

best practices

FEBRUARY 2006

New Processes, Technologies to Leverage Intellectual Assets

By Daratech Research Staff

Much has been made of an improved economy in North America and Europe, yet manufacturing industries still lag: poor earnings, workforce reductions, dramatically reduced prices, and a merciless influx of foreign goods have become all too common. There is a creeping realization that a page has turned in North American manufacturing; that it is not an economic downturn that has affected the industry, but an evolution of global economics that will forever see emerging economies—particularly a hungry China—competing for North American manufacturing jobs.

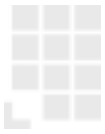
Manufacturers must also wrestle with global facilities and the challenges a distributed organization brings. These challenges include cultural, language, and reach barriers. Additionally, a global presence means that companies must stay on top of all intellectual property, export, safety and environmental regulations, which vary from country to country.

Mergers and acquisitions have become a common fixture upon the landscape, and along with the inherent cultural difficulties associated with combining companies, the glut of disparate systems only further complicates matters. Manufacturers must become lean and mean to stay competitive and must find new work processes to take advantage of what is otherwise a very hostile environment.

Manufacturers must become lean and mean to stay competitive ...

... must find new work processes ...

DISCLOSURE AND DISCLAIMER: RESEARCH FOR THIS PAPER WAS INDIRECTLY FUNDED BY ADOBE SYSTEMS INCORPORATED. The information in this publication is based on the most reliable information available to Daratech, Inc. However, the information in this publication was obtained from sources that Daratech, Inc. does not control, and unless otherwise indicated herein, it has not been verified or attested to. **WARNING TO INVESTORS: DARATECH'S OPINIONS AND FORECASTS ARE NOT INTENDED TO BE USED AS A BASIS FOR EQUITY INVESTMENT DECISIONS, AND THEREFORE MAY NOT HAVE BEEN CARRIED OUT AT THE LEVEL OF DUE DILIGENCE EXPECTED BY INVESTORS FROM INVESTMENT ADVISORS AND/OR STOCK ANALYSTS.** In furnishing this information, Daratech, Inc. and/or its officers, directors, employees in no way assume any part of the user's risks, do not guarantee its completeness, timeliness or accuracy, and shall not be liable for any loss or injury whatever resulting from use of or reliance on the information, or from omissions or negligence. Due to the sample size employed, user and supplier survey results reported in this publication may not be statistically significant. In reporting user survey results, the most extreme comments, both positive and negative, are disregarded. While Daratech, Inc. believes that comments published are representative of the views of typical users, subscribers are cautioned not to rely on them when forming a view of a company or its products. The information in this publication is not furnished in connection with any sale or offer to sell securities, or in connection with the solicitation of an offer to buy securities. Note also that Daratech, Inc. and/or its officers, directors, employees and/or customers may, from time to time, have long or short positions in securities of companies referred to herein, and may buy or sell such securities. Individual companies covered and analyzed by Daratech, Inc. may be clients of one or more Daratech, Inc. services. This publication is based on information available to the public. No representation is made that it is accurate or complete. No material provided to Daratech, Inc. in confidence covered by a nondisclosure agreement was used in preparing this publication. In the event of any error in the publication, the sole responsibility and liability of Daratech, Inc. will be to correct such errors in succeeding editions of the same publication. © 2006 DARATECH, Inc., 255 Bent Street, Cambridge, MA 02141-2001, USA, tel. (+1) 617.354.2339, fax (+1) 617.354.7822, e-mail daratech@daratech.com, www.daratech.com.



Many companies are fighting back with investment in new technologies that enable them to design and manufacture more efficiently.

Processes and work cultures have to capitalize and monetize innovation.

A manufacturing organization must be seen as one fluid entity rather than a collection of departments with individual agendas and incentives, and integrated solutions go a long way to fostering this new cultural climate.

Trim the fat but keep the muscle

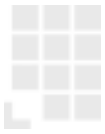
For years, companies have been cutting costs to catch up, and that remains a top priority. The temptation to continue cutting can be overwhelming, and in many cases is wholly necessary. But here danger lurks; cutting for short-term gain can become addictive and ultimately debilitating as the tendency to lay low financially can spill over into other areas, causing a corporate drain on big ideas and bold initiatives. Forward-thinking organizations set about improving their processes and IT infrastructure in the middle of the storm, so that they reemerge better conditioned to compete in this new environment. Today, more and more companies are taking this approach, investing in critical areas, and cutting where necessary; in other words, trimming the fat but keeping the muscle.

Many companies are fighting back with investment in new technologies that enable them to design and manufacture more efficiently. One such family of technologies is PLM, which stands for Product Lifecycle Management, and includes technologies as diverse as 2D CAD, 3D CAD, Product Data Management (PDM) and advanced analytical tools. In its simplest form, PLM allows manufacturers to create, manage, share, store and maintain product data in an integrated IT environment. PLM systems provide a backbone or infrastructure to support product design, manufacturing, maintenance and, ultimately, product retirement. It's no secret that all manufacturing companies are struggling with the same competitive pressures, regardless of the consumers they serve: the need to innovate more quickly, create more product variants than ever before, reduce cost to the absolute minimum and create IT infrastructures that foster collaboration with partners, suppliers, and customers. But a key component of PLM technologies is the collaboration infrastructure inherent in many PLM toolsets—crucial since collaboration was identified by over 75% of companies surveyed by Daratech as the most critical contributor to innovation.

How do companies innovate? Processes and work cultures have to evolve to capitalize and monetize innovation. A manufacturing organization must be seen as one fluid entity rather than a collection of departments with individual agendas and incentives, and integrated solutions go a long way to fostering this new cultural climate. In particular, PLM and a solution subset called MVP—short for mockup, visualization and 3D publishing—are enabling manufacturers to reconfigure their work processes so departments can more easily work together, and have access to better information. The more a company's personnel see the benefits of working across departments—more reliable information faster, more time to spend on high-value tasks—the faster an environment of shared goals is established, and the inter-company competition fades away.

Help on the way

Digital mockup, visualization and publishing technologies have been around for years, but these tools have just recently been receiving greater attention at manufacturing organizations and their suppliers around the world. This has much to do with the increased reliance upon 3D data and the rising popularity of PLM within global manufacturing industries. The PLM vision calls for the integration of disparate software sets to cut away process inefficiencies and streamline product creation processes. PLM is helping organizations bridge new work processes, reshaping not only the way people work, but also with whom they work. After all these years, the term "collaboration" actually means something because information can be shared and presented in a such a way that the data can be understood by engineers and non-engineers alike. This collaboration is opening new doors and getting marketing, sales, manufacturing, and other departments into the game much earlier, leading to more effective go-to-market campaigns, a better equipped sales staff, and prepared-in-advance manufacturing facilities.



PLM ... has heightened the need for and increased the benefits that digital mockup, 3D visualization and publishing can offer the manufacturing industry.

MVP solutions have emerged as potent weapons ...

... to reduce waste and inefficiency for all parties involved in the product creation process.

MVP promotes collaborative work processes realignment that enables employees to work with up-to-the-minute data and spend more time on high value tasks by granting stakeholders access to only relevant information.

This is where MVP can really make a difference; its application is broad and its potential is limitless. Digital mockup is generally targeted at CAD users to help them deal with large assemblies as well as complete products, while others help CAD engineers to design parts in the context of where they will be used. Still other digital mockup solutions are targeted at production people for designing assembly processes or to the people who design packaging. The visualization component is designed to allow users to easily send 3D information over the Web, which can be very beneficial when collaborating with distributed team members, suppliers, foreign offices, or when purchasing parts. 3D publishing applications, often used in the marketing and advertising domain, are ideal for brochure production, part catalogs, or TV advertising because of the ability to create photorealistic images.

The proprietors of PLM have long talked about its magical tentacles reaching outside the engineering department into other areas of the business—into sales, marketing, the shop floor, purchasing, maintenance and support. MVP allows for such movement by making data available to non-CAD literate departments and personnel in an understandable and usable format. And with security a constant concern, today's MVP technologies permit the viewer to see all that the viewer needs to see and no more.

MVP & PLM

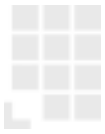
PLM and its overarchingly broad vision of managing and correlating product information over the entire lifecycle of a product has heightened the need for and increased the benefits that digital mockup, 3D visualization and publishing can offer the manufacturing industry. 80% of a product's cost is built-in during the first 10% of the product development cycle because so many important decisions are made early on. MVP technologies give participants more meaningful access to relevant and detailed information earlier in the process.

Of course, MVP goes hand in hand with PLM, but our research has shown that it can also be deployed as point solutions with great ROI potential. MVP is an area generally perceived as a technology in support of PLM, and to a great extent it is. However, Daratech's research has shown that it is much more; MVP in its own right monetizes innovation, improves productivity, allows key, scarce engineering resources to do more, accelerates time-to-market, reduces rework and improves quality.

Working out the technology kinks

With cost cutting still a top priority across manufacturing industry, MVP solutions have emerged as potent weapons to reduce waste and inefficiency for all parties involved in the product creation process. MVP promotes collaborative work processes realignment that enables employees to work with up-to-the-minute data and spend more time on high value tasks by granting stakeholders access to only relevant information. Design, analysis, purchasing, supply chain partners, sales, marketing, manufacturing, and support staff—all receive only the data applicable to the job at hand.

You may ask: "Who is driving the development of this innovative technology?" Surprisingly, the answer is that a number of small technology vendors, who initially built solutions for leading manufacturers, are now looking to bring their solutions to a broader market. In so doing, they are challenging a number of larger, more established providers by bringing to market a sophisticated solution that is looking for applications.



Maintaining accurate and up-to-date technical documentation ...

... [is] a "daunting" challenge because a change to a single part of an airplane can often affect hundreds, if not thousands, of downstream documents such as material requests, repair manuals and regulatory filings.

Management gurus and case study after case study suggest that involving many different functions in the product design process leads to better designs, faster and more reliably.

Where might this technology be applied to solve business problems? Maintaining accurate and up-to-date technical documentation, for example, could be kindly categorized as a "daunting" challenge because a change to a single part of an airplane can often affect hundreds, if not thousands, of downstream documents such as material requests, repair manuals and regulatory filings. This is often compounded by the fact that, in many companies, this documentation is derived from some in 2D hand-drafted material as well as drawings generated from CAD models. If this design is under revision control in a PDM, for example, it should be possible to log the change, spawn a process that notifies the documentation department of the need for an update, forward a representation in the appropriate format and, in a perfect world, even add the representation into a database of pending updates. Complex problem, complex IT solution—but doable, given what's out there today.

Manufacturers are searching for MVP solutions that enable:

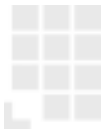
- mock-ups of large, complex assemblies such as an entire car or airplane—sometimes the entire design has to be viewed at once and a simplification will not suffice
- representations of such a mock-up in a highly compressed, yet highly accurate, digital model
- manipulation of these mock-ups on standard laptops so that customer service, repair and other non-CAD audiences can be involved in design discussions in an economical fashion
- automated publishing that can quickly create and distribute 3D-enabled documents across the entire supply chain
- 3D models that are linked by graphics management software that integrates, automates, and manages the images across the supply chain. As images change, every instance is automatically updated
- creation of sophisticated mock-ups and simulations to enhance the effectiveness of customer presentations, advertising and other media
- Web-ready content that can be made available to customers, partners, service personnel, and others for increased self-service.

Daratech research shows that, although MVP technology remains promising, cultural barriers have slowed adoption, as have IT challenges that have diluted its value proposition.

Resolving cultural issues

In many organizations, functional roles like marketing, design and manufacturing remain siloed, which can result in rigidly defined work processes. But management gurus and case study after case study suggest that involving many different functions in the product design process leads to better designs, faster and more reliably. MVP is a technology specifically suited to this type of process; successfully selling MVP requires that vendors and advocates target high level decision-makers that have the clout to influence organizational change and can look beyond the impact on each individual silo.

MVP can have a positive impact on organizational efficiency, especially if the tools used are open and provide an accessible user interface. Imagine the impact of a product design review that includes the ultimate customer, production/manufacturing, partner organizations, marketing, sales, after-sales support and technical publications—all working together to ensure that the design meets the buyers' needs at a cost that will allow the enterprise to realize the desired level of profitability and with maintenance in mind.



A design, begun with the concept of inclusion in downstream deliverables, will be significantly more efficient for all stakeholders.

Forward-thinking companies around the world and in many industries have recognized the benefits of using MVP tools as part of a comprehensive “digital design” vision.

But such a collaboration network requires that companies examine their needs very carefully. Who will be involved in these collaboration sessions? Who will have final authority over which aspects? What skill sets do they bring to the review? What do they need to learn to interact with the digital prototype? How will access to information be controlled so that the appropriate people have access only to that information they need in order to perform their specific tasks?

These questions do not have a universal answer, as each organization must grapple with these issues on its own. However, it is safe to say that a design, begun with the concept of inclusion in downstream deliverables, will be significantly more efficient for all stakeholders.

But what about protecting IP?

It's fairly intuitive that a digital prototype, accessible by many different skill sets, dramatically improves communication. Knowing this, many companies have made managing and leveraging intellectual property a primary goal. But for most, this means building a digital moat around their IP, protecting it from all real and imagined threats. Designs today, after all, include far more information than ever before—history trees, features, assembly information, tool paths, analytical results—and manufacturers are right to be worried about collaborating with partners who may be halfway around the world.

MVP tools on the market today are specifically designed to encrypt design information and other forms of intellectual property to protect the originator. Other tools (security servers, for example) exist today to help prevent unauthorized access to and use of IP, but the real goal is using these technologies to open that protective barrier just enough to allow the right degree of openness for all participants to have exactly what they need and no more.

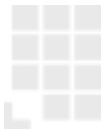
So, is MVP right for you?

Forward-thinking companies around the world and in many industries have recognized the benefits of using MVP tools as part of a comprehensive “digital design” vision. How can you apply the lessons learned by these companies?

The first step is to audit your current processes to determine if they meet your organization's current needs. Often, processes grow over time but do not represent the best an organization can do today. For example, how does your technical publications organization gather its inputs? Do they redraw designs for which CAD models are available? What do they do if a part is changed—is that somehow communicated to tech pubs so that they can update the correct training or service manuals? Does your design team build unneeded prototypes to communicate with other parts of the team?

Examine your current data management strategy. Can you be certain that any given manual or marketing piece represents the current, as-built design?

Look at your security protocols. Are you emailing complete CAD models? Remember that a legal infrastructure solution or relying upon a contract is a remedy only once a design has made it into the wrong hands—it's far better to prevent a possible problem than to use the courts after the fact.



Maximizing the use of MVP technologies requires IT changes, work process changes, and a careful examination of a company's IP protection strategy.

Once the current situation is understood, design optimum processes that could be in place in a year or two—keeping in mind:

- Anticipated product plans and their timeframes. Introducing new designs and process changes can be difficult if a product is in its late design changes; implementing MVP tools and creating processes to leverage these tools may be easier on new projects.
- If you embark upon an MVP implementation, start with a relatively simple project or a small set of collaboration partners to gain expertise and prove value.
- Try a design review with atypical participants. Their input will be invaluable.
- MVP tools are likely to yield the greatest return on investment if the surrounding design and operations work processes are reconfigured to take advantage of the data now available to new constituencies.
- Tie all process redesign to meeting business goals. The most advanced technologies will not succeed without a solid IT infrastructure that presents accurate information when it's needed, where it's needed—and, indeed, companies that cannot claim this will no longer be in business in a couple of years.
- Consider how your company goes about protecting its intellectual property. Avoid the risk of exposing trade secrets and other crown jewels by using tools and defining processes to ensure that critical information is encrypted before it is released, that only trusted partners have access to the full design data, and that all others have only what they need to do their jobs.
- Finally, examine investments from the perspective of a product's total lifecycle. The silos within many manufacturing organizations prevent this overarching view and compel engineering to lower the total cost of design, manufacturing to produce as cheaply as possible, etc. Manufacturers should consider the costs and benefits of having digital design available to many stakeholders—even if their creation may initially increase costs in the design group.

Manufacturers' gains from leveraging 2D and 3D assets for use in collaboration during the design process and afterwards, including downstream processes associated with the product, can be massive. But maximizing the use of MVP technologies requires IT changes, work process changes, and a careful examination of a company's IP protection strategy. The unrelentingly difficult manufacturing economy, however, requires companies to make these changes in order to stay competitive.