

Autodesk®
Automotive Solutions

Superior, Efficient, and Complete Automotive Concept Design

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Image Courtesy of Land Rover

Introduction

In today's automotive marketplace, design has become *the* key competitive advantage for many manufacturers and suppliers. For these companies, top business initiatives include streamlining the conceptual design process, increasing the number of iterations, developing desirable designs, and building brand equity.

Global brands, global design, and rapidly shifting market trends are contributing to a change in automotive styling. Designs must resonate with many different customers and raise demand, driving potential buyers to the vehicle. In addition, visualization and digital asset use and reuse are quickly becoming core requirements in the design decision process. All these factors require a seamless, single-system design process that provides unparalleled quality to reduce time-to-market constraints. Autodesk has this solution.

The Importance of Design

Automotive design, at its core, is the birth of an exciting product that customers will want. For decades, the process of designing automobiles has been an unusual blend of time-honored craft and modern processes. However, the two methodologies have never evolved to a seamless blend of aesthetic design, resulting in rework, lost design ideas, communication breakdowns, and poor design. Yet, many iconic vehicles have been designed this way, proving that the process is not fatally flawed, just inefficient. In today's marketplace, with many automotive companies reeling under global pressures, inappropriate use of tools coupled with processes that inhibit the ability to convert current market trends into future products is leading to poor design practices.

"Design is a critical element in our global growth," says Nissan's Chief of Design, Shiro Nakamura. During the last five years, while the company was reviving itself, Nissan designers created 20 concept cars and 27 production cars—certainly an amazing number given the condition of the company and impressive under any circumstances.¹ As this scenario demonstrates, design is increasingly recognized as an important business leadership competency. Autodesk® solutions help companies take advantage of their strengths and elevate processes to world-class quality.

¹ "Nissan Ups Its Design Capability," May 2005, Automotive Design and Production, www.autofieldguide.com/articles/wip/0505wip09.html.

Automotive Design and Visualization Challenges

Most automotive manufacturers follow the same process for conceptual design. Recognizing the opportunity for a seamless, single-system process requires an understanding of the design challenges.

Ideation

Ideation is the creation of a unique design idea. In automotive design, the idea *is* the product, and being able to capture that idea in visual and digital form is key. In many cases, static 2D images are captured in analog form (with paper and pen) or with mainstream digital tools intended for photography editing, not automotive concept creation and design. In addition, designers today are looking for ways to easily integrate engineering and ergonomic packaging constraints that come from the 3D world into 2D concepts—helping them to stay true to the design intent.

This phase of the design process presents the following challenges:

- Capturing 2D ideation sketches in digital form without compromising the designer's approach
- Having the ability to sketch in 2D over existing 3D packaging constraints to ensure technical feasibility
- Easily and seamlessly transforming 2D ideas into basic 3D models

Modeling and Technical Surfacing

In automotive design, modeling and technical surfacing are often categorically defined in the generic computer-aided design (CAD) space. These two processes are often singularly portrayed. In reality, both processes are unique, yet interlinked, and require specific tools. Modeling takes a 2D idea and defines a 3D shape, iterating multiple times and honing the digital concept. Technical surfacing—or Class-A modeling—refines the model to enable cutting of high-quality tooling, but also brings order and precision to the design of the vehicle. These two tasks represent a diverse set of requirements, including creative flexibility and uncompromising precision.

This phase of the design process presents the following challenges:

- Working seamlessly with 2D ideas and digital concepts
- Rapidly iterating a single core 3D concept to explore multiple shapes, configurations, sizes, and ideas
- Evaluating technical and aesthetic qualities of the surfaces and model
- Building quality and data integrity into models to easily use the content downstream
- Working with both mathematical surface data as well as polygonal, or tessellated data—scanned from clay bucks—to achieve the desired shape
- Accommodating design changes from design reviews and engineering
- Working seamlessly between the 3D concept model and the precise Class-A model

- Securing skilled, certified Class-A modelers
- Migrating the Class-A surfacing portion of the design process from an isolated activity to a more fully integrated part of the workflow

Design Collaboration

PLM, or *product lifecycle management*, is a standard in manufacturing. One of the cornerstones of the PLM initiative is collaboration. But, the filing, sharing, and updating of engineering and manufacturing data, with the associated requirements, are different from the collaboration needed in the visually rich and aesthetically driven process of conceptual modeling. Designers and executives are looking for ways to visually share concepts, locally and globally, and provide feedback appropriate to the medium in which the content was created.

This phase of the design process presents the following challenges:

- Using design criteria (color, shape, texture) to categorize and subsequently search for data
- Organizing, viewing, annotating, and making decisions about 2D and 3D digital visual assets
- Integrating conceptual design asset management into existing enterprise PLM collaboration systems
- Comparing image versions
- Making aesthetic decisions of both an objective and subjective nature simultaneously
- Integrating the final model with engineering (CAD)

Visualization and Marketing

For an idea to be successful, it must be explained and often rationalized. Designers need to convey the essence of their design—form, emotion, and brand. The more visual the process, the more concise and coherent the explanation. In the automotive industry, design sign-off is a crucial decision that includes risk and cost. For these decisions to be made with confidence, data must accurately reflect the product to be built.

A new landscape is emerging in automotive design: digital asset reuse for marketing and advertising collateral. Manufacturing executives are looking for ways to not only cut down the costs of prototypes, but also increase the chances of making the best possible market decision.

This phase of the design process presents the following challenges:

- Driving increased team productivity
- Cutting costs of digital prototypes
- Reducing time to market
- Making real-time design changes during design reviews
- Reducing time needed to prepare data for reuse in marketing and advertising media

Competition and Integration

The process for automotive conceptual design described in the previous section is typical throughout the industry. No two automotive manufacturers are the same, however, and many still incorporate some analog methods and physical models into the design process. In addition, all manufacturers are challenged with design data integration into their core engineering systems (CAD).

Competition

There are several competitors in the conceptual design and visualization process for automotive design, but none offers a full breadth of solutions for the entire process. Autodesk has a complete solution, driving efficiencies for designers, visualization experts, executives, and, ultimately, the customer.

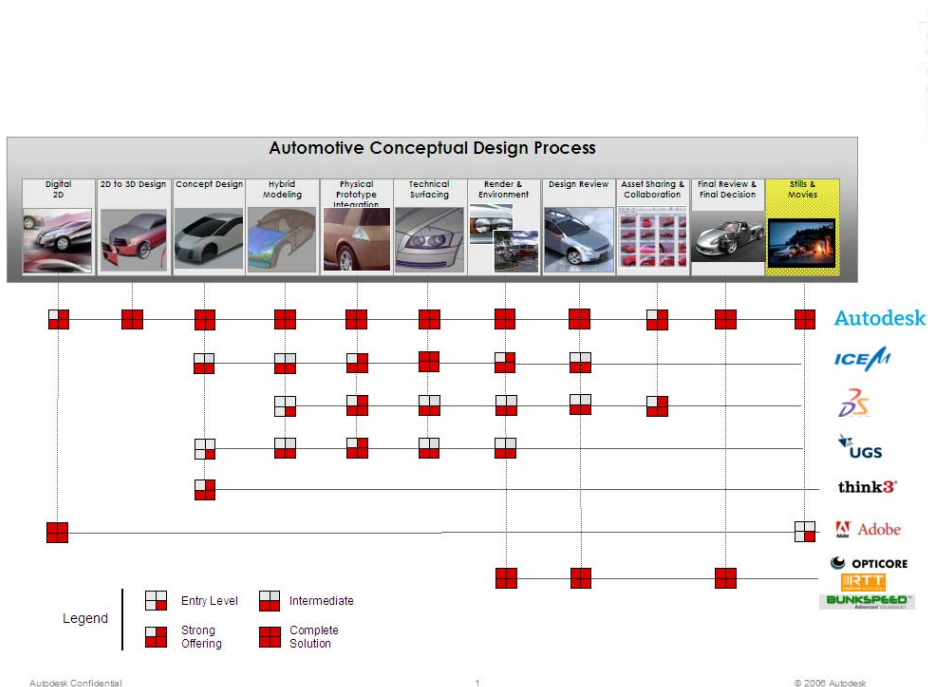


Figure 1: Competition in automotive conceptual design and visualization.

Integration

The workflow described earlier also highlights a typical conceptual design process that includes the use of analog processes (such as 2D tape drawings) and physical prototypes (such as clay models and interior bucks). These traditional steps are a fundamental part of the conceptual design process. The 2D-to-3D integration tools and reverse engineering tools from Autodesk not only support the analog processes and physical models within the conceptual design workflow, but also help to integrate traditional design methods within the digital process.

The Autodesk Solution

The Autodesk solution for automotive conceptual design and visualization is seamless and complete. Whether you're an executive looking to drive more informed decisions and innovative processes, or a manufacturing expert looking to effectively reduce costs and improve quality, you must bring innovation to your products and processes—profitably. Autodesk offers a full suite of products, customized consulting, professional services and support, and industry-leading education and training to provide the most complete and efficient solution available.

Transportation manufacturers and suppliers must address several business issues and process problems:

- Emerging markets with diverse consumer needs
- Economic and environmental pressures
- Desire to lead the market with innovative design
- Need to communicate with realistic, accurate visualization tools
- Affordable, manageable, and ultimately profitable design solutions
- Time-to-market pressures compounded with right-to-market pressures
- Distributed design facilities due to acquisitions, mergers, and remote studios
- Fast-growing, global competition

Autodesk provides powerful applications to help you design the next market-leading vehicle with tools and services that enable communication, collaboration, and visualization of the entire conceptual design process. Autodesk automotive solutions get results—efficiently and effectively—for the entire network of designers and suppliers.

The Autodesk solution provides the following business value:

Globally Connected Design: Autodesk automotive solutions improve interaction and traceability on a global scale by tightening the relationships between vehicle designs and the requirements that created them. Through improved integration between designers, engineers, modelers, executives, and marketing professionals, design information can be shared directly in a rich and collaborative environment. Highly distributed design teams can establish and synchronize design themes with other engineering and manufacturing teams—bringing better designs to market, faster.

Single-System Integration: Autodesk offers an unparalleled integration in conceptual design. All tools—from digital 2D to 3D, modeling to technical surfacing, surface evaluation to final decision, and design to marketing—promote a seamless digital workflow. For the design executive, this integration leads to several key benefits that result in positive business value:

- More design iterations with no increase in time
- Increased creativity and innovation
- Cost reductions in the design process
- Strategic flexibility and the ability to rapidly exploit new market opportunities
- Increased focus on design intent, not design infrastructure

- Reduced risk and capital investment

Innovative and Decisive Design: The best decisions require the best data. With Autodesk automotive solutions, decisions have less risk and less conflict because the best information has been communicated to the decision maker. Throughout the seamless, digital process, collaboration on shape, surface integrity, surface quality, lighting, color, texture, and emotional context—the entire framework of an idea—is consistent and concise. Autodesk provides the tools to make confident and informed design decisions.

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