Transforming PLM for the Automotive Industry

Beyond the Status Quo

TRANSFORMING PLM FOR THE AUTOMOTIVE INDUSTRY

BEYOND THE STATUS QUO

Today's automotive companies are challenged to design and develop more complex vehicles faster than ever in an increasingly competitive global environment.

Yet, despite years of investment, existing PLM systems are struggling to meet the challenge due to their inability to manage electronics, software and the complicated interfaces with manufacturing and suppliers. Automotive OEMs and tier suppliers relying on yesterday's PLM to meet today's realities risk their future.

This paper provides an overview of a new platform approach to enterprise PLM that is as innovative as the vehicles it helps create.

"The connected car fuels today's automotive innovation. Software systems now contribute more than 90 percent of innovations and new features in today's vehicle development process."

PricewaterhouseCoopers 2015

UNPRECEDENTED CHALLENGES

Auto makers are feeling the pressure to deliver technology-driven vehicles by globally dispersed teams in timelines that tighten for each new model. Moreover, they face a mandate to reduce costs and increase margins for sustained profitability.

Increasing market demand and aggressive CAFE requirements are propelling electrification for hybrid and battery-powered vehicles along with industry light-weighting initiatives.

These trends, combined with the push for "connected car" technologies and the rapid emergence of autonomous vehicles, are creating dynamic conditions that place unprecedented challenges on the product development and manufacturing teams of OEMs and their suppliers.

TECHNOLOGY DISRUPTIONS

For today's global automotive enterprise, the complexity of automotive product design and development continues to increase as advances in electrification, software and connectivity become integral to innovation. In fact, electronic systems contribute 90% of innovations and new features in vehicles, according to PwC's Strategy& 2015 study of auto industry trends.

Car companies want to embrace disruptive technologies. Industry research from Thompson Reuters shows that traditional automotive manufacturers have surpassed Silicon Valley upstarts in driverless car patents designed to advance the autonomy revolution.

TIGHTENING CYCLES

Against the backdrop of dramatic changes in vehicle technology, vehicle development cycle time is being compressed more now than at any time in the history of the industry. The typical eight-year vehicle development cycle is a thing of the past. Competitive pressures, regulatory requirements and consumer demand are all working together to drive down the product development cycle from the historical seven- or eight-year timeframe to a now accelerated four-year or less cycle for new passenger vehicles. Compounding the challenge, moderate refresh / mid-cycle enhancements are now occurring every two to three years, and are expected to tighten even further.

AUTOMOTIVE DEVELOPMENT CYCLES HAVE TIGHTENED FROM THE ONCE TYPICAL SEVEN- OR EIGHT-YEAR CYCLE TO A NOW ACCELERATED FOUR-YEAR OR LESS CYCLE FOR NEW PASSENGER VEHICLES.

Adding to this is the accelerated pace of new product launches. According to IHS Automotive, from 2016 through 2018 OEMs will launch a combined 434 vehicles into global markets, nearly 100 more launches than the previous three years' total.

Players throughout the automotive value chain recognize that the combination of more complex systems and shrinking vehicle development cycles are causing product development process breakdowns across the extended enterprise. Without greater process agility, auto makers jeopardize competitiveness in the mid- to long-term market.

GLOBAL COMPLEXITY

The globalization trend continues to further complicate the vehicle development equation. Complexity arises from ever greater regional and national regulations as well as constantly shifting international supply chain partnerships and collaborations.

The byzantine maze of global vehicle fuel economy and emissions regulations will be eclipsed by the oncoming networking, security and connected / autonomous vehicle safety compliance requirements that governments are sure to impose on vehicle manufacturers in the near future.

Meanwhile, mergers and acquisitions in the tier supplier landscape are creating new competitors where partners once existed. This continued consolidation complicates the management of design processes and the protection of critical intellectual property (IP).

To deal effectively with these unfolding global complexities, product development processes must be capable of morphing and adapting at a moment's notice. The ability to transform processes worldwide at the speed of strategy is paramount.

DIGITAL TRANSFORMATION

To thrive — and even survive — as conditions accelerate and complexity increases in this new reality, automotive companies are recognizing the need to undertake a digital transformation to better manage the processes that represent the "business of engineering" through the lifecycle.

Business of engineering, or BoE, translates to figuring out new ways to automate collaboration across disciplines to reduce time to market; increase new product throughput while improving product quality and safety; and ensure complex design and production processes are managed as efficiently as possible. No small matter.

DIGITAL TWIN & DIGITAL THREAD

Given the nature of technological change facing automotive companies, there is no longer room for data silos in the product lifecycle. Companies want to be more systems engineering-oriented with the management of mechanical, electrical, and software all seamlessly integrated to create a unified "digital twin" of product data at the system-level.

With electronics and software now accounting for an ever larger portion of vehicle capabilities, there's a clear recognition that the digital twin should reflect all of the various changes that occur throughout the lifecycle over time, from concept through product development, manufacturing and on through service – representing a continuous "digital thread."

The digital twin with its related digital thread are recognized as essential to tomorrow's intelligent, connected vehicles for interpreting IoT data that flows back from the car. They also provide the compatibility context necessary for software updates to occur without potential safety, environmental or performance issues.

The way global automotive companies will win moving forward is to undertake a digital transformation to achieve a systems approach without tearing out all of the existing enterprise systems, such as PLM, PDM, ALM and others.

RETHINKING TRADITIONAL APPROACHES

Over the past 25 years, automotive companies have made real advancements in mechanical design, electrical engineering and software development with the help of information technology. Each discipline has adopted specialized automation technology — often focused on the "science of engineering," such as 3D CAD modeling, simulation, programming, etc. — that improves productivity within that functional discipline.

These MCAD, ECAD and other specialist applications and their related management systems (i.e. PLM, PDM and ALM) have created isolated, functional islands of proprietary data. They have been implemented at great effort and expense and optimized for the narrow band of specialized professionals who use them, with little or no consideration for interoperability to support strategic processes or ease-of-use for others.

None of these traditional, monolithic systems were ever designed for broad cross-discipline or cross-functional use, nor were they set up to be constantly changed and upgraded as market requirements dictate. This is evidenced in both their hard-coded technology architectures and expensive licensing schemes.

Most global automotive companies find themselves in the same situation: constrained by legacy system silos that are difficult and costly to adapt, integrate and upgrade.

In many cases the vision of a digital transformation necessary to compete on next generation vehicles seems more like a rip-and-replace nightmare. However, new approaches are emerging, just in time.

TOMORROW'S PLM PLATFORM

Forward-thinking automotive manufacturers are discovering a new platform approach to automating the processes that support the business of engineering enterprise-wide. In an approach that departs greatly from the status quo, they use a PLM platform that is as innovative as the next-generation products it helps create.

PLM PLATFORM IN ACTION

PLM PLATFORM HELPS GLOBAL AUTOMOTIVE SUPPLIER WORK FASTER AND MORE EFFECTIVELY THROUGHOUT THE ENTERPRISE

Magna Powertrain's GETRAG division is the world's largest supplier of transmission systems for passenger cars and commercial vehicles. The company illustrates the benefits of the new platform approach to PLM.

In addition to the sophisticated mechanical design involved in today's modern transmissions systems, such as a dual clutch transmission system, products involve a substantial amount of software and electronics. To develop these increasingly complex products, departments with very different working styles, practices, processes and applications must to work together effectively. Recognizing the need for multi-discipline synchronization, the company extended Aras to support the Application Lifecycle Management (ALM) of the embedded software and firmware for the transmissions. Functionality including software release planning, bug tracking, issue management, test planning and management, task tracking and reporting were automated and part of the overall enterprise PLM backbone. Agile methodologies combined with competitive practices in a multi-site development environment required a sophisticated data model. Today, the Aras platform is the central key to coordinating the overall development process.

This new approach helps the company work faster and more effectively throughout the enterprise. Speed of implementation was also key. "A lengthy process was out of the question for us," explained Rolf Huesemann, the PLM project manager. "Our business requirements must be implemented in weeks, not years. Our business strategy can't wait for an extended IT process that results in a 'big bang' systems implementation. That's why we started with small, high impact projects based on the Aras platform to support specific processes that are critical to our competitiveness."

Rather than force-fit the business into a single PLM system, these companies wanted a resilient PLM platform that openly integrates with existing systems and easily adapts to align with their unique business processes to create a true PLM backbone. This makes implementation easier and minimizes disruptions to their organization.

Because of the adaptability of newer, more modern technology, manufacturers find that it's a PLM platform designed to deliver significant, long-term ownership benefits. Upgrades are straightforward and easy, regardless of the amount of customization an application has undergone.

The breakthrough that delivers platform resilience is a unique model-based, service-oriented architecture (model-based SOA) technology that is purpose-built to upgrade easily while delivering optimal flexibility and scalability.

These automotive leaders wanted to:

- Avoid the risk and disruption by using an overlay approach instead of tearing out existing PLM/PDM/ALM systems
- Enable cross-discipline collaboration and cross-functional processes
- Adapt processes to respond more quickly to changing conditions
- Upgrade more frequently to stay current with advancing technology
- Reduce ownership costs

BENEFITS OF THE PLM PLATFORM

▸ **Fully Integrating Product Development**

With increasing product complexity, automotive product development is no longer just about mechanical components. Manufacturers need a different approach for managing the design, development and release of mechanical, electronics, software and hardware components.

Today's winning automotive manufacturers gain true value from a PLM platform and a complete set of capabilities for multi-disciplinary product development. This means that solutions for EBOMs and MBOMs, change management, requirements and configuration management, technical documents, application lifecycle management (ALM) and more can all be linked together across electrical, mechanical and software/firmware disciplines.

The PLM platform is built with Aras to enable **all users** to have access to the correct, most current product information, no matter the department from which the data originated.

▶ **Enabling Global Collaboration**

For today's automotive manufacturer, globalization means managing diverse regional requirements, multiple approved manufacturer lists (AML) and varying local supply chain partners – not to mention development teams dispersed around the world. The challenge is to provide a secure, connected and collaborative environment in product development that works. A platform approach to PLM helps companies move away from complicated email trails and manual communications. Using a platform to integrate multiple existing PDM and ALM systems brings global teams in all disciplines together to create tomorrow's innovative products.

Real-time collaboration is critical. Users throughout the extended enterprise should have the ability to easily view and comment on all types of product information with security, control, and context. In a global product development environment, companies gain tremendous benefit by having the ability to easily view and graphically comment on file content, including 3D models, drawings, schematics, layouts, Office documents and other parts of the Digital Twin.

Multi-language support should be seamless and include both the solution screens and all end user data. With the PLM platform approach, everyone from engineering, operations, quality and the supply chain has a way to communicate about products more effectively, make decisions quickly, and solve problems faster.

▶ **Attaining The Digital Twin & Digital Thread**

With the automotive industry trend toward smart, connected products comes a shift in the way systems engineering, configuration management, design validation and product compliance are achieved.

THE PLM PLATFORM APPROACH OFFERS AUTOMOTIVE COMPANIES A BETTER WAY TO MANAGE COMBINED MECHANICAL, SOFTWARE AND ELECTRONICS SYSTEMS ACROSS THE LIFECYCLE.

To account for these changing products, the industry is working toward a digital twin with a complete digital thread of synchronized information that remains up-to-date across departments and throughout the product lifecycle for traceability.

To help create tomorrow's new products, the PLM platform must adapt over time to this changing environment to efficiently manage enterprise bill of materials (BOM), embedded software, supply chain processes, quality and more, extending from the conceptual design phase through on-going dealer maintenance.

With this in mind, today's automotive companies are turning to this new platform approach, because it spans the entire product lifecycle. With integrations for

PDM, ALM, ECAD, MCAD, ERP and more, today's new PLM platform enables a true digital twin with a digital thread that is constructed and maintained over time. The digital thread stays up-to-date throughout the product lifecycle enabling better traceability for continuous updates to vehicle software as well as providing better information in the event of a recall.

TOWARD THE NEXT GENERATION

This paper touched upon some of the key elements of the new platform approach to PLM. This approach helps automotive companies drive their digital transformation and achieve their long-sought PLM visions to fully support the business of engineering for the design, manufacture and service of complex, connected vehicles. The platform approach also enables efficient collaboration to optimize resources, minimize costly errors, and reduce development cycles, leading to better products and increased profitability.

ABOUT ARAS

Aras® offers the best Product Lifecycle Management (PLM) software for global businesses with complex products and processes. Advanced PLM platform technology makes Aras more scalable, flexible and resilient for the world's largest organizations, and a full set of applications provide complete functionality for companies of all sizes.

By rethinking the way PLM is designed, Aras has taken a fundamentally different approach with a focus on the Business of Engineering. Aras solutions support processes for global product development, systems engineering, multi-site manufacturing, supply chain, quality and more.

Companies running Aras include Airbus, Boeing, Bombardier, GE, Hitachi, Honda, Kawasaki, Magna, Microsoft, Motorola, Nissan, TOSHIBA, Xerox, the US Army and hundreds of others worldwide.

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