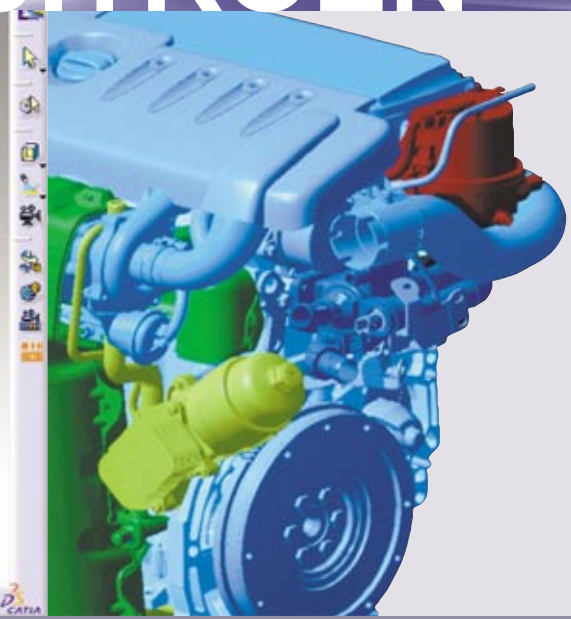




PSA PEUGEOT CITROËN

Building the Digital Enterprise



Stiff competition. Cost pressures. Excessive production capacity. Short development cycles. Faced with all these difficulties, global automotive manufacturers are making major changes in their business strategy.

For instance, in order to secure their long-term production plans, global automotive manufacturers are trying to expand into new markets. In addition, they are forming global alliances to assure their presence in regional and niche markets, and to achieve economies of scale. They are also rationalizing their worldwide industrial organization. In particular, the production of several vehicles on a single platform has been generalized, enabling the manufacturers to control production costs and to meet production deadlines. Finally, global automotive manufacturers are putting emphasis on managing their supply chain, and on developing efficient aftermarket strategy.

PSA PEUGEOT CITROËN is the number six global automotive manufacturer. It has enjoyed the strongest growth of any carmaker over the last four years. How is PSA PEUGEOT CITROËN coping with these changes in the automotive industry? That is the question we will answer in this case study of the PSA PEUGEOT CITROËN Group.



PSA PEUGEOT CITROËN Strategies and objectives

One Group, two brands

Ranking number six worldwide and number two in Europe, PSA PEUGEOT CITROËN Group, composed of two brands, Peugeot and Citroën, sold more than three million vehicles in 2001, representing a year-to-year increase of 11.3%. Through a consistent product plan and coordinated international strategies, the Group aims to give its two brands distinctive personalities that are as complementary as possible through a platform policy.

Group's objectives

PSA PEUGEOT CITROËN has set ambitious objectives to be reached by 2004 in the areas of sales growth within and outside Europe, environmental protection through innovative concepts such as the HDi engines or the particulate filter, cost control by implementing the platform strategy in all plants, and profitability. In addition, the company has an objective to increase and to fasten the renewal of product lineups in response to customer demand. In all, 25 new models will be introduced between 2001 and 2004, compared with 9 between 1997 and 2000. In 2004, the Peugeot and Citroën lineups will comprise 37 vehicles covering 90% of demand.

PSA PEUGEOT CITROËN's strategic ambitions, which are mainly focused around innovation and cooperation, cannot be made possible without a reengineering of the Group's processes. What processes are at stake when a company wants to foster innovation and collaboration with its extended enterprise? And how to optimize these processes?



Necessity to manage the product life cycle

Develop, produce and sell: three words that sum up the activity of PSA PEUGEOT CITROËN Group.

This section describes the processes involved in these activity domains, and how these processes can be optimized in order to achieve the Group's strategy and objectives.

Life cycle of a vehicle at PSA PEUGEOT CITROËN

The first stage of the life cycle of a vehicle is its design and development. The design and development of a vehicle is composed of three main phases: the choice of the concept of the vehicle, its preliminary definition (definition of the main components of the vehicle) and its detailed design and development.

Optimization of the product life cycle

Today's information systems enable manufacturers to create, simulate and thus optimize the entire life cycle of products from initial concept to product in service. In particular, the solutions specializing in this area, the 3D PLM (Product Lifecycle Management) solutions, support the following applications:

- **Digital definition of product information and digital 3D design and simulation.**

The major benefits of virtual prototyping are to decrease new vehicles' development costs and to shorten development time. Moreover, the use of 3D allows multidisciplinary teams (R&D, styling, marketing, etc.) to communicate and interact in a common language, fostering creativity and innovation.

- **Management and dissemination of integrated digital product information to the extended enterprise.**

The information on a project can thus be shared in a 3D collaborative environment open to all the teams in the enterprise and partners.

- **Digital definition and simulation of digital manufacturing processes.**

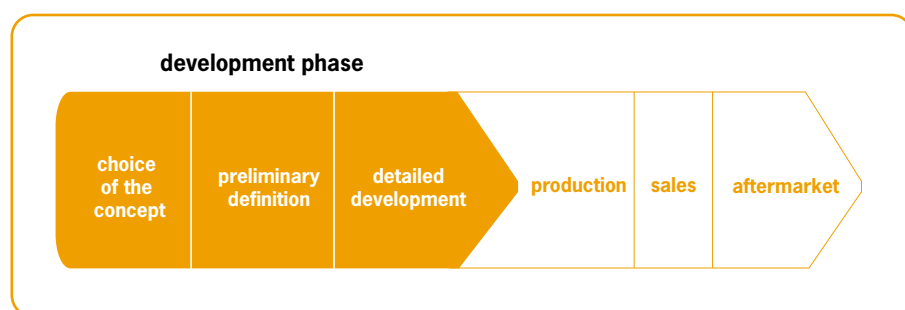
This enables optimization of production costs, ergonomics, assembly line order, productivity and timing.

- **Capture and reuse of digital product information.**

Reuse of data enables companies to leverage their intellectual capital and knowledge. New designs can thus be created easily from given specifications, fastening the renewal of product lineups.

- **Integration and management of the product, process and resources information into a unified database.**

The company's processes are integrated and optimized from development through manufacturing to maintenance, allowing the implementation of the digital enterprise.



Implementation of 3D PLM at PSA PEUGEOT CITROËN

The INGENUM Project

PSA PEUGEOT CITROËN Group has been a precursor in the implementation of the 3D PLM new business processes since the middle of the 1990's.

The Group's managers have understood the necessity to federate the development processes and manage the product life cycle in order to shorten schedules, enhance quality and reduce costs for new model development.

"Beginning in the mid-1990's, technical management at PSA PEUGEOT CITROËN identified the need to reengineer the Group's design processes and replace the old computer applications. Those information systems had been put in place during the creation of the Group, at the beginning of the 1980's. At that time, processes and organization were based on a sequential style of working and CAD was still new. In 1995-96, technological progress suggested that Digital Mockup could bring positive benefits. It was that conviction that led to the INGENUM project, which was supported at the highest level of management of the Group", said Jean-Jacques Urban Galindo, INGENUM Project Director, PSA PEUGEOT CITROËN.

In early 1998, PSA PEUGEOT CITROËN launched the INGENUM project based on Dassault Systemes' 3D PLM solutions, CATIA, ENOVIA^{VPM} (Virtual Product Modeling), and later DELMIA in some areas.

The main objective of the INGENUM project is to create a virtual vehicle platform where all product, process and resources information coming from the extended enterprise can be virtually managed and integrated.

In order to achieve this objective, three main phases have been defined:

- creating a virtual environment for collaborative development of products throughout the Group
- expanding this co-development environment to the extended enterprise
- enabling the digital factory through integration of the product, processes, and resources data.

Collaborative development environment throughout the Group

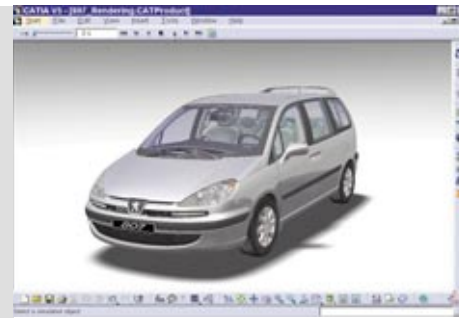
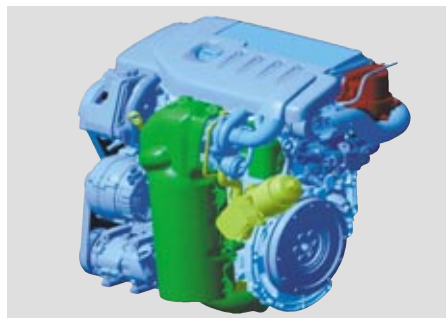
A core 3D modeling tool

In order to facilitate the implementation of the collaborative development environment, PSA PEUGEOT CITROËN decided to use a core 3D modeling tool for design of the entire vehicle.

Initially, the Group used CADDs for body design and CATIA from Dassault Systemes for powertrain design. However, the Group found CATIA to be efficient as a complete 3D modeling solution.

Two years later, the migration from CADDs to CATIA was completely achieved with 1,000 new users.

"The MTS organization (Technical and Scientific Support) was strongly involved during this transition phase by providing the user community with validated design methodologies that were adapted to the different domains. The permanent proximity support with the designers enabled to guarantee the continuity of operations in the design offices", said Pierre Borrel, Technical and Scientific Support Director, PSA PEUGEOT CITROËN.





Concurrent design

Collaborative design was made possible thanks to the implementation of a Digital Mockup environment. This environment consists of a Virtual Product Database, where designers can manage their CATIA parts and simultaneously share their parts with all the parts in the assembly (all the part definitions are kept up-to-date). Designers were thus able to design their part in the context of the whole assembly. The result is reduced product development time. Dassault Systemes' ENOVIA^{VPM} (Virtual Product Modeling) solution creates this environment. Development "in context" is today fully deployed throughout the Group.

Digital mockup visualization and simulation

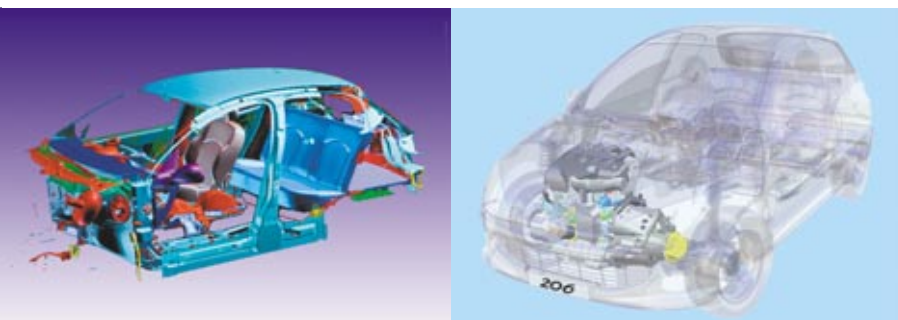
This digital mockup environment also enabled synthesis engineers to check, virtually and at an early stage of the development process, the consistency of the geometry thanks to the 3D visualization of proximity and the detection of interferences between parts. This allows the reduction of errors and the reduction of the need for physical prototypes.

Configuration management

This co-design environment has been enhanced to take into account the diversity of PSA PEUGEOT CITROËN vehicles. Since many different parts and assemblies compose each type of vehicle, the configuration of parts has to be managed within the Virtual Product Database. The description of mechanical and vehicle parts with all their characteristics are captured and checked against a set of rules in order to respect the multiple possible options. As many different types of users need to access this database, multiple views and profiles can be defined allowing access to several types of environments for specific purposes.

Multi-sites access to the digital mockup is also planned for long distance connections thanks to ENOVIA^{VPM} 1.5 capabilities. For instance, Digital Mockup sharing between France and Brazil is planned to be fully operational by the end of 2002.

Thanks to this foundation, PSA PEUGEOT CITROËN has established what it calls the "Virtual Platform" that enable users to focus on their own task while at the same time share their results with other users without geographical constraints.



Implementation of 3D PLM at PSA PEUGEOT CITROËN
The INGENUM Project

Remote co-development environment with the extended enterprise

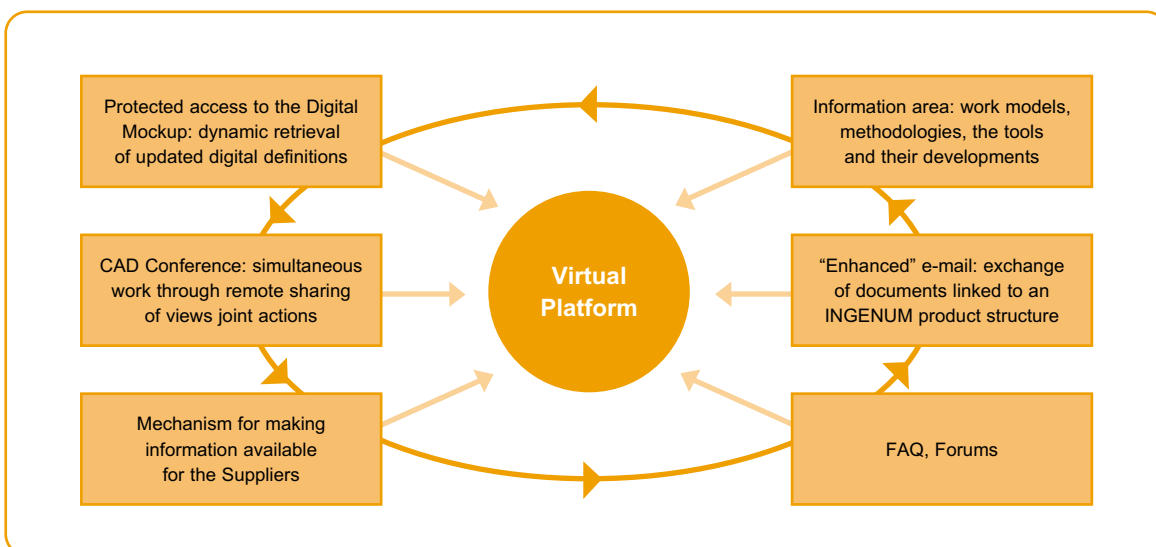
PSA PEUGEOT CITROËN decided to share this "Virtual Platform" with their suppliers in order to reduce design cycle time within the extended enterprise. This started the second milestone of the INGENUM project.

Today, PSA PEUGEOT CITROËN designers and their suppliers can work on the same digital mockup via the Internet Portal, which is based on ENOVIAVPM and ENOVIA Portal solutions from Dassault Systemes.

Accredited suppliers have secure, preferential access to PSA PEUGEOT CITROËN Group's information systems through the encrypted European ENX network. They can access the digital mockup through a login-protected area. Each designer retains control of his or her part with the exclusive ability to make changes, which are immediately shared with all project participants. Moreover, PSA PEUGEOT CITROËN can share many different types of data with suppliers thanks to this Supplier Relationship Portal. This includes email, documentation, libraries of design standards, workshop simulations, "3D" documents during conference meetings, and appropriate design data.

The benefits to PSA PEUGEOT CITROËN for implementing the Supplier Relationship Portal include a more up-to-date digital mockup and accelerated product development time. By the end of 2002, 150 suppliers will be able to connect to the digital mockup.

"We have opened our digital mockup to our suppliers in a completely secure manner. Our solution is based, on the one hand, on Internet standards with access through a simple browser, and on the other hand, on the ENX network for performance and security. We have also adapted our information systems in order to manage the access confidentiality to the level of the elementary part. In practical terms, suppliers can now access, in real time, the environment of the vehicle they are interested in, retrieve data in order to work in it in their design office, and send back the results to PSA PEUGEOT CITROËN. The objective is to shorten the development time by sharing the design data in an optimal way. Our plan is to have 150 supplier sites connected in this manner by the end of the year 2002", said Joël Daussin, I.T. Director, PSA PEUGEOT CITROËN.



Digital factory

The implementation of the digital factory corresponds to the final stage of the INGENUM project, and consists of the simulation and management of the entire product life cycle from preliminary design studies to the digital factory (products, processes, tooling, assembly and plant layout).

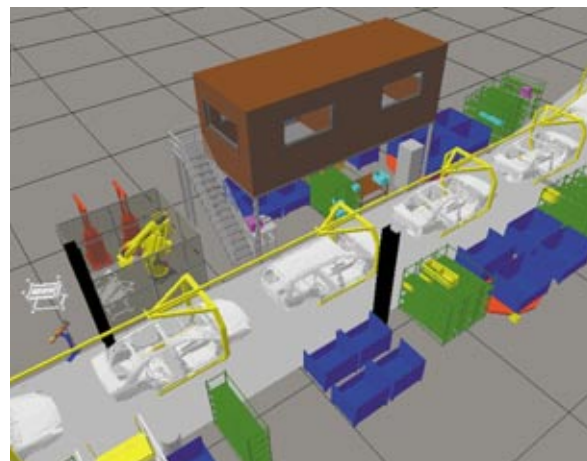
A project focusing on final car assembly has been launched at PSA PEUGEOT CITROËN in order to prepare the digital factory. Based on DELMIA solutions from Dassault Systemes (Process Engineer and DPM for Assembly), the project will provide an assembly process planning and verification solution for developing manufacturing and maintenance processes.

Moreover, in addition to optimizing processes and saving resources, the target is to replace the numerous legacy systems used in the Group with a fully integrated application linked to the ENOVIAVPM database, and to build a unified Product and Process database. To achieve this major step, PSA PEUGEOT CITROËN has identified the ENOVIA V5 solution from Dassault Systemes that will support the development of the new phases of the INGENUM project in association with the applications built on SAP. ENOVIA V5 will allow PSA PEUGEOT CITROËN to take advantage of the V5 architecture and the PPR model (Product, Process, Resources) that integrates a product with the processes and resources available to develop it. This evolution, which will provide the foundation for the Digital Factory environment, is a key milestone.

"Over the last years, we have successfully achieved a major step in improving our product development processes by extending the use of the Digital Mockup to all our designers. The design "in context" is now a common practice here at PSA PEUGEOT CITROËN. But, as the automotive product is a technologically advanced product, one of the challenges specific to our industry is the need to simultaneously define the corresponding processes to optimize investment and production costs, while continuously improving quality. That is the fundamental motivation that pushes us to take advantage of digital techniques for process design as they become available", said Jean-Jacques Urban Galindo, INGENUM Project Director, PSA PEUGEOT CITROËN.

Thanks to the implementation of the INGENUM project based on Dassault Systemes 3D PLM solutions for CAD/CAM activities, PSA PEUGEOT CITROËN today has the ability to virtually manage and simulate the life cycle of the vehicles. It makes it easier to work on different assumptions and identify the most feasible solutions. These are validated using physical prototypes during milestone phases.

This approach that combines virtual simulation during the development phase with physical prototypes during milestone phases should enable the PSA PEUGEOT CITROËN Group to quickly bring to market different, innovative vehicles that will meet all customer expectations.





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