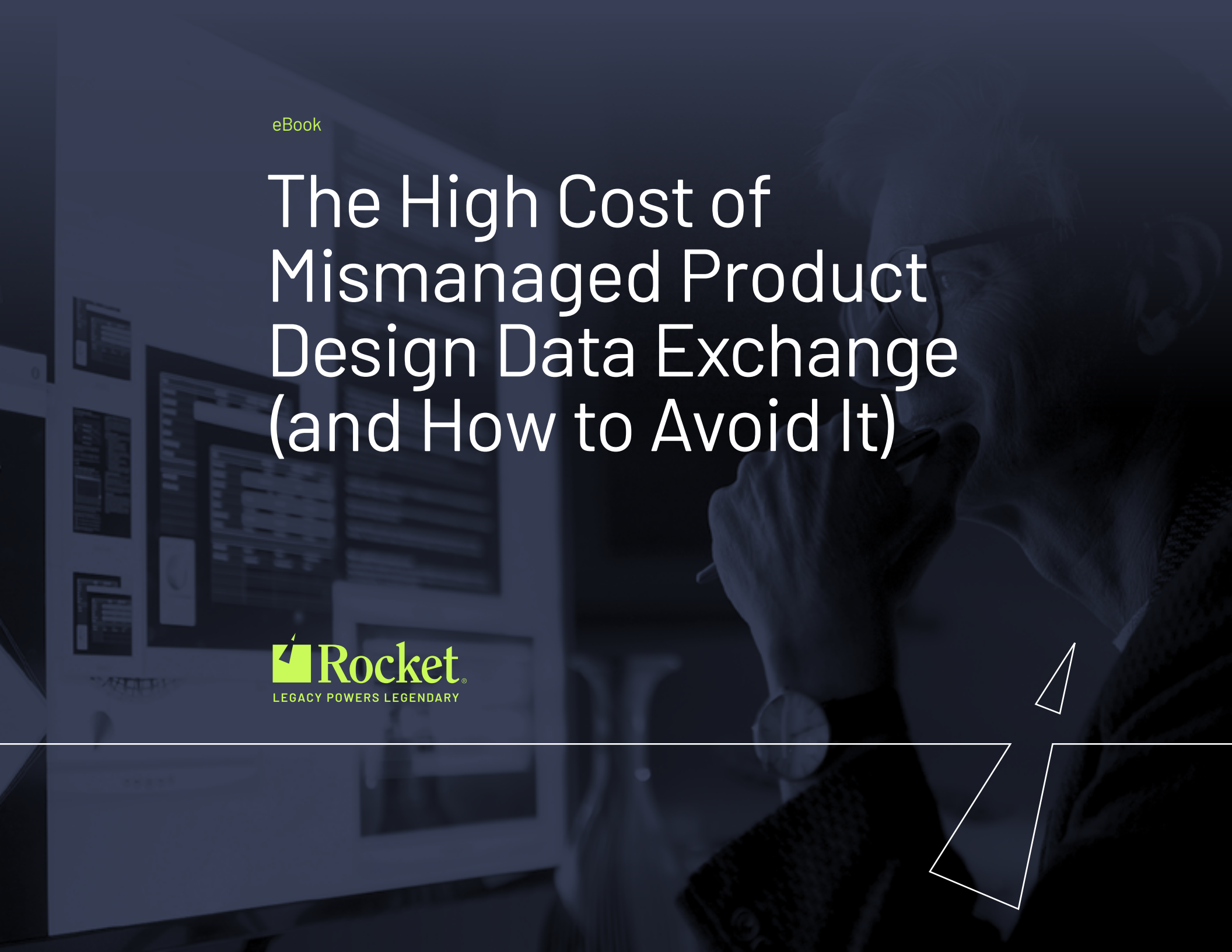

eBook

The High Cost of Mismanaged Product Design Data Exchange (and How to Avoid It)

Rocket
LEGACY POWERS LEGENDARY

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Introduction

Back in the 1930s, the combination of an inexperienced employee and a tight production schedule at the U.S. Mint allegedly resulted in the 1937-D three-legged Buffalo nickel. Some (probably panicky) manual mishandling of essential data—the dies in the coin press—ended up eliminating one of the buffalo's legs on the final product. Ironically, this manufacturing mistake made the end-product worth more to customers (coin collectors and non- collectors alike).[1]

If only.

Fast-forward to today. Data-driven, digitized manufacturing enables rapid innovation, product differentiation, and faster time to market. Yet simple mistakes still happen, and they can have big consequences.

When mistakes happen in automobiles, airplanes and other complex engineered products, it can cost millions of dollars or more in manufacturing delays or retooling, unhappy or lost customers, missed market opportunities, product recalls, reputational damage—even litigation. Interestingly, the cause of mistakes may be as basic as the manual mishandling of the dies at the US Mint: sharing the wrong version of a CAD assembly file with a supplier or OEM. (No collector's-item value here.)

In the following pages, we'll explain:

- Why more efficient product design data exchange (PDX) is essential
- Why PLM software alone doesn't solve the problem
- A three-step process to fill the PDX-PLM gap
- The benefits of automating PDX

Modern manufacturers have invested in automated processes for product lifecycle management, including change management, release management, RFQs, and data referencing. All rely on efficient product design data exchange. By automating the process of exchanging CAD data, you'll improve the entire product lifecycle—and your business.

And it's easier than you think.

[1] *PCGS*, *Numismatic News*

Meeting the need for speed

You don't have to be a space fan to remember the Mars Climate Orbiter, a $327.6-million NASA robotic space probe launched on December 11, 1998 to study the Martian climate and atmosphere. On September 23, 1999, it was lost in space. The root cause? "Failed translation of English units into metric units in a segment of ground-based, navigation-related mission software" (a math error), compounded by other, human errors. The discrepancy was enough to send the Orbiter careening into the Martian atmosphere, rather than in a stable orbit, likely vaporizing millions of dollars.

Your company may not be working on the next Orbiter, but the story is an object lesson for all manufacturers. Small errors can lead to enormous downstream costs in even the most scrupulous of organizations—particularly those engaged in a race to stay ahead in an ultra-competitive market.

The automotive industry is particularly vulnerable, with its complex, highly-distributed and diverse supply chain. Any market advantage—new product or product feature—is temporary. The only way to achieve that slim advantage? Continue to get products to market as quickly and efficiently as possible. With an average net margin of under 5%[2], time and cost of execution really matter.

If you're a Tier 1 or OEM in a large manufacturing industry such as automotive, aerospace, or transportation, efficiently sharing your high-value product IP across the supply chain can be a competitive differentiator. Yet, in far too many companies, exchanging CAD assemblies is still a tedious, manual process for engineers. The market is far too competitive to waste precious engineering time and talent on administrative tasks like product design data exchange. Yet many manufacturers persist in doing it this way. Why?

Let's do the math. A complex product can be made from thousands of parts from multiple suppliers. Preparing ready-to-use product design data for suppliers or OEM customers can require hours per transaction, especially if the assembly you're preparing contains hundreds of parts. With multiple PDX transactions per day, the problem is compounded. With thousands of PDX transactions a month—common in large companies—it's a serious business problem.

Worse, product design data exchange is a complex series of steps that must work together perfectly across the supply chain. Errors or delays in data exchange preparation can have a domino effect.

An international supplier of automotive parts found out the hard way when a tooling partner received the wrong (out-of-date) CAD file and started machining. The cost? $3 million.

[2] *2018, per CSIMarkets*

A (secret) competitive edge

Manually preparing CAD files for exchange is a huge time sink (just ask your engineers). Consider just one part of the data preparation process: renaming.

Imagine a scene in which a room full of engineers right-click repetitively on component-file names for assemblies, renaming them consistently to create CAD data exchange packages. The average medium-sized assembly in the automotive industry consists of 100 component files. Depending on the size of the assemblies, labeling all the files properly can easily take an hour or two per PDX transaction. Then add time for finding the right metadata, the right CAD format for the data, the right recipients, and the right workflow (secure portal or communication protocol such as OFTP).

Complying with partner mandates eats up still more time. For example, T1 suppliers who interact with multiple OEM customers often have their own data-formatting mandates. Each OEM has their own requirements for CAD, naming-convention, and metadata. Every engineer must know how to properly prepare files for each OEM customer and how to manage this valuable IP in their own PLM system.

Keeping track of all of this is confusing and complex. It's far too easy for errors to slip in unnoticed. A single, seemingly minor error could generate a hit to your supplier scorecard; add a few more and your status as a preferred OEM partner could be in jeopardy. Can you afford to risk it?

Perhaps your engineers have figured out how to keep track of everything, or you've built a spreadsheet or other process to help them. Or maybe you've assigned data coordinators or data stewards to handle data exchange preparation. All of these solutions divert engineering time, talent, and attention from more revenue-generating work, reducing design productivity and competitiveness.

Worse, the manual, disconnected nature of the process leaves you exposed to errors (like that at the US Mint). Even if your error rate is 0.01%, this can quickly snowball if you have multiple OEM partners and hundreds of engineers working on numerous projects for each partner.

A (secret) competitive edge

Small product design data exchange missteps can result in downstream delays and problems.

- If the right file is sent but it's named incorrectly or in the wrong format, your OEM could reject the file, requiring the whole exchange process to start over.
- A Tier 2 manufacturing partner might not reject the file, but must take time to determine the associated project and make the edits correctly before importing the file into their system. Meanwhile, tooling design for manufacturing the assembly can't proceed, possibly delaying production. If the wrong CAD format is sent, the partner might not have the ability to cleanly translate the CAD and check for errors, resulting in possible manufacturing errors.
- Your engineer could receive the assembly back from a partner, but need to deduce the source project and assembly, then manually rename and reformat it.

By intelligently automating product design data exchange, you can **save time, reduce errors, and improve data integrity** all at once.

It can really add up in lost time and money.

Automated PDX will slip right into your design and PLM processes (unlike the early days of CIM, when, in General Motors' mad rush to automate, the robots on the production line at the Hamtramck plant famously began painting each other, while helpless production workers stood by).[3]

By intelligently automating product design data exchange, you can save time, reduce errors, and improve data integrity all at once.

[3] *Comeback: The Fall & Rise of the American Automobile Industry," by Paul Ingrassia, Joseph B. White (1994)*

Three steps to automating product design data exchange

1. Map your PLM data model with key partners
2. Create a process for quality assurance
3. Automate (it's the secret ingredient)

STEP

1

Map your PLM data model with key partners

Mapping data models may sound tedious. However, without mapping as a foundation, you're perpetuating a version of the children's game "Telephone," where "bad" (highly interpretive) metadata gets passed across your supply chain.

Mapping, in effect, creates a virtual "golden record" of consistent, descriptive data across your engineering organization and your partners' and suppliers' organizations. The good news is you already have what you need to do data-model mapping.

Start by configuring your PLM solution with a data model that meets your company's needs as well as those of your customers (item types, attributes, naming conventions and so on).

Next, map between your PLM data model and each partner's data model for both sending and receiving data. Packages of design data are now ready to be processed efficiently, with the help of automation. When you perform mapping upfront, you can accurately process and transfer data files from your own CAD model and naming conventions into a partner's CAD model and naming conventions—every time.

Naming is a great example of the value of upfront data model mapping, as naming tends to be more time-consuming than other preparation tasks. Manufacturers typically have their own naming conventions, as do their partners. Imagine a situation where OEM #1 uses CAD system A with the naming convention "Product_Assembly_Version_Date," OEM #2 uses CAD system B with "Date_Product_Assembly_Version," and your company uses "Date_Version_Product_Assembly."

One company's data stewards were taking hours to sift through PDX packages sent by their customers. Each data steward had to determine the project, identify the related CAD program, and load the data packages into the PLM system while retaining the original naming metadata. With automation, the time required for this went from an average of one hour to approximately seven minutes per PDX transaction. The company saved massive amounts of time, improved data accuracy, and accelerated decision-making whether the PDX transaction involved an RFQ, reference data, change request, or data release.

You can configure all the different parts of the data preparation at the same time, including attribute mapping, structure renaming, adding necessary metadata, package comparison on import, and quality checking.

By configuring your process to handle customization of the file names and conversions automatically, you'll minimize the time and cost of accidental disruptions along the supply chain caused by human error.

STEP

2

Create a process for quality assurance

Configuration and automation introduce quality assurance (QA) discipline. But there's always a chance something will slip through the cracks. When it comes to data quality, experience suggests that it pays to be paranoid and proactive. Therefore, it helps to build a "catch-all" QA process to make sure renaming errors, formatting errors, and the like are caught before the data exchange occurs.

There are a number of good third-party solutions available that help ensure CAD data complies with a given customer's quality demands. These include TECHNIA Q-Checker for Dassault Systèmes® CATIA®, and DOCUFY CAx Quality Manager (DQM) for Siemens NX®. Some of these solutions will even plug directly into your PLM and/or PDX process to run automatically.

Look for an automated product design data exchange solution that provides integrations with Q-Checker (for CATIA V5) and DQM (for NX) to run checks as part of the usual data exchange workflow.

For each PDX transaction, the integration should set the correct environment (CAD version, Q-Checker-/DQM version, check profile) to run Q-Checker/DQM in batch mode and provide results through the PDX interface if review and approval are needed. If everything looks okay, the PDX transaction should be further processed and completed. If an error or alert occurs, the transaction should be halted so the CAD data can be corrected and re-submitted.

> When it comes to data quality, experience suggests that it pays to be paranoid and proactive.

STEP 3

Automate (it's the secret ingredient)

You've seen the benefits of automation in the first two steps. Now, picture its benefits across the entire product design data exchange process.

Human error is the number-one cause of CAD preparation mismanagement for any manufacturing company. Minimizing human interaction with the product design data exchange process will ensure data integrity and accuracy. Automation inherently drives integrity and accuracy, precisely because it limits the chance for human error.

Automation also:

Enforces security and protects your high-value product IP from falling into the wrong hands.

Enables auditing. Log files can be automatically generated to track what data files go where, who sends them when, what format and naming conventions were used, and who receives the files when.

Delivers productivity across the supply chain, which can speed up time to market as well provide the opportunity to pick up more projects.

Using Rocket® TRUfusion™ Enterprise, a $20B+ Tier 1 automotive supplier saw a 95% reduction in the man-hours needed for data exchange by standardizing and automating the process across their internal sites worldwide. With the time savings, the company was able to redeploy 85 full-time engineers to more strategic, productive roles. They also experienced a reduction of errors during the CAD exchange.

Reach total PDX automation with Rocket

The easiest, fastest way to reach savings and success is to find a solution that automates the PDX process from within your PLM system of choice.

Rocket® TRUfusion™ Enterprise is a product design data exchange solution built to work directly inside your PLM environment. TRUfusion Enterprise automates the entire CAD exchange process between you and your partners, OEM customers or remote manufacturing sites. You can:

- Import/export data into Siemens Teamcenter® or PTC Windchill and other PLM systems
- Map attributes and naming conventions between CAD and PLM systems to convert between different data models
- Perform CAD quality checks
- Convert to/from neutral formats (e.g., STEP, IGES, 3DPDF, JT)
- Convert between native CAD file formats from leading vendors (e.g., CATIA V5 to NX)
- Create format-specific packaging (e.g., partner workflows)
- Find, select, and confirm partner recipients
- Send secure file transfers (including package compression and encryption)
- Deliver via portal or OFTP
- Send email notifications
- Document the full audit trail
- Archive sent data packages

As a result, you get a competitive edge because you are able to:

Reduce the risk and cost of errors within your manufacturing supply chain

Minimize production delays caused by retooling needs

Respond to RFQs faster—pursue more opportunities to generate revenue

Improve product quality and customer satisfaction

Use your engineering talent and teams in a smarter, more efficient way

Automate your PDX today

Automating product design data exchange is a low-risk way to get a competitive edge from a basic (but critical) manufacturing workflow, bringing it safely into the 21st century. Automated PDX will slip right into your design and PLM processes.

By following the three-step process outlined above, you will nearly eliminate renaming and other data preparation mistakes in the CAD exchange process, in addition to creating a secure, accurate, and competitively advantageous process for product design data exchange. And, of course, you'll save your engineers hours of time per project, which means more time for design and more energy applied to creativity. (You may even get some thank-you gifts on your birthday.)

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