

## Strategic initiatives build Global Innovation Networks in the automotive industry

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white paper



- ▶ Automotive companies keep pace with global opportunities through strategic investments that transform their businesses and the process of innovation.

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## **Innovation networks open global opportunities and meet local requirements**

*Tremendous changes in the automotive business environment, precipitated largely by globalization, have created significant opportunities for automotive companies, but also have put pressure on them to enhance quality, improve styling, increase organizational efficiencies and drive innovative features into their products in an effort to attract customers and expand into new markets. Automotive suppliers interviewed in a study by the Center for Automotive Research indicate that developing engineering, expertise and intellectual property (IP) unique to their firm is a critical factor in long-term success. [Changing business dynamics in the automotive supplier sector, CAR 2005]*

*The challenge for automotive OEMs and suppliers is to accelerate product and process innovation while not adding costs. Leading companies are making this happen through Global Innovation Networks. These networks are helping them reach beyond traditional sources of invention to increase collaboration with their business partners and create a sustainable competitive advantage. To tap into the steady flow of ideas needed to stay competitive, it is clear that companies cannot remain focused on internal sources of innovation. Statistics show that the OEM's share of value added is decreasing while value contributed by suppliers is going up, underscoring their need to collaborate on the best new ideas. [Mercer Added Value Model 2015]*

*"A company can't outgrow its competitors unless it can out-innovate them."*

*– Harvard Business Review*

*"Over the next six years... more than 70% of today's products... will be obsolete..."*

*– Mastering Innovation, Deloitte Research*

*"... 90% of the executives said that generating organic growth through innovation is essential for success."*

*– The Boston Consulting Group, Innovation 2005*

*Companies also must seize opportunities that exist in the global marketplace by taking the offensive through IT initiatives that help them leverage existing resources and increase innovation. For example, to capitalize on business opportunities in China, India and Eastern Europe, automotive companies must adopt standardized manufacturing processes and globalize their supply networks. Companies also need to quickly become competent at building the latest software and electronics into vehicles. These are just two examples of opportunities that require tools to manage increasing levels of complexity.*

*As reports increase about significant gains made by companies investing in process improvement initiatives, more and more companies are making the decision to adopt these in cost-effective stages. For example, successes made possible by the re-use of parts across multiple vehicles have encouraged many companies to start implementing product lifecycle management, or PLM, with the capability to help identify opportunities for re-use, and to develop common components, products and processes.*

The automotive industry continues to grow. It accounts for 15 percent of the world's gross domestic product. Global vehicle production is forecast to grow by 10 million units (17%) between late 2005 and 2010 as emerging markets continue their rapid expansion [Executive perspective, PwC Autofacts, 2005]. However, competition for existing market share as well as for emerging market demand is and will continue to be very intense.

Automakers that have advantages in labor costs are entering the market, forcing long-standing companies to rethink where and how they design, engineer and produce their vehicles. Companies are being forced to set up technical and manufacturing operations in the markets they serve. This presents a whole new set of challenges as automotive companies strive to operate efficiently and maintain quality levels even though their operations are globally dispersed.

In addition, suppliers are assuming a growing role in the design and engineering of components, especially in powertrain, body structures and chassis areas. These trends underscore the need for better collaboration among OEMs and suppliers as they leverage product and process innovations that arise across the value chain.

### **Globalization requires lean, flexible processes across the value chain**

Companies that have met success on the global stage have developed lean, flexible processes that enable them to strive towards building any product on any production line in the world in response to local market demands. The days of huge runs on one platform with three minor variants in one dedicated plant are over; those companies that don't have truly flexible plants will not survive. By proactively employing best practices and modular or common components, companies like General Motors, Lear Corporation and Indiana Mills & Manufacturing (IMMI) leverage proven product designs to create variants that have been pre-validated for production. This approach also enables them to respond quickly to engineering changes that would otherwise set back the delivery timetable significantly.

### **Fragmented knowledge slows innovation and scheduling**

Efforts to expand and apply hard-earned achievements in product and process innovation are often complicated by the inability to collaborate and share information. Geographically dispersed engineering teams need to access product and process information that resides in different systems so that lessons learned and best practices can be leveraged to improve processes in later projects, thereby reducing the vehicle development process (VDP) for OEMs and time-to-schedule for suppliers.

Companies in the automotive industry are moving toward Global Innovation Networks, a transformative business model built on collaboration that fosters innovation and informed decision making at every stage of the product lifecycle. This model requires a digital environment that encompasses key contributions from strategic partners, suppliers and customers around the world. By creating Global Innovation Networks, manufacturers are able to harvest ideas across the entire network and efficiently drive the best ones into their products and processes. These innovations can help companies:

- **Reduce time-to-market** – whether for a niche vehicle that needs to get out quickly to meet a market window, or for a higher production program where companies need to maximize the life of the program
- **Leverage globalization** – from low-cost country to global partnerships and JV's, global production operations to regional sourcing
- **Optimize resources** – from leveraging knowledge across the enterprise to ensuring flexible manufacturing practices are implemented around the world
- **Ensure compliance** – to customer requirements or regulatory compliance imposed by every country where companies do business

### **GM Daewoo finds success in a challenging international market**

In the Korean car market, GM Daewoo faced a supply glut, fickle customer demand, challenging regulations and high costs as it launched its new SUV program. To leverage product and process innovation, management chose PLM and successfully transformed and streamlined the product development process to react faster in this volatile market. After completing its initiatives, the company was able to concurrently execute three successful projects. Through increased knowledge re-use and faster access to product information it reduced vehicle development time by six months.

According to independent industry analyst firm Forrester Research, Global Innovation Networks represent a new model for product-focused companies that recognize the new paradigm in which Original Equipment Manufacturers (OEMs) focus on core competencies (essentially the intellectual property behind their product lines) while outsourcing design and manufacturing. Most automotive suppliers say this is exactly what is happening. [Changing business dynamics in the automotive sector. CAR, 2005]

For automotive companies, these networks increase flexibility and responsiveness through stronger collaboration and greater visibility across the value chain. They often include Original Equipment Manufacturers (OEMs), Tier I and other suppliers and joint ventures or business partners around the world.

Global Innovation Networks, Forrester continues, “enable companies to match their global demand for innovation with worldwide sources of talent and capital. Savvy firms make use of Innovation Networks to bring in new ideas and fresh, outside perspectives as a replacement for stale, vertically integrated approaches to innovation. To effectively meet growing innovation demand, firms must join an emerging market model that lets players co-invent with customers, source and market innovations anywhere, and anticipate as well as respond to supply and demand changes.” [Topic Overview: Innovation Networks, December 2005 and Fortune 500 CEOs Embrace Innovation Networks, December 2005. Forrester]

Once automotive companies have identified their top business challenges, they naturally will want to undertake initiatives to ensure they reach their business improvement goals.

Companies across many industries are considering initiatives such as:

- New product development
- Value chain synchronization
- Enterprise data management
- Commonization and re-use
- Knowledge and IP management
- Regulatory compliance
- Production efficiency
- Systems engineering and mechatronics

Many automotive companies have found PLM solutions to be the ideal platform from which to launch business process improvement initiatives. A comprehensive digital product platform based on PLM offers unprecedented capabilities to global teams by bridging siloed departments and systems and by providing a virtual environment for collaboration. PLM enables manufacturers to address their key business initiatives internally, then cost-effectively extend these initiatives to include strategic partners, suppliers and customers in the process of innovation.

Optimum PLM solutions are designed to be implemented in cost-effective stages, systematically enabling key business initiatives and providing substantial rewards along the way. Each initiative gives manufacturers the opportunity to establish the PLM framework, best practices and product-related data that will form the core of their Global Innovation Networks and help them transform their process of innovation.

Automotive manufacturers should start by addressing those business initiatives that are most critical to their near term success. As more of these initiatives are undertaken, the PLM platform from which they are launched will grow to support a robust Global Innovation Network.

This paper discusses some specific examples of business process improvement initiatives that are critical to manufacturers in the automotive industry:

- **Commonization and re-use** – Design common products and process with the intent of maximizing the re-use of existing parts, assemblies, equipment and processes
- **Strategic sourcing** – Reduce the need for procurement professionals to administer change management tasks, and provide them with robust sourcing tools so they can focus on continually improving the supply base
- **Value chain integration** – Connect all value chain members in order to effectively share information and knowledge
- **Change management** – Quickly and accurately assess the impact of proposed changes and ensure complete traceability on every change that is executed
- **Knowledge driven engineering and manufacturing** – Capture, re-use and automate product and process knowledge to continually improve engineering and manufacturing processes

## ► Commonization and re-use

Commonization and re-use enables companies to maximize value creation by leveraging proven parts and processes at each stage of the product lifecycle. A commonization and re-use initiative improves a company's ability to define and implement common architectures, systems, components and processes among different vehicle programs.

Re-used items have already been validated for production, and their quality and reliability have been proven in earlier products. This reduces complexity and enables them to accomplish more with the same resources, increases their flexibility in design, manufacturing and assembly and reduces downstream costs in maintenance and repair.

By implementing PLM, companies gain an integrated digital environment that provides key capabilities to enable commonization and re-use:

- *Knowledge-enabled archetypes* – Capture engineering and manufacturing expertise in a re-usable format that stores accumulated knowledge so that it is readily available for re-use. Archetypes can be created for products, sub-systems or entire processes. They are not a one-time capture of someone's implicit knowledge, but a dynamic process that is continually improved over time to reflect best practices and lessons learned throughout the execution of the product development process. Knowledge archetypes are especially helpful in promoting commonization because they define the interfaces and standards necessary to properly integrate a component or sub-system into an entire system
- *In-context search* – Find information in the context of the function an individual performs. For example, while everyone wants to find information related to a specific part number, designers might want to search based on shape; manufacturing engineers based on a process that was used to manufacture; purchasing may search based on cost or other supplier criteria
- *Cross-functional integration* – Connect people across the organization with the processes they are involved in and the tools they use to support those processes in order to increase effectiveness enterprise-wide. Commonization and re-use is most effective when executed at the enterprise level, where opportunities for re-use are evaluated across the entire product lifecycle

### **General Motors balances commonization, re-use and unique content**

General Motors has implemented commonization and re-use best practices for years. The company has found the right balance between commonization, re-use and unique content on to get vehicles out very quickly, re-using a large number of components and systems from other GM vehicles, yet delivering a vehicle that looks and drives different from anything on the market today. An excellent example is the production of the Pontiac Solstice and the Saturn Sky, which leverages GM's enormous global virtual parts bin. The seat frames came from the Corsa in Europe, the HVAC controls came from the Hummer H3 and the steering wheels and controls are used in multiple vehicles.

According to the 2004 AT Kearney study, “Assessment of excellence in procurement,” executives want their sourcing teams to create value through their relationships with key suppliers. And yet the same study found that sourcing teams spend 70 percent of their time on tactical activities, such as processing RFQs, with little value added to those strategic relationships. By contrast, manufacturers that collaborate with procurement earlier in the design process and make sourcing decisions a higher priority during the early phases of the product lifecycle are realizing product cost reductions of nearly 18 percent, as well as 10 to 20 percent improvements in time-to-market cycles. [Procurement in new product development, 2006]

A well-implemented strategic sourcing initiative connects all supply chain members, making certain that procurement professionals and product design and engineering are all working from the same base of information. It minimizes the time and resource required to respond to change, thereby allowing procurement to focus on building the supply base. PLM enables strategic sourcing by providing capabilities that support:

- *Sourcing integration* – Integrate procurement with other product lifecycle processes to provide sourcing teams with immediate access to comprehensive information about products, costs, previous sourcing responses and bid packages
- *Supplier collaboration* – Give decision-makers visibility into the change process, including views of current status and task execution. Achieve real-time collaboration between suppliers and their customers
- *Sourcing automation* – Develop robust sourcing tools to help suppliers actively evaluate and upgrade the supply base. Buyers can create, view and monitor RFQ, RFI and RFP events in conjunction with other supply chain partners – without having to hunt down part specifications from multiple sources

Managing the product development process from design through manufacturing is a complex task that is further complicated by the need to incorporate sub-tier support and low-cost country operations. Automotive companies need to ensure that their suppliers, customers and business partners keep their information synchronized throughout the process regardless of organizational or geographic boundaries.

In a recent Automotive Industry Action Group (AIAG) study, automotive suppliers attributed significant costs to keeping up with each OEM's requirements around design geometry exchange and data management. Through open solutions that leverage industry standards, companies can establish an environment that ensures that dispersed teams collaborate freely and confidently across heterogeneous systems with proper security and interoperability. PLM enables value chain synchronization through:

- *Interoperable design* – Enable suppliers to work in a multi-CAD environment and re-use geometry regardless of the CAD system in which the original geometry was created. This helps facilitate re-use across multiple customers and programs
- *Geometry-based enterprise collaboration* – Leverage geometry across multiple functions within the organization. Traditionally, only designers who had CAD on their workstations could interact and use design geometry. Now, through the lightweight JT™ format that has become an industry standard, design geometry can be used across the value chain, from manufacturing planning to purchasing to marketing brochures
- *Information exchange and synchronization* – Enable OEMs and all tier suppliers to share design context and bill of material (BOM) information through a single environment, eliminating the need for native CAD exchanges or translated data. This gives OEMs the deliverable they need while eliminating the suppliers' need to maintain CAD/PDM environments for every customer

A company's ability to manage engineering changes efficiently frequently spells the difference between profit and loss. A change management initiative establishes the systems and processes that enable OEMs and their suppliers to evaluate the true impact of change across the extended organization prior to making any commitment to its implementation.

Through PLM, change management provides visibility into complete product and process information relative to a change and its implementation. All product lifecycle information is available at key decision points in the change process. This enables suppliers to rapidly conduct a thorough impact analysis and establish accurate estimates of the cost of change even as the RFQ response time required by OEMs continues to shorten. In addition, this visibility enables OEMs to manage the change process, tracking the progress of change requests and monitoring its efficiency against established metrics. Both OEMs and suppliers are able to trace and report on the impact of change across the product lifecycle.

With PLM, automotive companies can establish an integrated platform for change management that ensures:

- *Change process and information integration* – Integrate change with other lifecycle processes so that the work and cost-related impact of proposed changes can be assessed rapidly. Teams are able to quickly analyze information about a product's function, aesthetics, performance, cost, assembly process, tooling, project schedule, program milestones and packaging. Lessons learned and best practices from prior engineering changes are always available, thereby enabling companies to apply this experience to both current and future programs
- *Best practice-based change processes* – Base change processes on best practices such as APQP to ensure that change-related workflow leverages the most cost-effective, industry-proven change routing. Equally important, decision makers have complete visibility to the entire change process, including views to current status and task execution, thereby enabling them to monitor progress and catch mistakes early in the change process
- *Program dashboards* – Enable program managers to account for change across an entire program and evaluate the impact of proposed changes on program cost, timing and overall program milestones. Program teams can use these dashboards to view a specific change within the context of other program changes. This holistic approach enables companies to determine how a single change can be combined with other changes to deliver aggregate benefit for any given program

### **Tier 1 supplier reduces change order cycle times by 70 percent**

American Axle & Manufacturing, a US tier 1 supplier to the automotive industry, provides sophisticated drivetrain systems for many of the world's leading vehicle manufacturers. A global manufacturer with 20 facilities worldwide, the company implemented a digital PLM environment to improve productivity and simultaneously reduce costs. It has far surpassed its goals, with a 30 percent reduction in time-to-market, and a 70 percent reduction in engineering change order cycle time representing a 9 month reduction in the design engineering process. Through its interface with the company's ERP system, the PLM solution provides American Axle with "cradle-to-grave" control over the change management process.

Gartner's 2006 report "Knowledge Management Enables the High-Performance Workplace" suggests that effective knowledge management is critical to keeping companies on the road to global innovation. Knowledge-driven engineering and manufacturing seeks to implement better ways to capture, automate and re-use product and process knowledge wherever it resides across the value chain.

Companies need tools that turn data into actionable information by linking related elements – from part geometries to design intent and multidisciplinary validations – into a meaningful context. As with any "recipe," these tools help speed the development process and sure first-time quality independent of a user's expertise.

PLM systems enable the capture and re-use of knowledge and facilitate the embedding of knowledge in day-to-day workflow processes. They include tools that team members can use to incrementally capture and apply knowledge as they perform their product development and manufacturing tasks – for example, a step-by-step process guide (or "wizard") that leverages and distributes the know-how of seasoned experts. These capabilities ensure that marketing, documentation, support and design have access to one centralized and coordinated system, so that even new employees can leverage the cumulative knowledge of the organization.

- *Knowledge enabled archetype* – Provide a rich collection of knowledge that helps a specific discipline meet the overall product development goals. As new innovations are discovered and developed from the experts in an organization, they are incorporated into the archetype for use on future products
- *Requirements management* – Establish comprehensive requirements definition and management to ensure that products are delivered with predictable performance and consistent quality. Deliver product requirements throughout the enterprise to the point in development where design decisions are being made, so that design decisions can be influenced by requirements as they are being made
- *Multidisciplinary validation* – Automate validation across the product lifecycle, ensuring that workers in all disciplines touched by a design or manufacturing change can validate the impact and ensure that needs are met from the start
- *Global shared knowledge environment* – Share knowledge that has been captured and contextualized internally and externally across the value chain. Provide all stakeholders with the ability to evaluate and contribute to innovative ideas

### **Knowledge-enabled engineering tools dramatically shorten the configuration process**

A leading designer and manufacturer of safety restraint systems, Indiana Mills & Manufacturing, Inc. (IMMI), faced shorter lead times on OEM inquiries and quotes for seat belts. To address this, the company used knowledge-enabled engineering tools to automate the quotation and product development process with an on-line product configurator. The PLM-enabled system reduced a month-long configuration/quotation process to a few minutes and improved both time-to-market and product quality.

Threats and opportunities introduced by globalization are forcing changes in the way companies do business in the automotive industry at an unprecedented rate. In spite of this, innovation leaders can and are accomplishing more with less as roles evolve, costs rise and the field of competition grows larger and savvier. Building a network that feeds continuous product and process improvements is perhaps the most important step a company can take to successfully address the many challenges that exist now as well as those that will arise in the future.

A fundamental purpose of PLM-enabled Global Innovation Networks is to drive innovation by supporting better business decisions and delivering the right information to the right decision makers across globally dispersed organizations. Manufacturers who harness the power of their corporate-wide knowledge can innovate far more effectively than their competitors. To win in their markets, automotive companies must:

- Proactively design systems and parts with the intent of maximizing the re-use of parts, assemblies, equipment and processes through commonization and re-use
- Manage and continuously upgrade the supply base through strategic sourcing
- Facilitate collaboration through open, interoperable solutions that leverage industry standards to integrate the value chain
- Accurately and quickly understand the impact of change, and manage the implementation of change through change management
- Leverage knowledge-enabled engineering and manufacturing to capture and automate product and process knowledge

A successful Global Innovation Network grows out of the implementation of a PLM-enabled digital product platform that lets automotive companies focus on core competencies and leverage knowledge wherever it emerges throughout the development process and across the value chain. The PLM platform provides a secure digital environment that effectively connects people, processes and information while integrating with current business systems supports. It also creates an agile environment for managing change in a globally distributed and outsourced environment.

Automotive OEMs and suppliers who reach across the value chain to harvest new ideas and apply them in their own products and organizations gain a sustainable competitive advantage. Some OEMs are already claiming the ability to run any vehicle in their portfolio down any plant, enabling them to load balance and leverage low-cost countries. Suppliers are collaborating with customers across geographies, gaining visibility into innovation processes and assessing the impact of engineering changes so they can take appropriate actions. At the product launch, customer requirements are being met while they are still fresh and before competitors can drive down pricing.

The advantage of better product and process innovation in the automotive industry is clear. The only question remaining is which companies will place themselves in line to reap the rewards.

### **About Siemens PLM Software**

Siemens PLM Software, a division of Siemens Automation and Drives (A&D), is a leading global provider of product lifecycle management (PLM) software and services with 4.3 million licensed seats and 47,000 customers worldwide.

Headquartered in Plano, Texas, Siemens PLM Software's open enterprise solutions enable a world where organizations and their partners collaborate through Global Innovation Networks to deliver world-class products and services.

For more information on Siemens PLM Software products and services, visit [www.siemens.com/plm](http://www.siemens.com/plm).

# SIEMENS

## **Division headquarters**

### **United States**

Granite Park One  
5800 Granite Parkway  
Suite 600  
Plano, TX 75024  
972 987 3000  
Fax 972 987 3398

## **Regions**

### **Americas**

Granite Park One  
5800 Granite Parkway  
Suite 600  
Plano, TX 75024  
800 498 5351  
Fax 972 987 3398

### **Europe**

Norwich House Knoll Road  
Camberley, Surrey  
GU15 3SY  
United Kingdom  
+44 (0) 1276 702000  
Fax +44 (0) 1276 705150

### **Asia-Pacific**

Suites 6804-8, 68/F Central Plaza  
18 Harbour Road, Wan Chai  
Hong Kong  
852 2230 3333  
Fax 852 2230 3210