



3D Publishing: Extending PLM Collaboration Downstream

Key Facts

Collaboration is a core component of a product lifecycle management (PLM) strategy for achieving profitable growth. AberdeenGroup's [Product Innovation Agenda](#) research shows that best-in-class companies are four times more likely than other manufacturers to have integrated data, process, and collaboration capabilities to improve product innovation, product development, and engineering performance. Further analyzing the use of collaboration in-depth, Aberdeen's recent [Product Lifecycle Collaboration Benchmark Report](#) identifies that companies are extending their collaborative processes further downstream into the product lifecycle. In fact, the report indicates that collaboration in downstream or later lifecycle phases is a key contributor to high levels of product innovation performance.

One clear example of the extension of collaboration to improve downstream processes is the growing use of 3D publishing. This practice leverages product designs from Engineering to enhance the development of technical publications by incorporating graphics taken directly from 3D CAD (computer aided design) models. Aberdeen research indicates that 3D publishing is a key enabler of some of the fastest growing areas in collaboration, including service and maintenance training, product documentation, and manufacturing and assembly instructions.

Decision Framework

The Value of 3D Publishing

The goal of these downstream process improvements is cost reduction, and, even more important, reductions in time to market – key contributors to revenue growth (Figure 1). Graphics play an important role in the communicating product information, particularly for complicated assemblies. The adage “a picture is worth a thousand words” is true in many ways. High-quality graphics are increasingly appearing in marketing and sales tools as well as in technical documentation such as installation manuals, service documentation, and manufacturing instructions. Perhaps one reason for the increased usage of graphics is the growing need for multilingual documents. A picture that is “worth a thousand words” can eliminate the need to translate those thousand words into multiple languages, reducing the time and cost of producing documentation for different populations.

Graphics are not new to technical publications. Frequently, however, the graphics are created independently from the product design itself – developed from scratch based on prototypes, drawings, or the final product itself. This duplicated effort adds time and cost to the process. While most downstream users might have had difficulty interpreting 2D engineering drawings in the past, current 3D product models are much easier to understand. Reusing these designs electronically also allows for specialized functions such as part explosions, planar views, multiple viewing angles, and annotations to be readily incorporated. In addition, embedding 3D

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images into electronic documents can allow downstream users to manipulate the model or to view predefined animations of assembly or disassembly instructions – to help them visualize the intended procedures.

Table 1: Goals of 3D Publishing

Goals for 3D Publishing	% Reported
Faster time to market	61%
Product development cost reduction	58%
Higher quality product documentation	47%
Promote reuse and efficiencies	47%
Identify and automate documentation updates based on product changes	44%
Earlier availability of documentation	39%
Provide consistent, complete documentation	36%

Source: [AberdeenGroup](#), June 2006

Automating publishing processes further leverages the value from design reuse for publication. Although less frequent, some companies have developed automated processes that allow common portions of content to be inserted in product documents -- reducing the effort of propagating content into multiple documents manually. This can be particularly important in dynamic environments in which content changes frequently. As companies begin documentation sooner in the product development process, the occurrence of changes that must be propagated throughout the document rises. The manual effort to find and replace changed content can be significant. As many engineers have discovered from using CAD and product data management (PDM) tools that recognize the relationships between parts – known as “relational design” or “associativity” – some changes can be automated to reduce effort and increase the likelihood that all changes are made. In the future, publishing solutions that couple design reuse with automation may promise to revolutionize technical publishing.

Developing a 3D Publishing Strategy

While not every company is ready for a fully automated solution today, specific actions that survey participants for Aberdeen’s [Product Lifecycle Collaboration Benchmark Report](#) are currently taking to improve 3D publishing include:

- Reusing design data in downstream publishing (62%)
- Aligning creative and engineering teams (54%)
- Collapsing timeframe required to generate technical documentation (43%)

When developing a 3D publishing strategy, it is important to determine which downstream functions to improve and how they can best be helped. Automation? Change management? Higher quality documentation? Faster development of technical publications? Cost savings? Understanding your goals will help you select the best solution.

Major processes that should be considered include:

- **Capturing and reusing design data** – This entails reading and capturing CAD models to generate graphics for use in publication. Capturing the model can also include capturing the product structure or bill of material (BOM) to provide more detailed information on individual components in an assembly and their relationships. CAD models can be complex and can capture design information beyond what needs to be shared for downstream processes. They are also typically large files or combinations of files that are difficult to manage and communicate. Capturing the design also involves conversion that can reduce their level of detail (if required to protect intellectual property) and compress the file size.
- **Tailoring graphics for specific purposes** – CAD models, while simpler to review than 2D drawings, are still not ideally suited for downstream use. Viewing technology and graphical tools can tailor a model for specific purposes, such as exploded views to display assembly information. Graphical editing tools provide capabilities to communicate the information to the appropriate audience and allow for annotations.
- **Publishing in context** – Publishing requires more than graphics and, frequently, can involve multiple formats. Information may be communicated in printed form, within electronic documents such as MS Word or Adobe PDF, on the World Wide Web, or in other formats. Frequently, in fact, the same information may need to be reused for multiple media formats. Publishing can encompass incorporating all required elements and producing the final document in the desired format.
- **Maintaining over time** – Products change over time. To document and downstream deliverables over time, change management that tracks the association between the document and the underlying model can facilitate and expedite updates and document maintenance.

Enabling a 3D Publishing Strategy – The 3D Publishing Vendor Landscape

When developing a strategy, it is important to look beyond current needs. To enable a leading-edge 3D publishing strategy today may require a combination of solutions. Alternatively, less aggressive companies can identify their short-term needs and select vendors that can both meet those needs and have the promise of delivering the full vision over time. It is important to recognize is that few vendors, if any, meet all of the criteria in the decision framework above. Each company should develop a checklist of required capabilities for its solution and seek a vendor that can meet today's requirements and provide a vision and direction compatible with long term goals for 3D publishing, to support increased maturation of 3D publishing over time. The vendor checklist in this document can serve as input to a more in-depth checklist for reviewing 3D publishing solutions.

Several classes of vendors provide solutions that can play a part in a 3D publishing strategy. The first class of vendors specializes in 3D publication.

- **Adobe Systems** offers publishing software, including solutions acquired from **Macromedia** in 2005. In 2006 Adobe released Acrobat 3D, which allows companies to embed 3D, interactive graphics into Adobe PDF documents, enabling anyone with the free Adobe Reader to view 3D graphics.
- **Arbortext** is a solution that focuses on streamlining overall publishing processes. Acquired by PTC (www.ptc.com) in 2005, Arbortext provides capabilities to develop reusable components of content that can be dynamically assembled and published. PTC is currently enhancing Arbortext's 3D capabilities and integrating the solution with Windchill, PTC's content and process management solution.

- **Lattice3D** (www.lattice3d.com) specializes in leveraging existing 3D designs to create “3D aware” documents for a variety of functions, including design reviews and digital mockups, with a significant focus on downstream publishing. Lattice3D has spent significant time focusing on compression with its XVL format, which the company claims can capture designs in file sizes as little as 1% of the original size of the CAD model with no loss of accuracy.
- **ParallelGraphics** (www.parallelgraphics.com) allows organizations to reuse their existing 3D design (CAD) data to create user manuals and interactive 3D simulations. The company focuses on using visual product information to enable product maintenance and training processes.
- **QuadriSpace** (www.quadrispace.com) focuses on reusing 3D models with integrated page layout and authoring tools to create downstream documentation for engineering design review, manufacturing assembly instructions, procurement packages, customer support (via manuals and repair and maintenance instructions), and sales and marketing tools. Quadrispace has solutions for interactive 3D, 3D PDF, Web, and print publishing.
- **Right Hemisphere** (www.righthemisphere.com) focuses primarily on the aerospace, automotive, and discrete manufacturing companies. Its Product Graphics Management solution is intended to improve downstream process by making the right 3D information available in a large number of easy-to-access formats. As a key technology partner of Adobe, Right Hemisphere has focused on developing strong capabilities to automate the generation of 3D PDF documents.
- **Seemage** (www.seemage.com) offers capabilities in its Publisher product to create animations and technical illustrations based on CAD data, to provide a simple way to communicate designs to people that don't actively work in 3D tools. Seemage has a suite of solutions that also includes visualization and digital mockup capabilities.
- **nGrain** (www.ngrain.com) is a specialist in training for installation, maintenance, and repair. Targeting primarily the aerospace and defense industry, nGrain is focused on accelerating learning on complex equipment by incorporating 3D “knowledge objects.”

Vendor Checklist

- √ Can the solution capture designs from your current authoring tools, including multiple CAD systems if they are used in your business?.
- √ Does the solution enable modifying the visual representation of the design to match your needs, such as annotating and creating appropriate views such as exploded assemblies or sectioned drawings.
- √ Does the solution offer the ability to animate the design, if animation is beneficial to downstream processes?
- √ Is the solution capable of publishing information in the formats you require, potentially including web, document, and online formats?
- √ Does the solution provide automation of the documentation process, such as assembling predefined blocks of content?
- √ Does the solution offer the ability to identify and propagate design changes to associated documentation?

In addition to companies that focus on 3D publishing exclusively, visualization providers such as *Actify* with its Spinfire solution, Agile with its *Cimmetry Solutions*, *Proficiency* with its design translation and integration capabilities, and *Spicer* provide capabilities that can be used to enhance the reuse of CAD data in downstream functions without requiring non-engineers to license and use CAD software.

Larger PLM suite providers have taken notice of the 3D publishing opportunity as well, as evidenced by *UGS*' partnerships with Adobe and Microsoft and *Dassault Systèmes* investments in 3D XML.

Finally, infrastructure providers are recognizing the power of 3D, with *Adobe* launching Acrobat 3D and *Microsoft* incorporating significant 3D functionality into its next-generation operating system and its investments in 3D XML.

Related Research

[The Product Lifecycle Collaboration Benchmark Report](#); June 2006

[The Product Innovation Agenda Benchmark Report](#); September 2005

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