

Digital Prototyping: Questions and Answers

1. What is a digital prototype?

A digital prototype is a digital simulation of a product that can be used to test form, fit, and function. The digital prototype becomes more and more complete as all associated conceptual, mechanical, and electrical design data are integrated. A complete digital prototype is a true digital simulation of the entire end product, and can be used to virtually optimize and validate a product to reduce the necessity of building expensive physical prototypes.



2. What is Digital Prototyping?

Digital Prototyping gives conceptual design, engineering and manufacturing departments the ability to virtually explore a complete product before it becomes real. With Digital Prototyping manufacturers can create, validate, optimize, and manage designs from the conceptual design phase through the manufacturing process. Using a single digital model throughout the design process helps product development teams boost the level of communication with different stakeholders while getting more innovative products to market, faster. By using a digital prototype, manufacturers can visualize and simulate the real-world performance of the design with less reliance on costly physical prototypes.



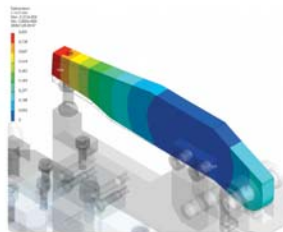
3. What are the pain points that Digital Prototyping addresses?

The manufacturing product development process today is dominated by islands of competency:

- In the Conceptual Design phase industrial designers and engineers often use paper-based methods or digital formats that are incompatible with the digital information used in the Engineering phase. A lack of digital data, compatible formats and automation keeps this island separate from engineering and manufacturing, and means that the conceptual design data must be recreated digitally downstream resulting in lost time and money.
- In the Engineering phase, mechanical and electrical engineers use different systems and formats, and a lack of automation makes it difficult to capture and rapidly respond to change requests from manufacturing. Another problem in the Engineering phase is that with typical 3D CAD software its geometric focus makes it difficult to create and use a digital prototype to validate and optimize products before they are built, making it necessary to build multiple costly physical prototypes.
- Manufacturing is at the downstream end of all the broken digital processes—the disconnection between the Conceptual Design phase, the Engineering components, electrical and mechanical—and they receive this analog information in the form of drawings. The result is a heavy reliance on physical prototypes and the subsequent impacts on productivity and innovation.

4. Hasn't the concept of Digital Prototyping been around for years?

Although there has been talk about the benefits of Digital Prototyping for years, the budget for the tools required to build and test a true digital prototype has been out of reach for most manufacturing companies. Digital Prototyping solutions are usually expensive, customized installations for large enterprises. Most out-of-the-box 3D modeling applications provide only part of the functionality needed to create a complete digital prototype.



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5. What is unique about the Autodesk approach to Digital Prototyping?

- **Attainable:** The Autodesk Digital Prototyping Solution provides the most straightforward and unproblematic path for manufacturers to create and maintain a single digital model. Ease of deployment and management of the technology allows design and manufacturing workgroups to quickly create and share a single digital model that can be used in all stages of production.
- **Cost effective:** Autodesk Manufacturing is uniquely positioned to bring Digital Prototyping to a broader market by making it cost-effective for design and manufacturing workgroups. With its history of democratization, Autodesk has a proven track record of making powerful desktop technology available to companies of all sizes.
- **Scalable:** The Autodesk Digital Prototyping Solution is scalable, flexible, and easy to integrate into existing business processes. So manufacturers can realize the benefits of Digital Prototyping at their own pace, with minimal disruption to existing productive workflows.

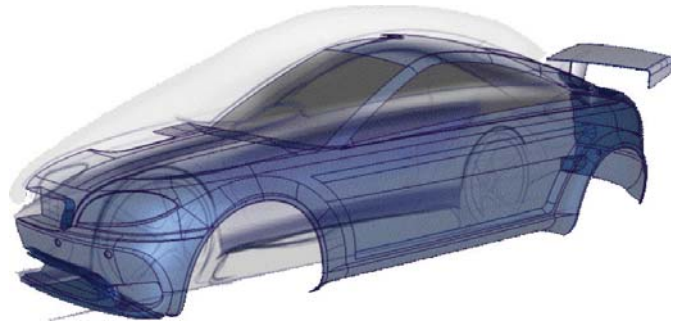


6. How do the Autodesk Manufacturing products and technology drive Digital Prototyping?

The Autodesk Digital Prototyping Solution brings together design data from all phases of the product development process to create a single digital model. This single digital model simulates the complete product and gives engineers the ability to better visualize, optimize and manage their design before producing a physical prototype.

Autodesk provides the interoperable tools required to create a complete digital prototype from the conceptual phase of a project through manufacturing:

Autodesk® AliasStudio™ software enables users to work digitally from the start of a project with best-in-class industrial design tools. Users can capture ideas digitally from initial sketches through to 3D concept models and share those designs with the engineering team using a common file format—allowing a product's industrial design data to be incorporated into the digital prototype. Today, the look and feel of a machine or device is more important than ever for consumers, so housing and user interfaces must be shared early in the process between industrial designers and engineers.



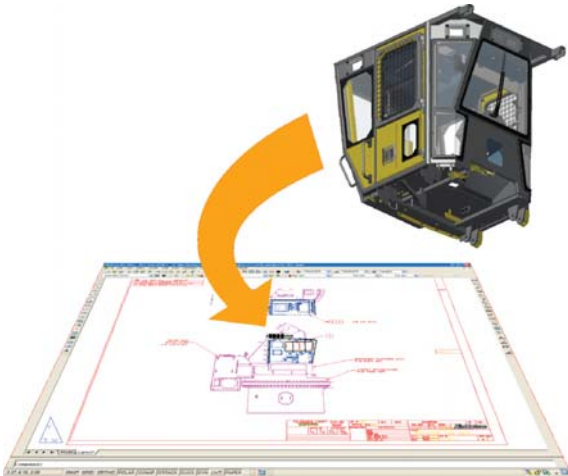
Autodesk® Showcase™ software creates accurate, highly realistic representations from 3D design data, enabling informed decision-making on digital prototypes. The unique Showcase environment facilitates the process of presenting and reviewing designs for important product decisions.



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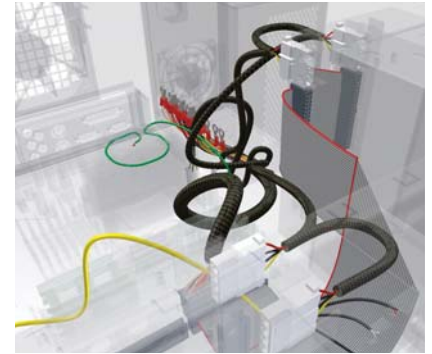
Autodesk® Inventor™ software is the foundation for Digital Prototyping. The Inventor model is an accurate 3D digital prototype that lets users validate design and engineering data as they work, minimize the need for physical prototypes, and reduce expensive engineering changes that are often discovered after the design is sent to manufacturing.

- Functional Design capabilities in Inventor allow engineers to focus on the functional requirements of a design (such as the layout of a gear, shaft, machine frame) and uses those requirements to help drive the creation of intelligent 3D models and geometry. With a workflow driven by functional design, engineers can easily and rapidly build digital prototypes that help them simulate and validate design functions and catch errors before they reach manufacturing.
- DWG TrueConnect technology simplifies the sharing of manufacturing information with AutoCAD® software users by providing the ability to read and write DWG™ files while maintaining full associativity to the 3D model, without needing translators. It lets users combine views of Inventor 3D part and assembly designs with AutoCAD data including symbols, schematics, plant layouts and existing 2D designs.



AutoCAD® Mechanical software, part of the AutoCAD family of products, is built for mechanical designers and drafters to improve the design experience by simplifying complex mechanical design work. AutoCAD Mechanical can detail and document native Autodesk Inventor models allowing large engineering departments to use 3D to build digital prototypes while still taking full advantage of the skills and expertise of the 2D drafting team.

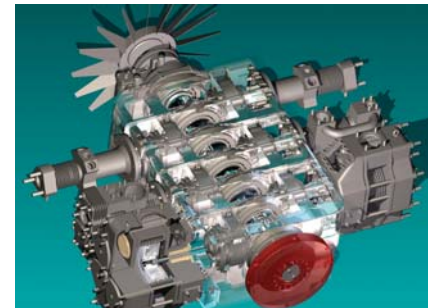
AutoCAD® Electrical software passes electrical design intent information for cables and conductors directly to Autodesk Inventor to automatically create a 3D harness design, adding valuable electrical controls design data to the digital prototype created in Inventor. Inventor users can pass wire-connectivity information to AutoCAD Electrical and automatically create the corresponding 2D schematics. The smooth integration between AutoCAD Electrical and Inventor helps users create accurate 2D and 3D electrical designs in less time.



Autodesk Data Management Tools allow design workgroups to manage and track all the design components for a digital prototype. It provides the path through which the digital prototype moves, and seamlessly connects all design and manufacturing workgroups. The Autodesk® Productstream® family of product data management (PDM) applications gives users a modular and practical approach to controlling design data and maximizing the value of an investment in design data.

7. What can customers do with the Autodesk Digital Prototyping Solution today?

Industrial designers use AliasStudio to digitally sketch design ideas and create 3D digital concept models for validation that then can be shared with the engineering team or manufacturing.



Engineers use Inventor to explore ideas with simple, functional representations that help generate a digital prototype. Inventor delivers the best bidirectional interoperability between 2D and 3D mechanical and electrical design applications on the market. Integrated stress analysis and motion simulation help engineers optimize and validate complete designs digitally and confirm that customer requirements are met even before the product is built.

Manufacturing teams benefit from accessing the most current and accurate data (release drawings, models, and BOMs)—avoiding mistakes caused by using outdated documents. And, they can provide expertise earlier in the engineering process by using the digital prototype delivered using DWF™ technology to communicate, mark up, and measure designs—moving one step closer to true paperless manufacturing processes.

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8. What are the business benefits of Digital Prototyping?

According to an independent study by the Aberdeen Group, best-in-class manufacturers use Digital Prototyping to build half the number of physical prototypes as the average manufacturer, get to market 58 days faster than average, experience 48 percent lower prototyping costs, and ultimately drive greater innovation in their products. The Autodesk Digital Prototyping Solution helps customers achieve these results.

9. How does the Autodesk Digital Prototyping Solution help get customers to best-in-class?

By giving customers the tools to develop a complete digital prototype, Autodesk helps them build fewer physical prototypes and ultimately get to market ahead of the competition with more innovative products.

Autodesk's position is that moving to 3D is only the first step in creating a digital prototype. In today's increasingly competitive global market, being best-in-class means using technology to stay ahead of the competition and incorporating Digital Prototyping into the product development process gives manufacturers that edge. Autodesk provides this functionality through a complete, easy-to-learn set of design applications and a wide range of partners for consultation regarding what is needed to make Digital Prototyping a reality.

10. What is the market saying about Digital Prototyping?

"To be best-in-class is not just about moving from 2D to 3D, but rather to push ahead to digital prototyping to answer questions about your product before you start to build it."

—Start-IT

"It [Autodesk] provides a comprehensive range of software solutions for the manufacturing industry including its flagship 3D design offering, Autodesk Inventor. The solutions redefine product design process by supporting and connecting all disciplines of product development, from industrial design to mechanical and electrical engineering, and manufacturing."

—Design News

"The latest Autodesk manufacturing solutions redefine the product design process by supporting and natively connecting all of the disciplines involved in product development, from industrial design to mechanical and electrical engineering and manufacturing."

—The Manufacturer

"With updates to Autodesk Inventor, AutoCAD Mechanical, AutoCAD Electrical, Autodesk AliasStudio, Autodesk Showcase and Autodesk Productstream software products, the company is offering a complete approach to digital prototyping that allows manufacturers to cost-effectively validate their ideas and foster product innovation."

—CXToday

"One company that began with digital prototyping is Thompson Couplings, maker of what it claims to be a world first in constant velocity shaft couplings. "We now have a team of people taking the concept into reality using [Autodesk] Inventor, so the ability to very quickly manufacture the prototype components and rapidly alter them for slight design modifications only takes an order of minutes."

—Computer World

"Gulf Stream Coach saw in digital prototyping the opportunity to reduce "information cycle times," according to Mark Smith, the company's chief information officer. Information cycle time is the time it takes to share and refine information between all parties involved in the production development process, including engineers, management and outside partners. "We move quickly; it's one of the things we are noted for," Smith says. "Yet our information cycle times were much longer than production cycle times."

—Industry Week

11. Where can I get more information on the Autodesk Digital Prototyping Solution?

A host of resources exist to help customers learn more about getting to best-in-class with the Autodesk Digital Prototyping Solution at www.autodesk.com/digitalprototyping

