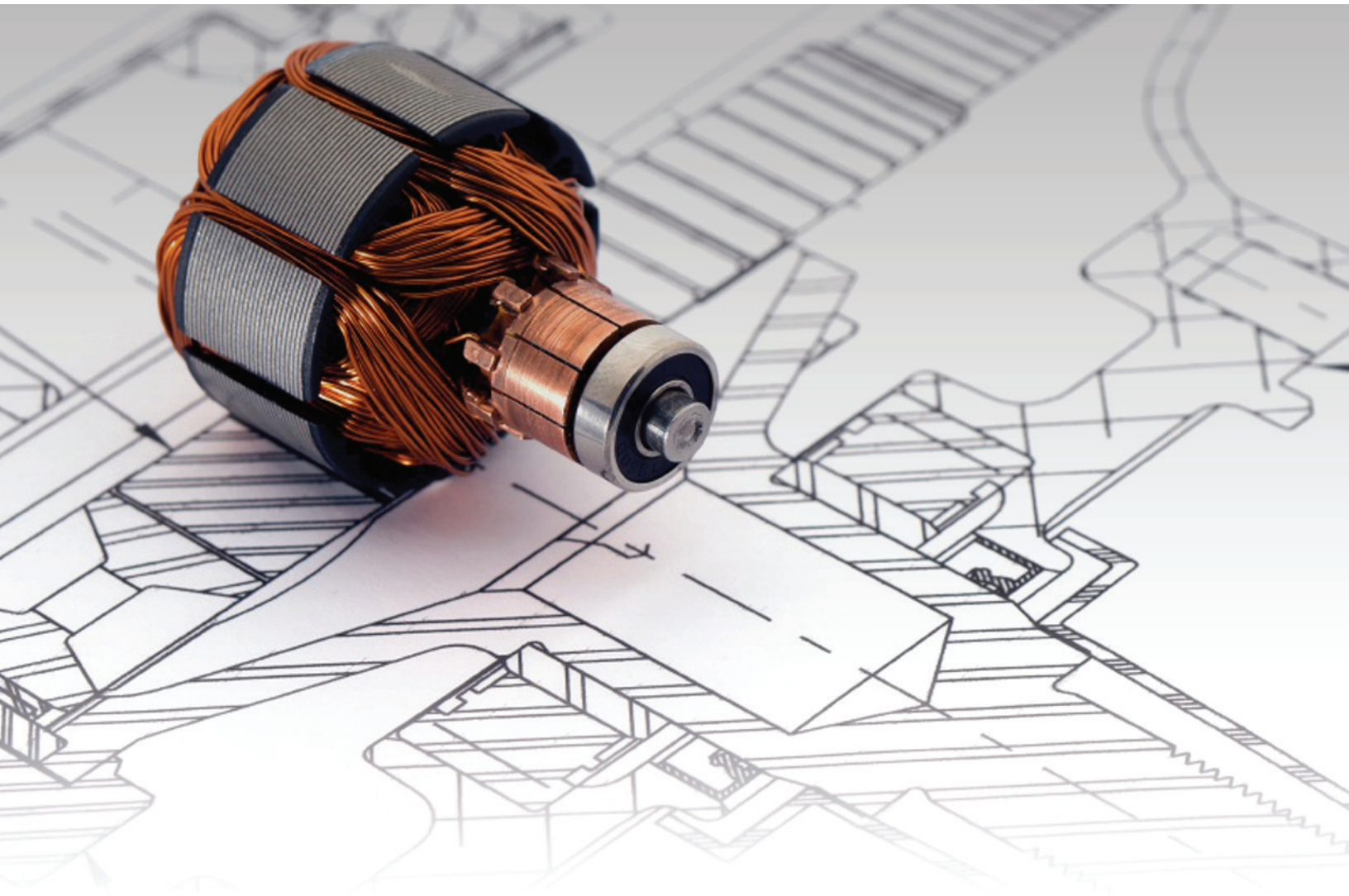
Best Practices for Data Migration Success



Although switching to 3D CAD software dramatically improves business performance, the investment raises questions about how to handle legacy data. How much, if any, should be converted to 3D models? When do you convert it? Which data do you convert? How can you avoid errors? What has proven successful for other companies?

This paper outlines migration strategies that squarely address these questions and covers objectives, return on investment considerations, quality issues, and best practices.

SolidWorks

1. Objective

Successfully migrating engineering data to a new CAD system requires careful planning, preparation, and logistics. The framework outlined in this document for planning and managing a smooth and successful conversion process will maximize returns as quickly as possible.

This framework focuses on the high-level preparation and practices required for converting legacy data, or for having it coexist with your new CAD system. It focuses on important guidelines for a practical, efficient, and effective overall strategy that avoids common pitfalls and meets an organization's engineering and business goals. It is not intended to map the conversion process in great detail nor document one definitive approach. The finer details of the conversion process should be discussed with your CAD vendor.

The data migration strategies described herein are intended for medium-to-large businesses that are replacing legacy CAD systems either partially or completely. The planned conversion is assumed to be extensive and encompass separate, even autonomous, business units. This framework also assumes the organization will standardize on the new software tools and, consequently, refine engineering standards and procedures to realize the maximum benefits of the new environment.

2. Business and Engineering Objectives

It's important to take a big picture look at data conversion in the context of your larger engineering goals. The goals of the migration/coexistence program per se should line up with objectives that originally prompted the new software initiative. And because of the far-reaching impact, the migration strategy should be an explicit, formal component of your overall engineering systems strategy. This way, a clear understanding of the business and engineering objectives will drive any detailed technical project tasks, helping ensure efficiency and success.

3. Return on Investment Considerations

As with all business decisions, it is important to consider the return on investment potential of your existing data. CAD data conversion often requires that you estimate its potential future returns. In either case, it's important to try to establish the value of the data that you are considering converting and the scope of that effort. To that end, we suggest evaluating the following:

The Value of the Product/Product Line to the Company
What is the part, assembly, or drawing worth to your company, and would that value be sustained or increase if the product were modeled in your new 3D CAD system? Value may be determined in many ways, such as the revenue or profit a product generates, its relation to other products, or its potential growth. The question to be asked for each product or product line is, to what degree is it an integral part of your organization?

The Value of the Product/Product Line as Modeled
Evaluate parts or assemblies based on their value if modeled in your new CAD system not in their current form. The modeled part or assembly is likely to be easier to manufacture, visualize, analyze, modify, or market. With this in mind, your organization can assign a numerical, if not dollar, value to that data.

The Cost to Model the Product/Product Line
After you decide how an object will be converted, straightforward accounting can determine the cost of doing so. Beware of frequently overlooked costs, however, such as the opportunity cost of diverting staff from work on new designs and training costs for the personnel involved.

Conversion Evaluation Model

Once the cost/value benefits are determined, it's helpful to represent findings graphically to determine a hierarchy of conversion. In Figure A below, the top-right cube area represents the data with the greatest value: high product importance, high value in having models, and low cost to create the model(s). This graph assumes equal weighting of each criterion.

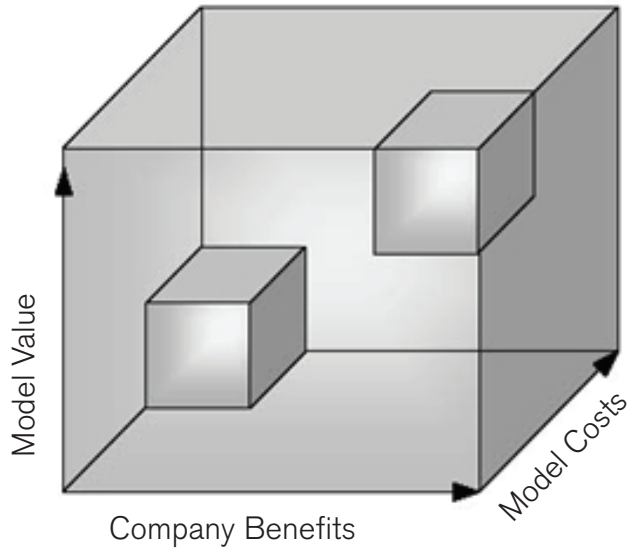


FIGURE A: MIGRATION JUSTIFICATION MODEL

However, organizations tend to weight each value criterion differently, thus skewing the cube into a different shape. This organization, for example, considers every product valuable and is less sensitive to modeling costs.

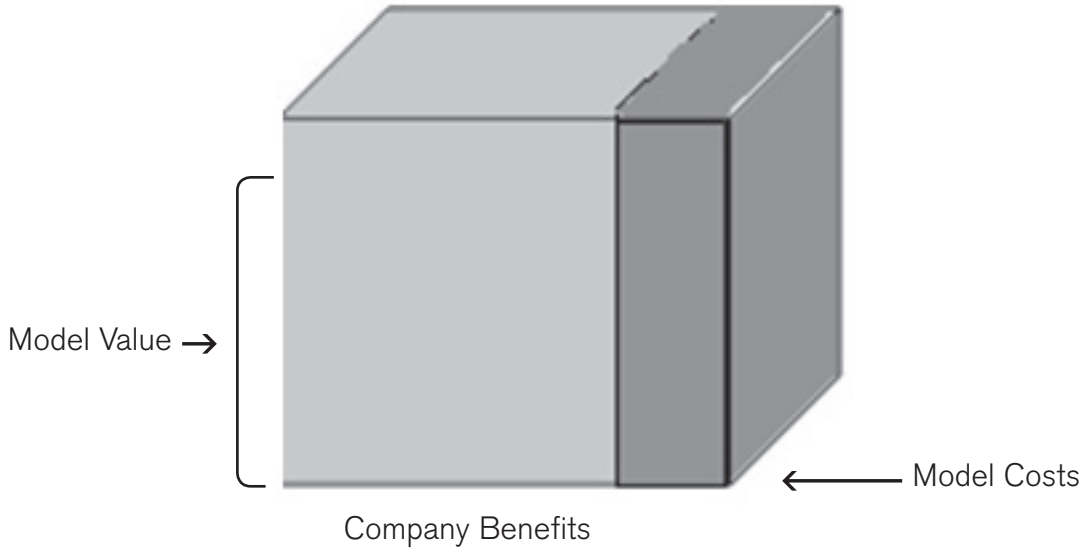


FIGURE B: DIFFERENTLY WEIGHTED VARIABLES CHANGE SHAPE OF CONVERTIBLE DRAWINGS AREA

Your organization may find the justification model more useful for eliminating or reprioritizing candidates rather than identifying the best data to convert. To illustrate, Figure A also represents a volume of minimal-value data in the lower left corner. Thus, one approach is assessing the least valuable parts and assemblies and expanding out to those that start to show significant value.

Once you have identified data that is not worth converting, the remaining data constitutes the scope of the migration project.

Although the cubes powerfully illustrate how values and costs interact, quantifying the value of new models is the ultimate goal. Figure C below illustrates a way to assign value ratings to parts and assemblies. The weighting factor, often contentious because of its subjectivity, adds greater value to any variable your organization deems appropriate. The sum of the three areas after weighting—product value, value as modeled, and cost to model—determines a rating that can be used to rank a product or product lines and determine a hierarchy of conversion.

Part Number	**A**-Value to Company	**A1**-Weight Factor	**B**-Value as Modeled	**B1**-Weight Factor	**C**-Cost to Model	**C1**-Weight Factor	Total **A(A1)+B(B1)-C(C1)**
AAAAA	7	6	3	5	3	2	51
BBBBB	4	6	4	5	4	2	36
CCCC	3	6	9	5	7	2	49
DDDD	8	6	6	5	5	2	68
EEEE	9	6	5	5	4	2	71
FFFFF	2	6	8	5	8	2	36
GGGG	10	6	8	5	7	2	86
KKKK	7	6	5	5	4	2	59
Values for A and B are assigned from 1 (lowest) to 10 (highest). Costs (C) to model are determined as follows: 1 (1-3 hrs.); 2 (4-6 hrs.); 3 (7-9 hrs.), etc.							

FIGURE C: CONVERSION EVALUATION CHART

4. Different Migration Approaches

Assuming your organization is committed to converting at least some of its CAD data, there are various approaches to execution. Here are some examples along with pros and cons.

A. Convert Nothing and Model Only New Products

Typically, this means maintaining all existing data in the old CAD system. This is viable when changes to old product lines are infrequent or new products are entirely new. It's a risky approach since having already-modeled parts is surprisingly convenient when the opportunity arises to reuse previously designed parts. Having a model ready for your new CAD system saves time, errors, and frustration.

B. Convert Products on the Fly as Needed

This approach is often less a strategy than a default result of not taking the time to anticipate needs or focus on current business objectives. Although the approach sounds viable, it is rarely the proper methodology. Failure to plan ahead and leaving conversion to whoever is available will often result in

- Compromised standards and best practices, since on-demand conversions are likely to be rushed;
- Inefficient use of technical staff who should focus on designing new product rather than lower-value component conversion; and
- Product development interruptions resulting in late arrival to market.

C. Convert Targeted Product Lines, Projects, Part Families, etc.
After crunching conversion costs and the value of existing data, it's cost-effective to convert the product lines that return the most value for the investment. Focusing on long-term benefits generally brings about positive results.

D. Convert a Percentage of the Product Line
Another viable approach is targeting a certain percentage of products selected for their value. Much like the above approach, in which certain categories are targeted, converting a percentage of the product line allows one to focus both on big-picture return and on individual pockets of parts and assemblies that are the most valuable. This strategy is a sound approach to getting the most out of the conversion process.

E. Migrate Everything
Although rare, this approach stems from a conviction that all products are valuable and that the long-term benefits of a concentrated conversion effort outweigh the immediate financial investment. It often results from a desire to retire the old CAD system and create a "pure" environment in which everyone speaks the same language.

Whatever the long-term benefits, complete conversion of legacy data can be costly and requires a great deal of planning and resource management. Much of the time being spent on the conversion may go to low-value parts and assemblies and is in most cases neither cost-effective nor necessary for the business.

5. Quality Considerations

Perfection is as elusive in this process as in any other endeavor. Errors happen. There are two major origins of errors in any CAD data conversion project: 1) the legacy source data and 2) the conversion process itself. Legacy-source data errors can range from innocuous clerical mistakes to serious engineering oversights that escaped detection in the original creation phase. It is very important to systematically review legacy-source databases before they are converted as well as the data after the conversion is complete.

Some error categories follow, ranging from most damaging to least damaging.

A. Engineering Intent
The original drawing does not reflect the intent for which it was created, or a flawed conversion compromises the intent. In either case, the design does not meet original specifications.

B. Engineering/Manufacturing Oversights
These can be issues of incorrect fit or lack of manufacturability, often the result of tolerance stack-ups. If manufactured to the print, the part may not function as intended.

C. Functional – Modeling
The new model of the part does not reflect the design intent of the legacy print. Information was not properly transferred to the new model, and proper modeling techniques were not incorporated in the new model.

D. Functional – Dimensional
Dimensions, notes, and callouts may be omitted or incorrectly recorded on the new model or drawing. These errors and omissions could lead to scrapped parts.

E. Clerical

Incorrectly entered part numbers or dimensions placed on the wrong side of the geometry are less serious errors. Although they do not directly influence the manufacturing of the part, they can consume time and money nonetheless.

F. Cosmetic

The drawing has a cluttered look, incorrect font size, or improper spacing between views. This is usually no more than a nuisance, but it can lead to misinterpretation, confusion, or wasted time.

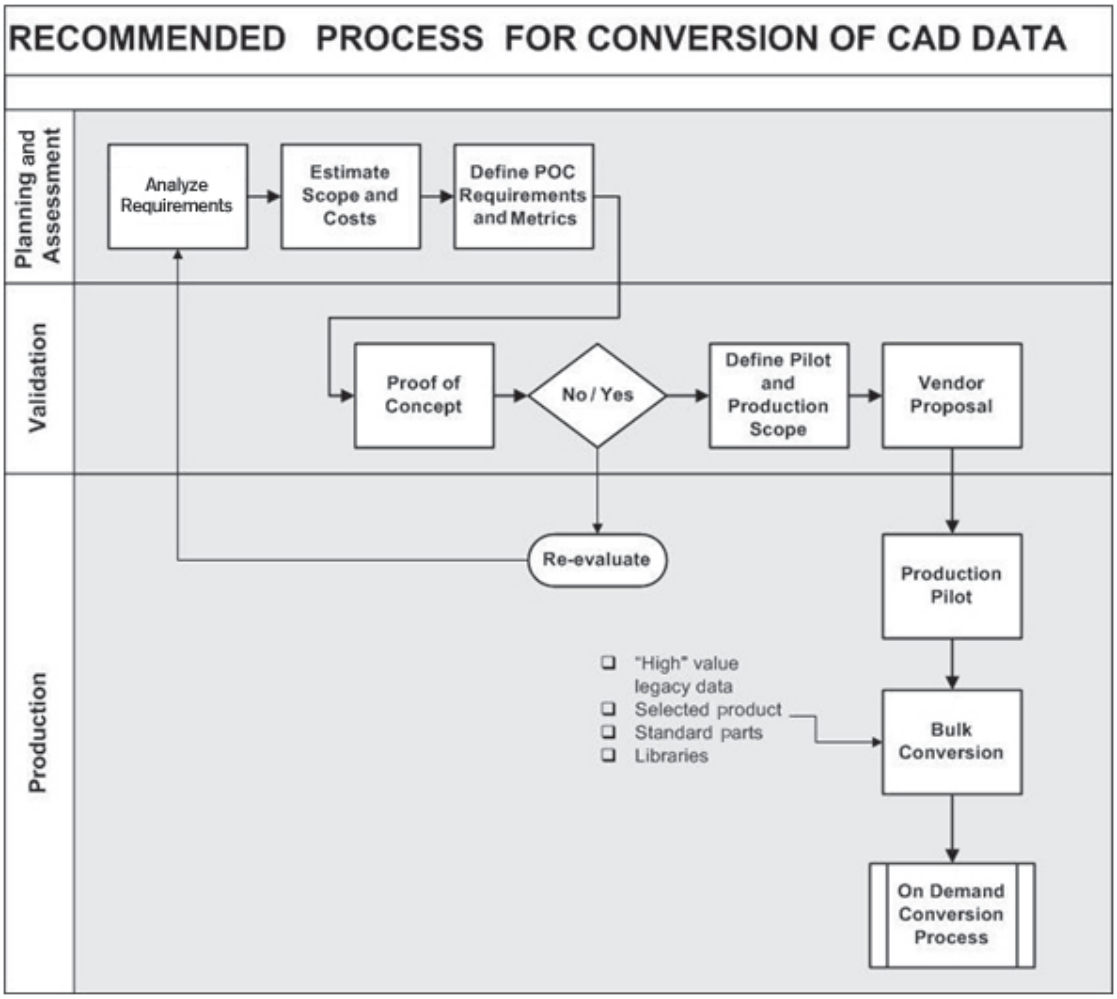
Although all of these error types matter, engineering issues are the most difficult to address. Since it's a significant undertaking to address engineering issues in thousands of parts, the task is commonly ignored. But since the legacy information is being re-examined and at least a cursory review of the drawing is taking place, it only makes sense to have a strategy to deal with engineering issues during the conversion initiative.

6. Recommended Processes and Best Practices

To ensure your efforts pay off, your organization must adhere to well-founded processes, procedures, and best practices.

Migration Processes

While each organization is unique, our experience indicates that the following workflow is a sound baseline for designing specific processes for each business unit and legacy source data format.



Best Practices

Practices to follow is a short summary of interrelated topics that every project manager should monitor during a data conversion project.

Management

Managers must demonstrate their commitment to a data conversion project through their actions in order for the project to succeed. Commitment is manifested by proper funding; formation of a strong, well-represented steering committee; and the allocation of resources (including time) to ensure completion of the project. The project manager leading the effort must continuously report progress to upper management, stay focused on the overall objectives, and quickly address any obstacles that may impede success.

Momentum

Just as in sports, successful projects require momentum. To sustain staff interest and peak performance, and to ensure adequate funding, keep the project moving steadily. Make sure milestones are met and that everyone is aware of progress. And make sure staffers understand why they are doing what they are doing.

User Acceptance

To secure the benefits of switching to powerful new CAD software, users must buy in. No matter how well-defined the objectives or how strong the leadership, user acceptance can make or break a project. It is vital that key technically oriented individuals in the organization accept and even champion the new direction. Lack of user acceptance may very well be the number one reason why major reengineering initiatives fail within an organization.

Team Makeup

Whatever the execution plan for a conversion project, a cross-divisional team should be making the decisions. There are a couple of major reasons. First, it's unlikely any one division knows all the engineering, design, and documentation issues in all the other divisions. Second, multiple perspectives, insights, and best practices generally produce the most efficient approach to any significant endeavor, including converting legacy data. While each division has unique needs and challenges, the project should be grounded in a shared vision of the common good.

Information Gathering and Categorization

During the planning process, it's essential to collect metadata on all products, including the number of models and drawings for each product, as well as the CAD system in which they reside. An estimate of the data volume should suffice, and probably will have to suffice in many manufacturing environments. These numbers will persistently come up during conversion discussions, often broached by management.

The next step is to begin roughly categorizing models and drawings according to product line, when and where they were last used, and any other value-related data.

Standards and Personal Preferences

Make modeling and drawing standards a priority early on, even though they will evolve as your organization learns how the new software is changing the business. It's not necessary to solidify standards before they are tested in an early pilot (discussed further below). It's smart to focus first on proposed changes to established drawing standards, which require less knowledge of the software than addressing modeling standards. When time and experience permit, invest in refining and documenting the modeling standards and best practices.

Project Road Map

This is a necessity even though it, too, may evolve. An early road map stimulates thought on upcoming tasks, milestones, and potential obstacles. The earlier these issues are addressed the better.

Pilot Projects

Pilot projects are an absolute requirement in tackling a new initiative of significant magnitude. In general terms, a pilot is a small, manageable project that closely mirrors the overall assignment. The pilot group should represent the entire company in order to uncover unanticipated issues. The course of action should be well defined and skewed toward problem parts and assemblies. The pilot should have a specific timeline and metrics.

7. Summary and Next Steps

It's important to have a structured and well-planned approach. There is a lot to think about, but many of the concerns are standard project management fare. A successful conversion project moves from general to specific, starting with an analysis of your organization's needs and proceeding to detailed project plans. Start early, stay focused, follow through, and enjoy the benefits of your new, more effective design and engineering environment.

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