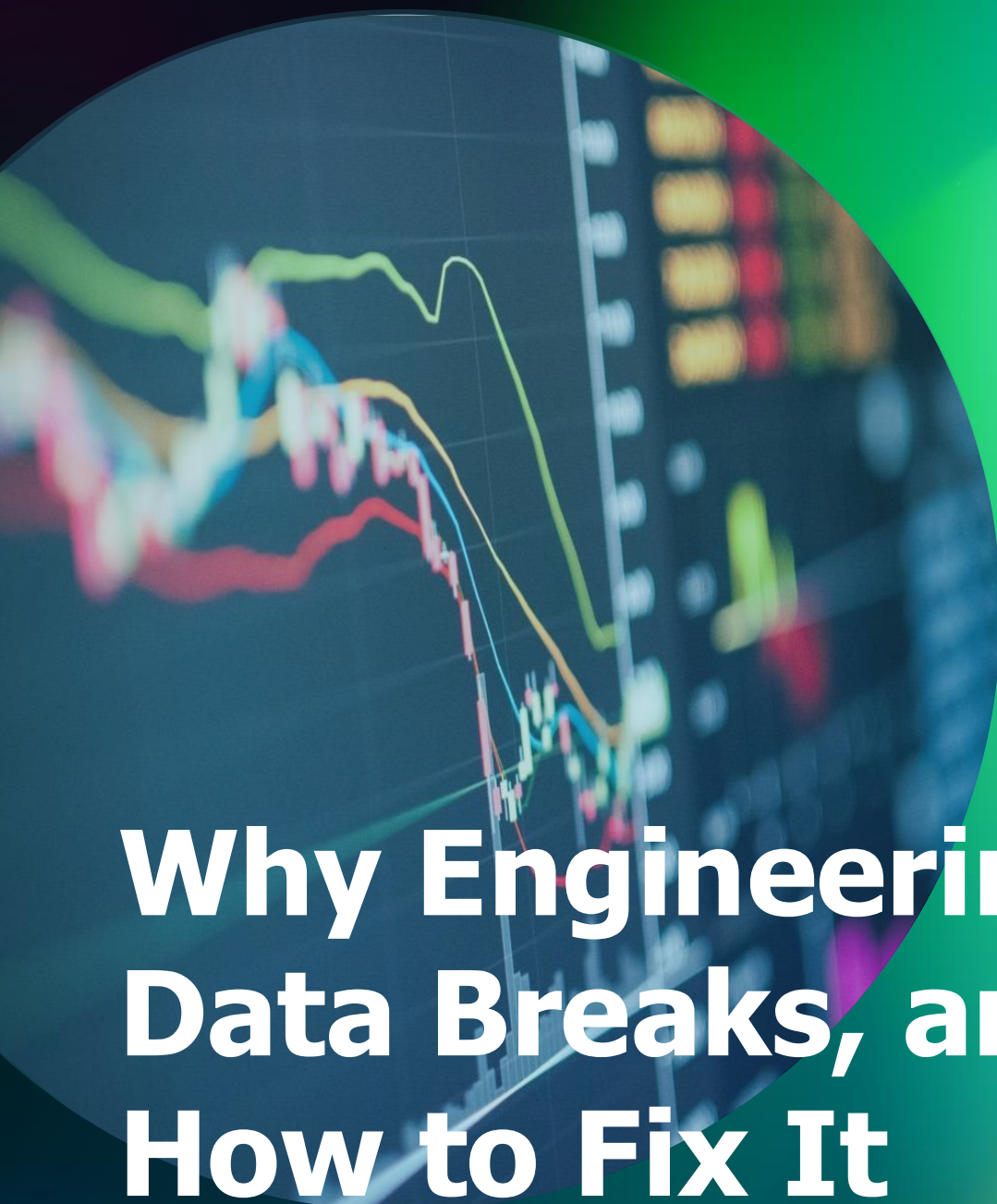


A circular inset on the left side of the slide shows a blurred financial chart with multiple colored lines (green, blue, red, yellow) and a candlestick pattern, set against a dark background with some text and numbers. The rest of the slide has a teal-to-green gradient background.

Why Engineering Data Breaks, and How to Fix It

October 2026

Introduction

Consider an automotive supplier developing a new EV subsystem. Mechanical engineers create geometry in one CAD environment, simulation teams prepare models in specialised CAE tools, and manufacturing partners rely on entirely different downstream systems. By the time the design reaches production, the same engineering information may have been translated multiple times, introducing risk for lost metadata, altered geometry and duplicated effort.

For example, a UK-based automotive testing and vehicle validation organisation routinely received complex vehicle models from customers working in different CAD environments. Before those models could be used for engineering and testing, teams sometimes spent days converting, repairing and preparing geometry. During their evaluation of CADfix, representative models that previously required days of remediation were repaired in a matter of minutes, allowing engineers to move much more quickly from receiving customer data to performing testing and validation.

As a result, digital transformation in manufacturing is often constrained by an inability to maintain engineering data continuity as it moves across the enterprise. Generating product data is rarely the problem. Maintaining engineering intent, geometry and metadata as that data moves through the lifecycle is where manufacturers continue to struggle.

The Cost of Engineering Data Fragmentation

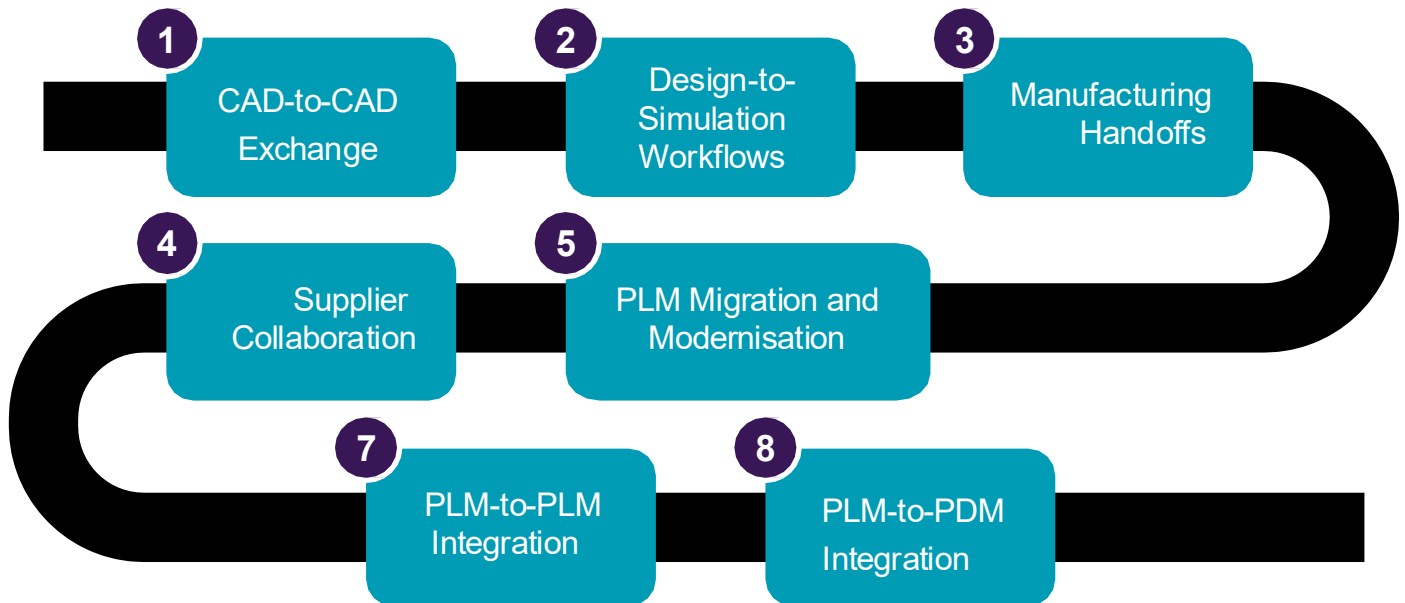
The growing focus on engineering data continuity has pushed the digital thread to the centre of many manufacturing transformation programmes. Without reliable engineering data continuity, even well-funded digital thread initiatives can struggle to deliver the expected benefits of traceability, collaboration and downstream reuse.

The goal is to create an uninterrupted flow of information that connects design, engineering, manufacturing, quality, service and operations. Yet, many organisations still struggle to achieve that vision because engineering data remains fragmented as it moves across systems, teams and partners.

When engineering information cannot move seamlessly between systems, organisations are forced into workarounds. Teams spend time recreating geometry, repairing models, validating translations and troubleshooting data issues that should not exist in the first place. The result is more than inefficiency. It slows decision-making, delays product development and reduces the return on investments made elsewhere in the digital engineering stack.

Seven Places Where Data Interoperability Breaks

While every manufacturer's engineering landscape is unique, interoperability challenges consistently emerge at key handoff points where engineering data moves between systems, teams and organisations. The seven places where data interoperability breaks are:



CAD-to-CAD Exchange

Manufacturers rarely operate within a single CAD ecosystem. Design data frequently moves between customers, suppliers and partners using different platforms, creating opportunities for geometry, feature history and metadata to be lost or altered.

Design-to-Simulation Workflows

Simulation teams often rely on specialised tools optimised for analysis rather than design. Preparing models for these environments can require significant manual effort, creating disconnects between the original design and the version being analysed.

Manufacturing Handoffs

Manufacturing applications often have different data requirements from engineering systems. Product and manufacturing information, annotations and metadata can be lost or modified during transfer, forcing teams to recreate information downstream.

Supplier Collaboration

Modern product development depends on distributed ecosystems of suppliers and partners. As information flows between organisations using different tools and processes, maintaining consistency becomes increasingly difficult.

Seven Places Where Data Interoperability Breaks (Continued)

PLM Migration and Modernisation

As manufacturers modernise their engineering data management and PLM environments, legacy data must be migrated, validated and integrated into new systems. Preserving context, relationships and usability can be just as challenging as moving the data itself.

PLM-to-PLM Integration

Manufacturers often operate multiple PLM environments across business units, acquisitions, suppliers, and legacy organisations. Differences in data models, workflows, configurations, and change-management can make it difficult to synchronise product information. Without effective interoperability, organisations risk duplicate product definitions, inconsistent configurations, and fragmented digital threads that undermine collaboration and decision-making.

PLM-to-PDM Integration

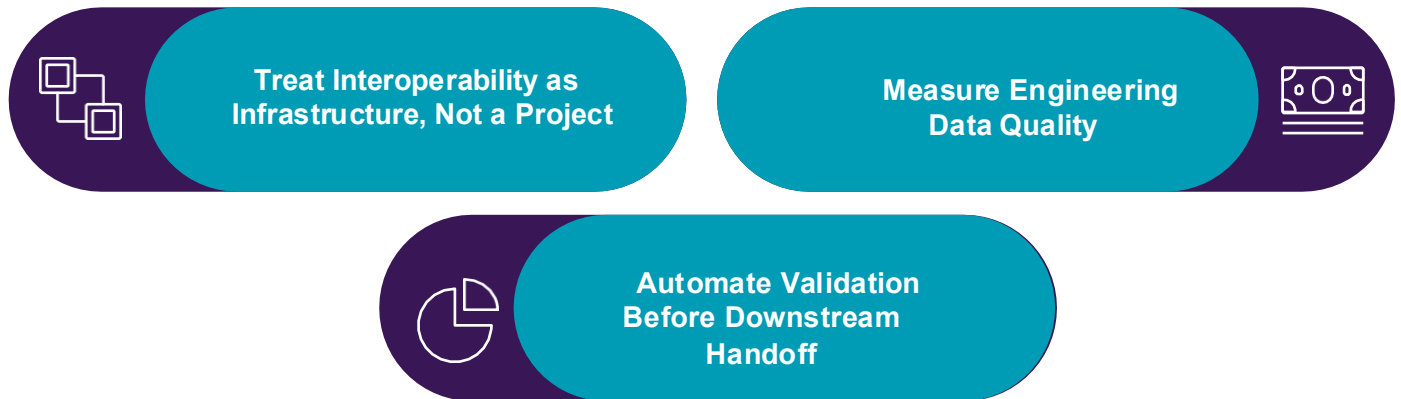
Many manufacturers manage CAD and engineering content in PDM systems while relying on PLM platforms for product governance and lifecycle management. Keeping product structures, revisions, configurations, and design data synchronised across both environments is a persistent challenge. Poor integration can lead to conflicting product definitions, delayed engineering changes, and reduced confidence in downstream manufacturing and quality processes.

The following table outlines some examples of the data interoperability problems and solutions:

Industry Example	Interoperability Challenge	What Broke	How It Was Fixed	Business Impact
Global engineering company	CAD-to-CAD Exchange	Feature history lost	Automated feature conversion	20,000 engineering hours saved
Manufacturing operations	Manufacturing Handoffs	Information lost downstream	Model-based workflows	Cycle time reduced from 60.3 to 15.2 hours
South Korean shipbuilder	Supplier Collaboration	Large supplier models failed to import efficiently	Model simplification	\$30,000+ annual savings
Automotive steering systems manufacturer	PLM Migration & Modernisation	Legacy data migration complexity	Automated migration	80,000 files migrated in 3.5 hours

Three Principles for Engineering Data Continuity

Sustainable engineering data continuity requires organisations to address several interconnected capabilities: making data reusable, measuring its quality and validating it before it reaches downstream teams.



1. Treat Interoperability as Infrastructure, Not a Project

Information exchanges should be incorporated into repeatable workflows rather than relying on manual intervention, and engineering assets must be reusable across multiple lifecycle stages.

2. Measure Engineering Data Quality

Leading manufacturers do not assume that a successful transfer equals usable data. They establish metrics and validation processes that allow them to monitor the quality, integrity and usability of engineering information as it moves across systems.

Industry example: A global automotive manufacturer found that CAD model defects were creating costly downstream rework. Through a Six Sigma Model Quality initiative, they implemented systematic CAD quality checks and set a goal of eliminating 70% of design-data-related rework.

3. Automate Validation Before Downstream Handoff

Rather than relying on engineers to identify issues manually, organisations automate validation checks to ensure geometry, metadata and product information remain intact before data reaches downstream teams and processes.

Industry example: A leading aerospace engine manufacturer needed to ensure CAD data remained trustworthy across product lifecycles. It integrated automated NX and STEP validation with Teamcenter, enabling continuous model verification and long-term quality tracking.

Companies that excel in these areas create digital environments where information can support design, simulation, manufacturing and service activities without repeated transformation or reconstruction. As engineering ecosystems become increasingly complex, this ability to maintain continuity across systems is becoming a competitive differentiator.

Why Engineering Data Continuity Matters Beyond Interoperability

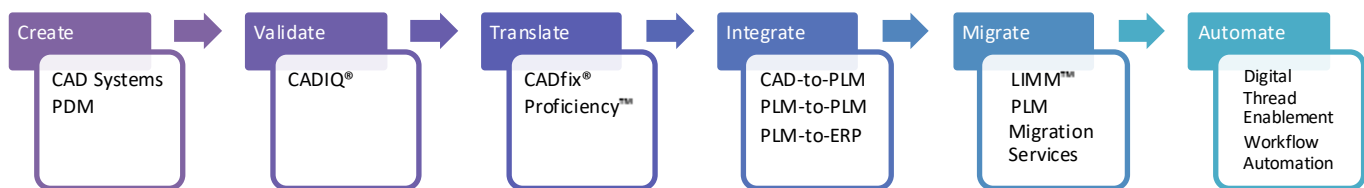
Most discussions about engineering data continuity focus on familiar challenges such as data interoperability, supplier collaboration, PLM modernisation and digital thread initiatives. The same issues are becoming increasingly relevant to manufacturers investing in AI-assisted engineering, predictive maintenance, closed-loop manufacturing and other forms of industrial automation.

These technologies depend on the same engineering information that already moves between design, simulation, manufacturing, quality and service environments. If the product information arrives incomplete, disconnected or stripped of context, automation inherits the same limitations.

This is where engineering data continuity becomes relevant beyond traditional interoperability projects. The work manufacturers do today to improve engineering data management, reduce data fragmentation and strengthen data interoperability creates the foundation required for more advanced automation. Before organisations can trust autonomous systems to make decisions, they need confidence that the engineering information those systems depend on remains accurate, connected and usable across the lifecycle.

How ITI Helps With Data Interoperability

For more than four decades, ITI has helped manufacturers address engineering data management and data interoperability challenges across complex product-development environments. What has since remained is the need to ensure that engineering information can move reliably between people, systems and processes.



That experience provides visibility into challenges that many manufacturers encounter as engineering data moves across systems, teams and suppliers. ITI's work spans the broader interoperability landscape, including data translation, validation, migration, integration and automation across complex engineering environments, frequently involving CAD interoperability, PLM migration and model-based engineering, helping organisations improve engineering data quality and support digital thread initiatives.

ITI's capabilities also extend to commercial interoperability solutions and services, including CADfix®, CADIQ®, Proficiency™, LIMM™, CAD-to-PLM integration, PLM-to-PLM and PDM integration, PLM-to-ERP integration, and large-scale PLM data migration programmes that help manufacturers maintain data continuity across heterogeneous engineering ecosystems.

Conclusion: What Leading Manufacturers Do Differently

Manufacturers that have made meaningful progress in this area tend to view interoperability differently from their peers. Rather than treating it as a collection of discrete technology projects, they approach it as a strategic capability that underpins the entire engineering lifecycle. Successful manufacturers pay close attention to what happens to engineering information after it leaves its system of origin. They build data continuity by keeping engineering information accurate, accessible and usable wherever it needs to go and whoever needs to use it.

Rather than measuring success by the completion of a data transfer, they look at whether engineering intent can be preserved and reused downstream. They also recognise that interoperability cannot be treated as a downstream clean-up exercise. It needs to be considered from the outset. In practice, this means establishing neutral-data strategies, automating validation checkpoints and introducing quality controls before engineering data enters downstream workflows. The result is an environment where information can support design, simulation, manufacturing and service activities without requiring costly rework at every handoff.

Large-scale engineering programmes, too, increasingly follow the same principles. Both the national Department of Defense, which oversees some of the world's most complex defence engineering and acquisition programmes, and space research program of a first-world country, have formalised digital engineering approaches that prioritise authoritative sources of data, connected digital models and lifecycle-wide information continuity across organisations and disciplines.

Turning Engineering Data Into a Competitive Advantage

As products become more sophisticated and engineering ecosystems become more distributed, the ability to move information across organisational and technology boundaries will become increasingly important. Companies that establish strong foundations for engineering data continuity will be better positioned to accelerate product development, improve collaboration and realise greater value from digital transformation in manufacturing.

Most manufacturers already have the tools they need to support a digital thread. The harder challenge is ensuring that engineering information remains usable as it moves between those tools. While that capability improves efficiency and collaboration today, it also creates the trusted data foundation required for the next phase of manufacturing transformation.

FAQs

What is engineering data continuity?

Engineering data continuity refers to the ability to preserve engineering intent, geometry, metadata and product information as data moves across systems, teams and lifecycle stages.

What is engineering data management?

Engineering data management is the structured control of product information, including CAD models, metadata, product structures and related engineering records, throughout the product lifecycle. Effective engineering data management helps keep that information accessible, traceable and usable across systems and teams.

Why is engineering data continuity important?

Without data continuity, manufacturers often face rework, translation issues, duplicated effort and reduced confidence in downstream engineering and manufacturing processes.

What causes engineering data fragmentation?

Common causes include CAD-to-CAD translation issues, disconnected engineering systems, supplier data exchange challenges, PLM migrations and inconsistent validation processes.

How are data interoperability and data continuity different?

Data interoperability enables engineering information to move between systems. Data continuity ensures that the information remains accurate, meaningful and usable as it moves across systems, teams and lifecycle stages.





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