

The Future of Automotive Design & Development: 3D for All

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ABSTRACT

For over 20 years, automotive manufacturers have been harnessing the power of 3D to help create, optimize and produce great vehicles. Product Lifecycle Management (PLM) capabilities such as concurrent development, seamless integration, simultaneous engineering, single source database, and real-time visibility have long been capable within the automotive development process. However, the reality is that these tools have existed for a select few within a corporation, and have never been pervasive to every person involved in a product's development process.

Today, there are certain market drivers requiring more from PLM technology. This includes the fact that companies must drive innovation to survive in today's increasingly competitive and global auto industry. The next generation of 3D PLM tools, referred to as PLM 2.0 can bring real-time, global collaboration to life with features such as a single PLM platform for Intellectual Property (IP) management (one database and one server), and the open Server-Oriented Architecture (SOA) development platform. With only a web connection, product authoring and collaboration are enabled for real time, concurrent work, across multiple remote locations all in a 3D lifelike environment.

This presentation will point out how by expanding 3D PLM beyond engineering and manufacturing to include everyone who has a role in the life of a vehicle from business users to end consumers, vehicles will be developed in a shorter time frame, and better-suited to the public desires, with improvements made along the whole product development process.

INTRODUCTION

With the intense competition in today's global market place in addition to recent economic events, the auto industry is under extreme duress to improve the efficiency and effectiveness of the way it designs and builds vehicles. Whereas North America, Western Europe and Japan accounted for nearly 90 percent of global production earlier in the decade, these are mature markets that have clearly experienced over-capacity.¹ China is now the worlds' third largest producer of cars², bypassing the United States. Despite the current economic crisis, growth opportunities for vehicle production in emerging markets such as Latin America, India, Russia, and China is still expected to grow.

All of this makes the competition for the North American vehicle buyer even more fierce. Although this market has a large number of automotive styles to choose from, many seem to be similar in looks, function and performance. Successes of cars like the Chrysler PT Cruiser and Chevrolet HHR will continue to fragment the market, yet provide OEMs the ability to differentiate themselves in order to gain customer loyalty and market share. With tightened credit markets, buyers will be much more select in their new vehicle purchase decisions. The bottom line is that vehicle manufacturers must deliver what the consumer wants, when and where they want it, at a price point they are willing to pay.

Global product development strategies are implemented by every major vehicle manufacturer with the Tier suppliers following suit. Work can be performed around the clock to, supposedly, reduce product development time. However, globalization comes with its own set of challenges for manufacturers, including differing compliance requirements, materials availability and cultural issues that affect vehicle styling and features.

Expanding the number of partners involved, especially when they speak a different language, brings increased risk of miscommunication. Meeting the needs of vastly different consumer markets requires the design and production of additional vehicle styles while ensuring product quality and regulatory compliance. Additionally, design and production facilities are spread across the globe, requiring a central system of consistent and current information. Everyone must be working from the same page.

These global product development strategies have been greatly enabled by the deployment of modern computer-aided design, manufacturing, testing and simulation technologies, helping OEMs gain both financial and operational efficiencies. By employing integrated CAD/CAM/CAE tools across the entire product lifecycle, companies can better automate, manage and collaborate. This leads to increased innovation in creative product design as well as efficiencies in manufacturing considerations.

As globalization of the automotive industry continues, global centers of excellence are developing, making the standardization and sharing of disparate, yet related information even more critical. In order to innovate efficiently, companies must maximize the use of their intellectual assets that are spread across the world to share the knowledge base and intellectual properties, spurring frequent, global, ad-hoc collaboration, leading to innovation.

While collaborative innovation is a critical factor in maintaining competitiveness, it must be achieved within an environment where overall product related costs must be reduced across development, production, and service in order to sustain a company's operational excellence.

Achieving and sustaining business success requires the ability to increase the pace of innovation and new product development. To do so, companies must open communication channels, standardize processes and offer technologies that foster a continuous improvement environment. The challenge is to have everyone -- from planners, designers, and analysts to manufacturers, service personnel, and importantly, the consumer, to be able to see and participate effectively in the complete product lifecycle.

MAIN SECTION

THE ROLE OF PRODUCT LIFECYCLE MANAGEMENT (PLM) -- Product Lifecycle Management (PLM) is defined as a strategic business approach that applies a consistent set of business solutions support the collaborative creation, management, dissemination and use of product definition information. It also supports the extended enterprise (customers, design and supply partners) and spans the concept of end of life for a product, integrating people, processes, business systems and information.² The goal is to capture every aspect of the automotive development cycle in a way that

can automatically convey, not only how design modifications affect manufacturing planning but also, how changes in materials cost and labor, differing environmental regulations, etc., can affect the delivery, maintenance and cost of a vehicle.

Whereas early implementations of PLM were typically customized programs of functionally-focused applications to address specific issues (primarily CAD file management), most current PLM includes management of all product-related information from design to manufacturing deployment to maintenance to compliance requirements. PLM solutions link information from many different authoring tools and other systems to the developing product configuration. However, even with this level of sophistication, both PLM and PDM (Product Data Management) solutions are typically document-focused solutions delivering a CAD part, a Word file or Excel spreadsheet... something that is textually-based. (Fig.#1) This can be a potential problem in a global workspace.

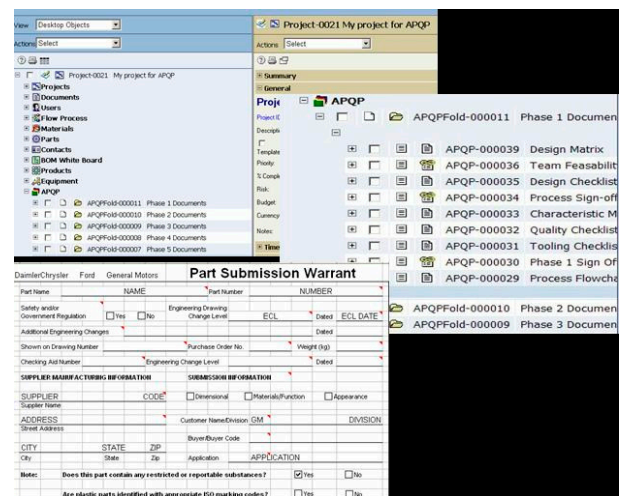


Fig. 1 Quality Process documentation

Also, the idea of a single source database from which all other data throughout the lifecycle process is based, has been elusive. There has always been an issue of moving this data from one application into another application. Although a successful strategy, there is a time factor involved as well as a potential loss of data richness, depending upon the various applications.

As the progress in adopting 3D PLM technologies has expanded throughout the automotive industry and into the supply base, it has become increasingly important that this product, process and resource information be made easily accessible to a wider audience of users -- both externally to vendors and internally to purchasing agents, executives, field service technicians, or manufacturing personnel. This demand has put pressure on PLM solution suppliers to develop solutions that allow non-engineers to also be part of the collaborative product development process. Additionally, to involve this extended audience in the product development process would require a simpler, more intuitive user interface.

A first step in this process was the development of lightweight XML-based CAD files that enabled users to share accurate 3D data quickly and easily, via email that then allowed the opening programs in typical Microsoft applications such as Word or Excel. This was, and still is, an excellent communication tool to involve purchasing and executives in the process, but it is not a real-time collaborative tool.

Dassault Systèmes then leveraged that technology to develop 3D Live, which not only had a new, simpler intuitive interface, but was the first solution to allow companies to conceptualize, develop and deliver products in a shared environment over the Web, communicating with partners in real-time.

Studies have found that implementation of an integrated PLM solution can significantly improve a company's performance to affect these types of savings:

- Data searching reduced by 20-60%
- BOM accuracy improved by 40%
- Entering and rekeying of data reduced by 75%
- Cost of launch delay positively impacted by 30%
- Product development time easily decreased by 60-70%.

Results like these would make any CEO take notice. However, it is a known fact that disparate IT systems increase the cost of business application ownership. This fact has led many OEMs to go to a single CAD or ERP system, yet with PLM solution process there are many, many niche players.

For a successful PLM strategy implementation, it is necessary for these solutions to accommodate a wide range of applications -- not only those developed by the PLM solution partners, but from the existing applications within the enterprise such as ERP or Financial solutions. In addition, thousands of legacy applications are in widespread use, which has been a key reason for corporations to not implement and streamline solutions across the corporation -- the integration has just been too difficult.

CURRENT LEVELS OF COLLABORATION -- Various types of collaborative processes and tools have long existed within the automotive industry, from simultaneous engineering to concurrent development, single source database, seamless integration, and real-time visibility. These are all enabled by a product/process and resource data hub, where all the knowledge about the product is produced and maintained including the Engineering BOM, Manufacturing BOM, manufacturing process, product routings, tooling requirements, sourcing information, etc. These various engineering data are all interconnected, so that the impact of a change in one data type is visible in the other data processes. This allows the change to be easily examined and propagated, leveraging relational design and manufacturing capability.

All data sources are integrated but, true collaboration has had to be structured and scheduled -- such as in a webex or video conference, which works well when you want efficiency, control and accuracy.

Also, the data involved in the product development process is limited to a select few within the corporation. As mentioned earlier, delivery formats are typically text-based, resulting in potential language issues in a global environment. The idea of flexible, unstructured or 'ad hoc' collaboration has not been possible, and the idea of making data available throughout the enterprise would be very difficult given the limitations of bandwidth available to email large files of information.

Additionally, the idea of real-time data has not truly been deliverable. In past platforms, every time a file is worked upon, an engineering change order must be recorded. Files are checked out to be worked on, changes made and then files checked back into the PDM. The system then checks all files that have been changed and updates accordingly. But, while the design engineer is working on File A, the manufacturing engineer has no way to know that File A is being changed. So, he is still going forward with his tooling based upon the last configuration.

PLM 2.0: UNIFIED LIVE COLLABORATION -- We have all become comfortable with the idea of Web 2.0, where users can do much more than just retrieve information from the Internet. They can run software applications entirely through a browser and own the data on a Web 2.0 site, exercising control over that data. These sites may have an "Architecture of participation" that encourages users to add value to the application as they use it. User-developed content and online applications provide a significant leap in interactivity and power beyond the initial wave of Web content.

The same concept is being applied to PLM, with the idea of PLM 2.0 or as Dassault Systèmes refers to it, "PLM online for all." With the implementation of Dassault Systèmes V6 platform, PLM 2.0 becomes a reality. V6 is an enterprise-level platform that provides a single environment in which product-related information created in both DS and non-DS applications can be consolidated and collaboratively used by participants from all business functions and areas of the extended enterprise that are involved in the product lifecycle.

What truly makes this platform different from previous generations, is that in this environment, people can work concurrently in real time via a simple Web connection relying upon a single server.

The V6 (SOA) enables global deployment while centralizing the meta data in a single master site repository and distributing the file within the different remote locations. This centralized dataset is accessible to all users, regardless of location. The different distant sites use a local file server to load large representation files, eliminating time consuming network transmissions.