

SIEMENS
Ingenuity for life

Siemens PLM Software

Mastertrim

Supporting the entire seat trim
engineering process

siemens.com/plm/mastertrim



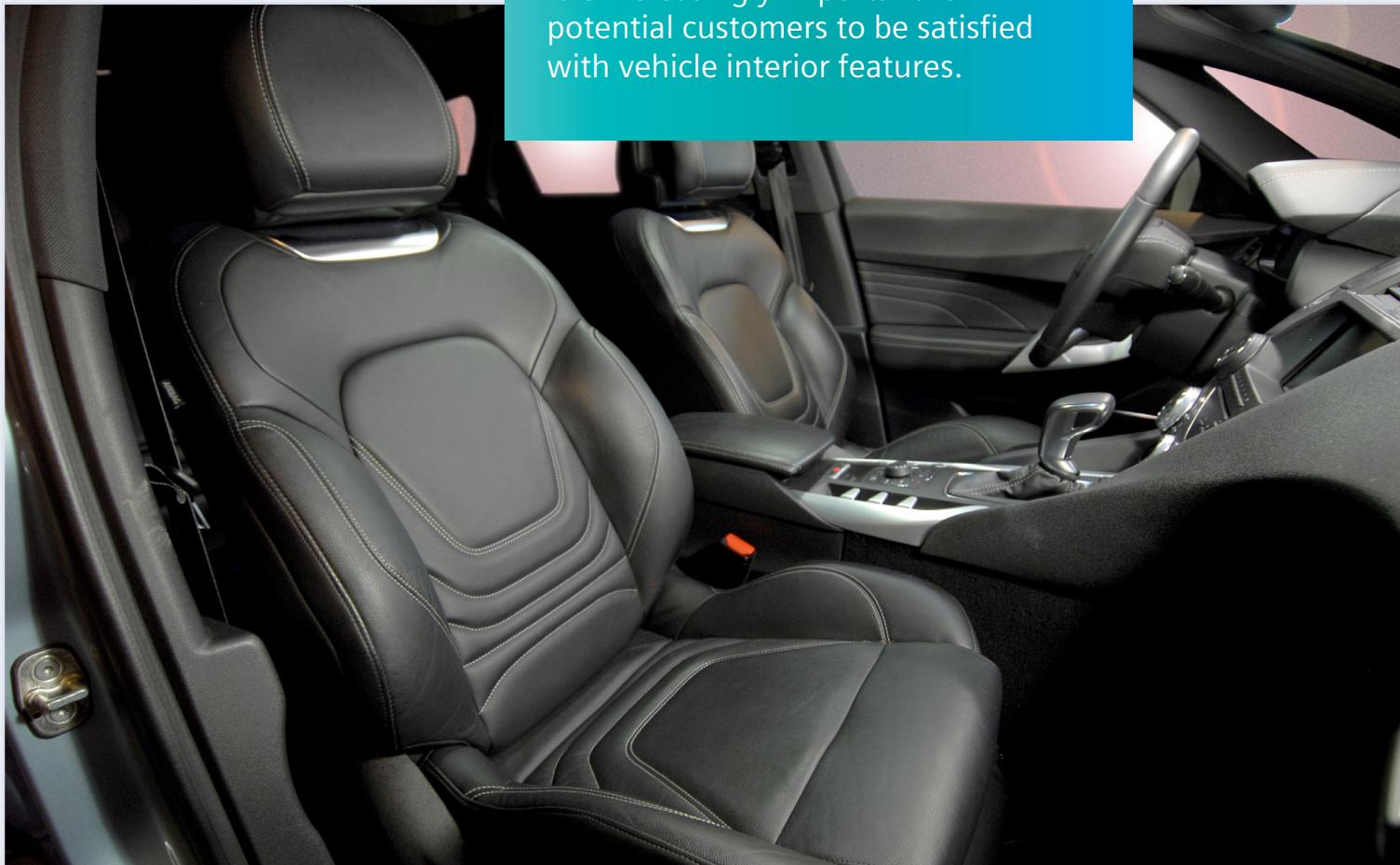
How will you design and manufacture the interiors of the future?

When it comes to vehicle interiors, style, comfort and quality drive end-user decision making. It is increasingly important for potential customers to be satisfied with vehicle interior features, placing new pressure on auto makers to reduce their time-to-market while also providing a living-room-on-wheels kind of experience. In order to differentiate between models in increasingly shorter cycle times, engineers must find a way to deliver more and better designs in less time.

To do this, seat engineers need a more productive workflow that includes:

- **Less reliance on physical prototypes**
- **More efficient and accurate design, validation and manufacturing development processes**
- **Streamlined collaboration and communication between styling, design and manufacturing as well as between original equipment manufacturers (OEMs) and the supply chain.**

It is increasingly important for potential customers to be satisfied with vehicle interior features.



How the Mastertrim digital twin can help

A digital twin is a complete computer model that provides the means to design, validate and optimize a product in the virtual world. Using the Mastertrim™ portfolio enables companies to create a digital twin, allowing them to work smarter and more efficiently during the seat trim engineering process.



Using Mastertrim enables you to:

Efficiently create the digital twin

- The computer-aided design (CAD) system becomes a system for trim engineers to create a complete digital twin, including all geometric and nongeometric data, such as seam type and the material needed to fully define seat trim

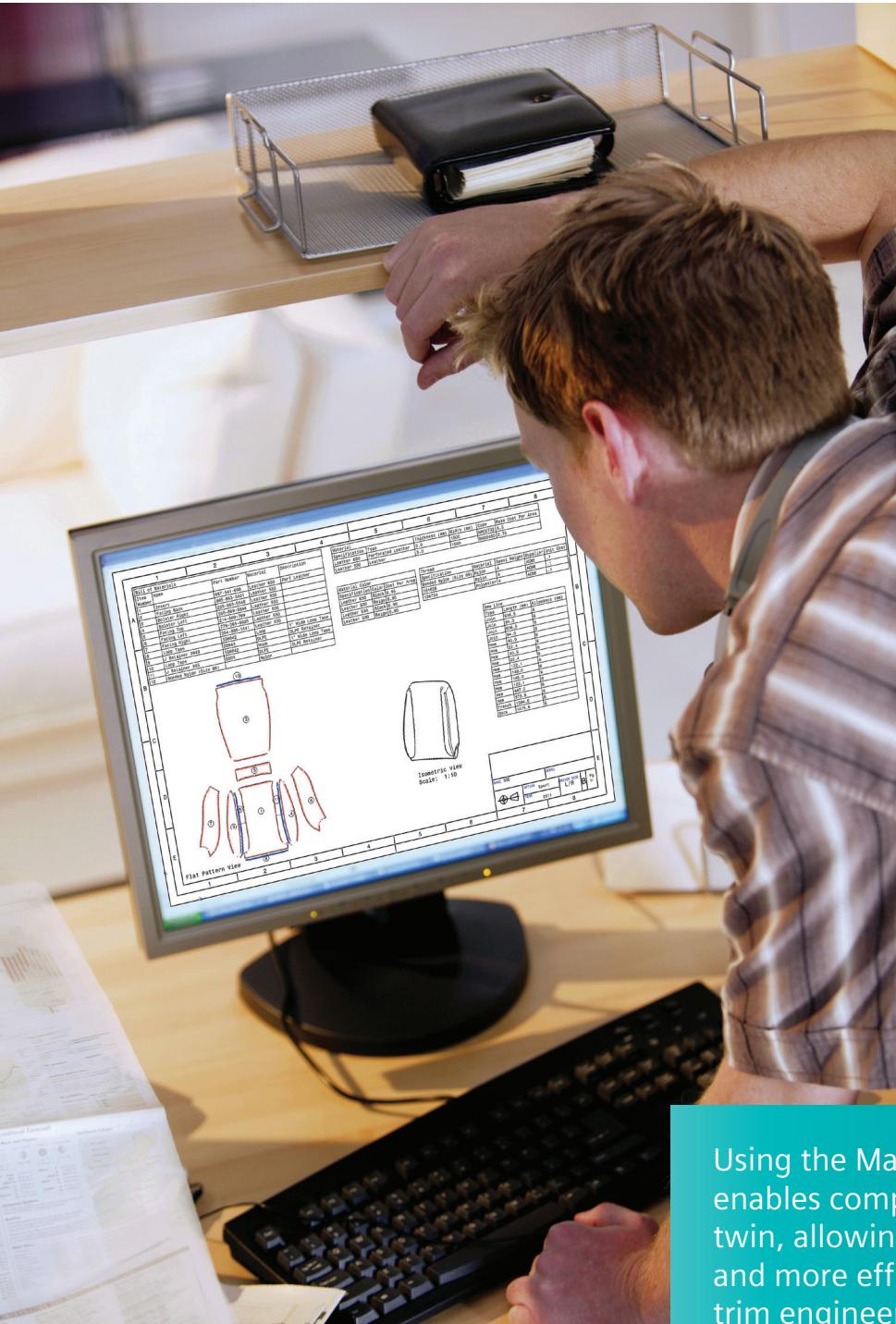
Leverage the digital twin for a more productive workflow

- Check design appearance and manufacturability, assess producibility and eliminate wrinkling without a prototype
- Generate patterns automatically with all seam allowances, notches, etc.
- Quickly check that cost targets are met by automatically generating reports for cost analysis
- Automatically generate engineering drawings, bills-of-material (BOM), quote documents and manufacturing instructions in custom formats

Integrate data within your product lifecycle management system

- All data can be managed by the product lifecycle management (PLM) system that manages your CAD data. For example, Mastertrim is integrated with Siemens PLM Software's Teamcenter® software

Get your products to market quicker



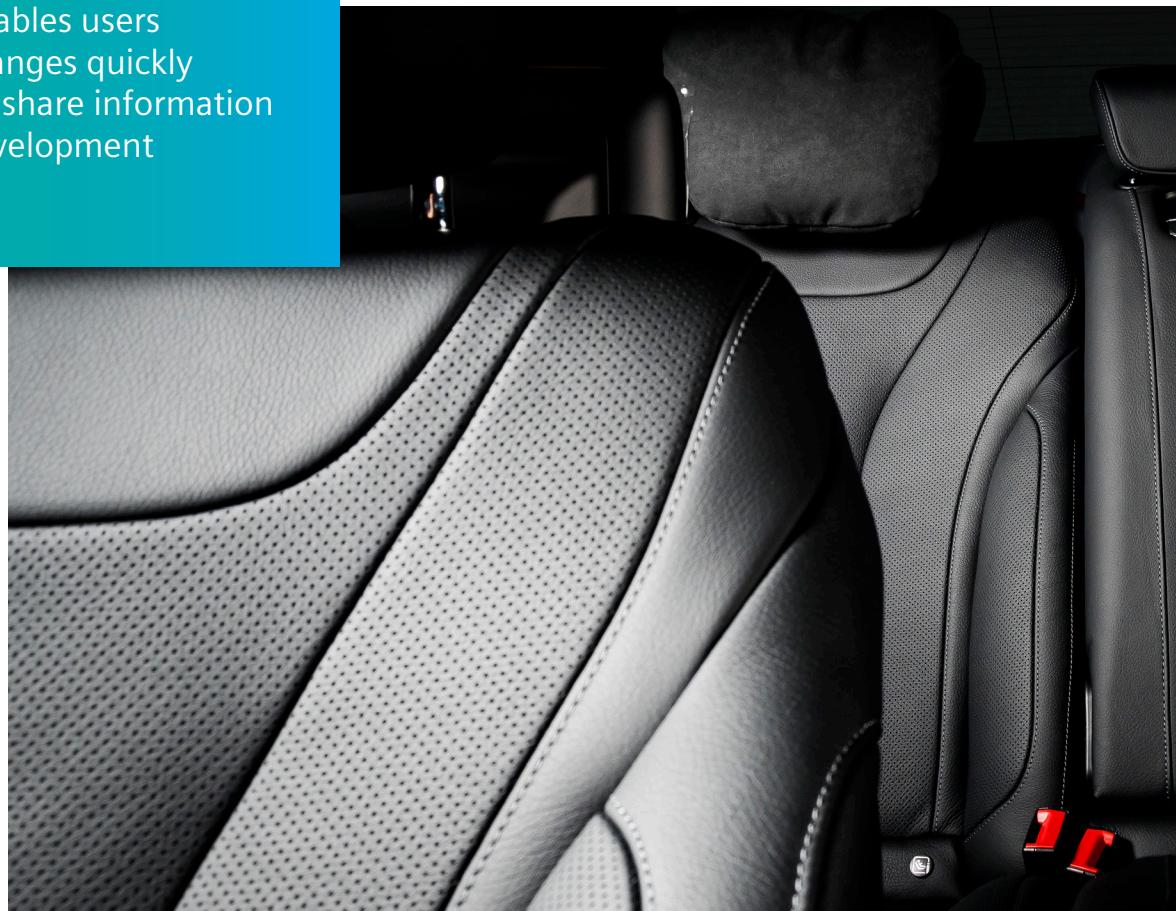
Mastertrim helps users solve these common challenges and complexities throughout the seat trim engineering design and manufacturing process, enabling manufacturers to:

- Reduce the time it takes to develop first proof of concept and initial flat patterns from days or weeks to just hours
- Cut time spent developing initial drawings and documentation for manufacturing and quotations by more than 90 percent
- Reduce time spent processing changes and generating updated documentations and drawings by 75 percent
- Generate more accurate quotations by reducing inaccuracy of cost estimates from over 5 percent to less than 2 percent

Using the Mastertrim portfolio enables companies to create a digital twin, allowing them to work smarter and more efficiently during the seat trim engineering process.

The design engineering process

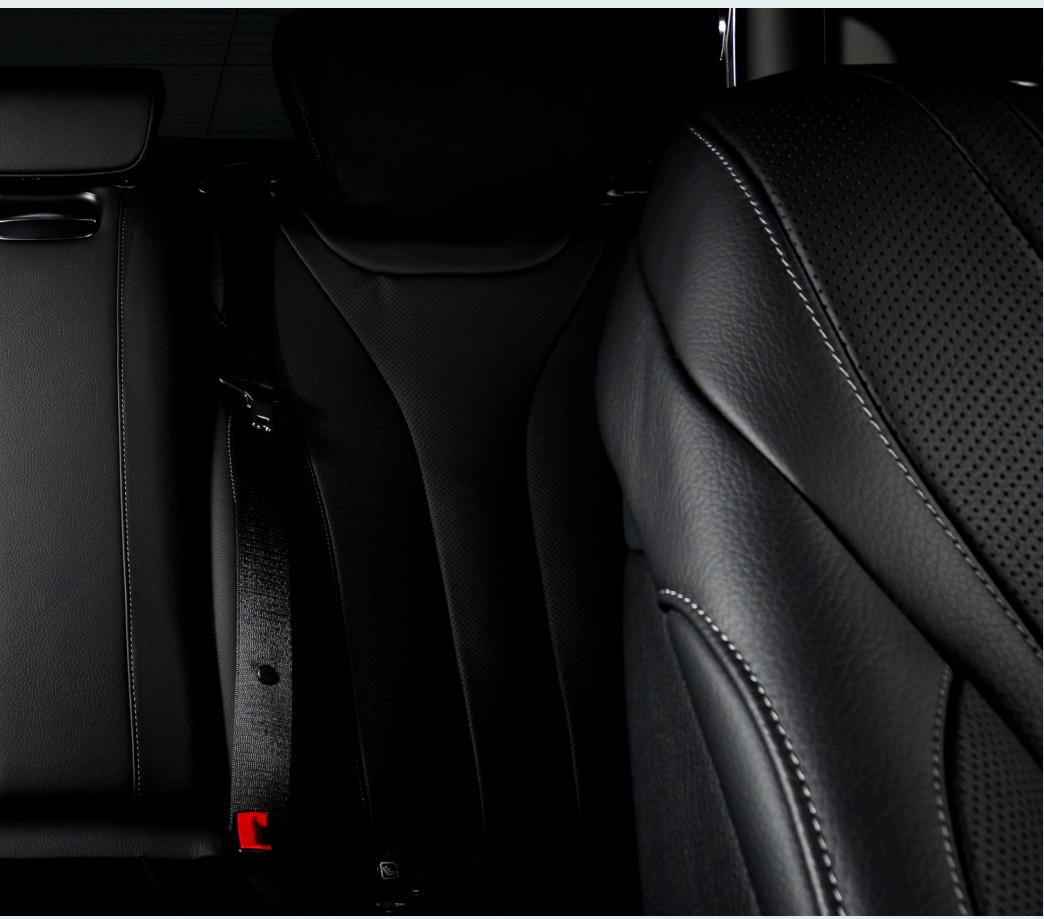
The digital twin enables users to make design changes quickly and efficiently and share information throughout the development process.



Using the digital twin to effectively share information throughout the development process

Using Mastertrim for design facilitates the creation of a 3D CAD digital twin by streamlining the task of authoring design data that defines a seat trim cover, including sew lines, cover pieces, materials, attachments and hardware.

The digital twin then enables users to make design changes quickly and efficiently and share information throughout the development process, facilitating a concurrent seat trim engineering process. Through this concurrent development process, designers are able to seamlessly integrate more accurate feedback into designs driven by a material property-based producibility assessment that identifies wrinkling and over tension.



Once designs have been fully optimized for producibility, the digital twin also enables users to easily generate a variety of deliverables, including design documentation and the BOM.

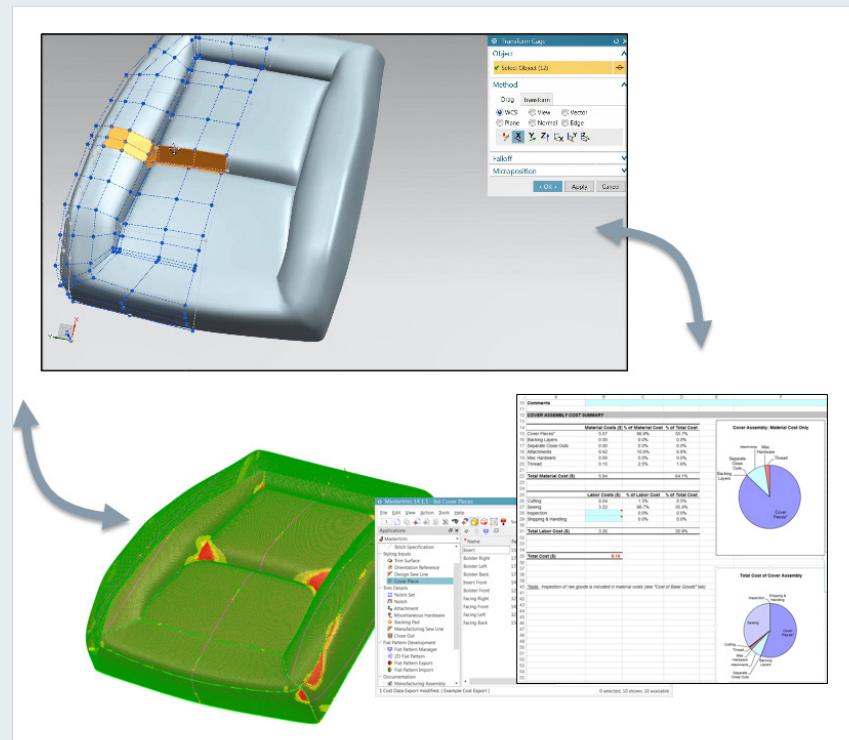
Benefits

- Provide accurate and complete trim cover data for quoting and manufacturing
- Quickly analyze impact of changes leading to less need for prototypes
- Enable efficient data sharing across the supply chain
- Allow engineers to focus on engineering rather than finding or formatting data
- Reduce bidding response time while improving bid accuracy
- Enable improved documentation that can reduce time and errors

Features

- All data is stored and managed in a single CAD model
- Drive downstream outputs with a 3D definition of seam allowances, notches, attachments and more
- Mastertrim simulation displays areas of wrinkling and over-tension based on material properties
- Generate accurate flat patterns with proprietary seam-length-matching algorithm
- Automatically generate BOM, costing data, engineering and manufacturing drawings from 3D definition

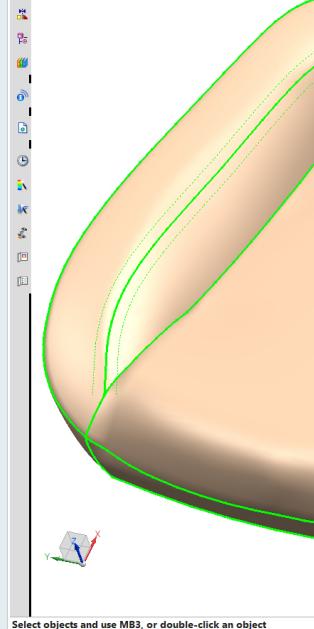
Easily communicate priorities and issues between stylists and engineering



One of the primary challenges in the seat trim design process is achieving concurrency between styling and engineering.

With Mastertrim, stylists and engineers can easily communicate priorities and issues via a single platform. Mastertrim is integrated with NX™ software and CATIA® software for CAD, allowing stylists to immediately see the impact of their designs.

This allows users to easily change shapes and sew lines on the same platform. With Mastertrim, stylists and engineers can easily collaborate to get feedback on potential manufacturing issues and quickly estimate the cost of styling or design change.

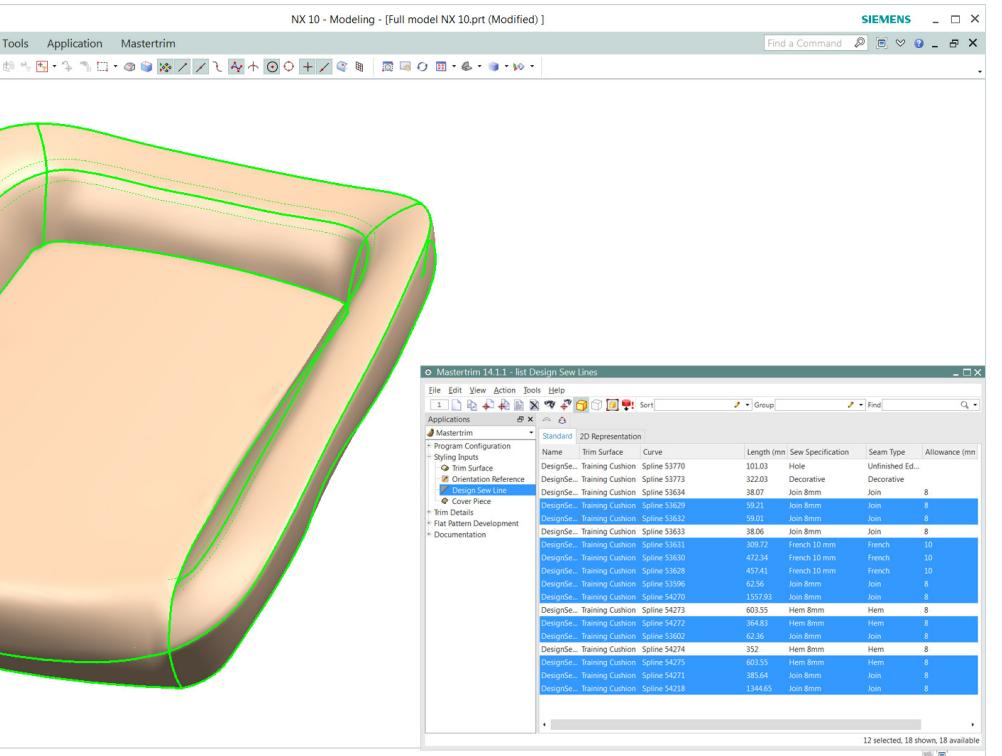


Create a complete digital twin model of your seat trim definition

One of the concerns of engineers is the lack of standardized engineering and trim definition processes across the lifecycle. The way to overcome that challenge is by providing accurate and precise design data in the digital twin so you can develop a complete seat trim cover definition.

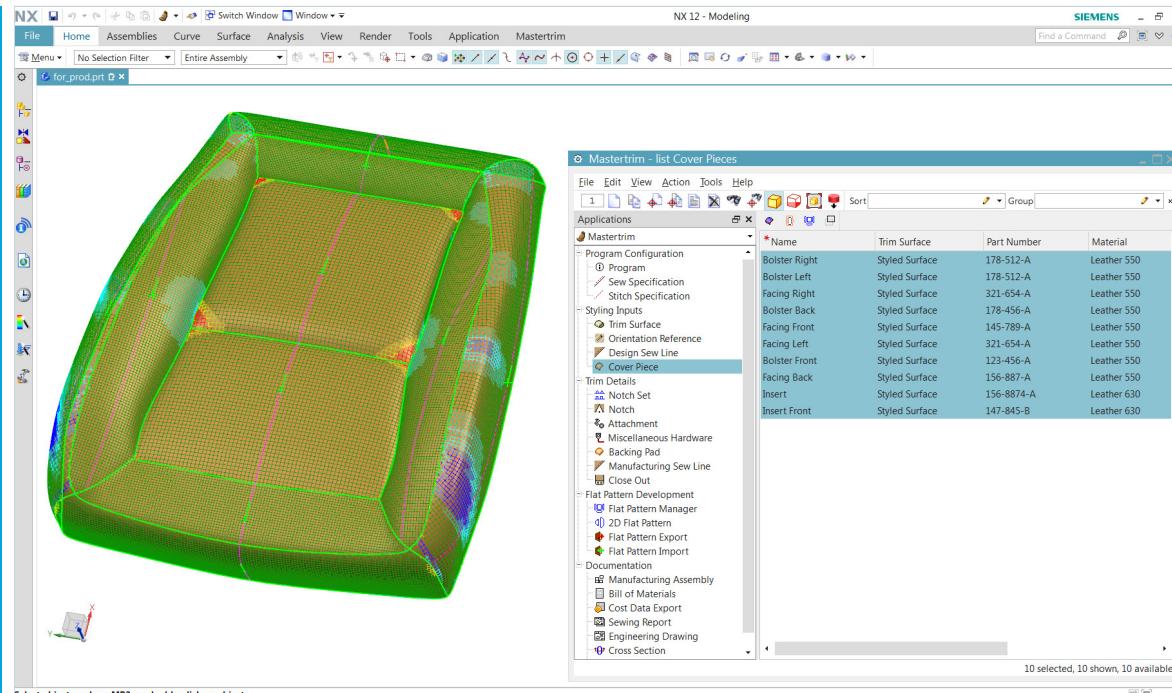
Mastertrim allows engineers to easily create a complete digital twin model of their desired seat trim definition, including geometric and nongeometric data, material, seam and attachment types and material and seam properties.

Creating this complete definition in the digital twin allows users to quickly and easily make changes to sew lines, assign names and add descriptive information to pieces and access material databases to sort and, find materials for design. Using Mastertrim enables engineers to work the way they think with a CAD-integrated solution that is aligned with the seat design development process.



Using Mastertrim enables engineers to work the way they think with a CAD-integrated solution that is aligned with the seat design development process.

Identify manufacturing issues early in the design process



The digital twin allows for design decisions to be made early in the design process.

Delays in the design process can result when having to wait for physical prototypes to help resolve manufacturing issues. The best way to address the problem is by eliminating design errors and using producibility simulations to diagnose potential manufacturing issues.

By enabling you to identify manufacturing issues early in the design process, Mastertrim allows users to validate the quality of cover fit and assess manufacturing issues. When issues are uncovered, design engineers have the choice of selecting alternative materials or moving seams to easily address any issues.

The digital twin allows for design decisions to be made early in the design process, decreasing the need for prototyping, thus significantly reducing overall design time and time-to-market by ensuring the first article will be closer to final production configuration.

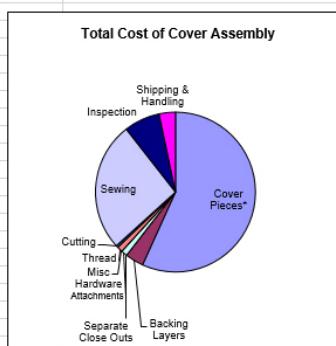
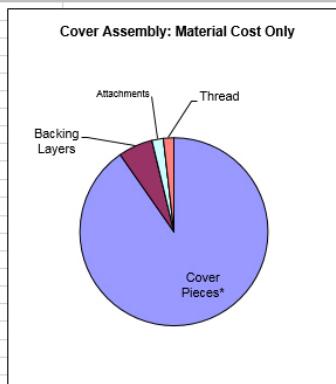
Automatically understand the cost implications of your designs

Historical data doesn't always give you accurate cost estimates. As they say in the financial services industry, past performance is no guarantee of future performance. The answer is to automatically generate detailed cost analysis early in the design and bidding process for more accurate cost estimates.

Small changes in a design can have dramatic cost effects. With Mastertrim, early in the design process you can produce accurate cost estimates driven by design details, such as material area, length of seams, attachment,

materials used and seam types. Mastertrim automatically generates data needed from the design details in the seat trim cover digital twin. As a result, you can assess the cost impact of design decisions quickly and use this data during bidding, design and manufacture.

Total costs of assembly			
Part Number(s)	123-665	Created by	Siemens
Amended by	SES	Comments	Revision B
COVER ASSEMBLY COST SUMMARY			
	Material Costs (\$)	% of Material Cost	% of Total Cost
Cover Pieces*	8.61	90.3%	56.8%
Backing Layers	0.57	5.9%	3.7%
Separate Close Outs	0.00	0.0%	0.0%
Attachments	0.19	2.0%	1.2%
Misc Hardware	0.00	0.0%	0.0%
Thread	0.17	1.8%	1.1%
Total Material Cost (\$)	9.53		62.9%
	Labor Costs (\$)	% of Labor Cost	% of Total Cost
Cutting	0.06	1.1%	0.4%
Sewing	3.97	70.5%	26.2%
Inspection	1.10	19.5%	7.3%
Shipping & Handling	0.50	8.9%	3.3%
Total Labor Cost (\$)	5.63		37.1%
Total Cost (\$)	15.16		
 <i>Note: Inspection of raw goods is included in material costs (see "Cost of Base Goods" tab)</i>			



Small changes in design can have dramatic cost effects.

Generate engineering documentation at the press of a button

Creating engineering documentation manually can be tedious and error prone, so automating the process is key to developing reliable documentation.

The value of Mastertrim becomes evident when users automatically generate engineering documentation. Customizable details are automatically incorporated into drawing and

documents, including labeling for flat patterns, annotated 3D cross-sections, coloring by material, customizable tables and labeling of isometric views.

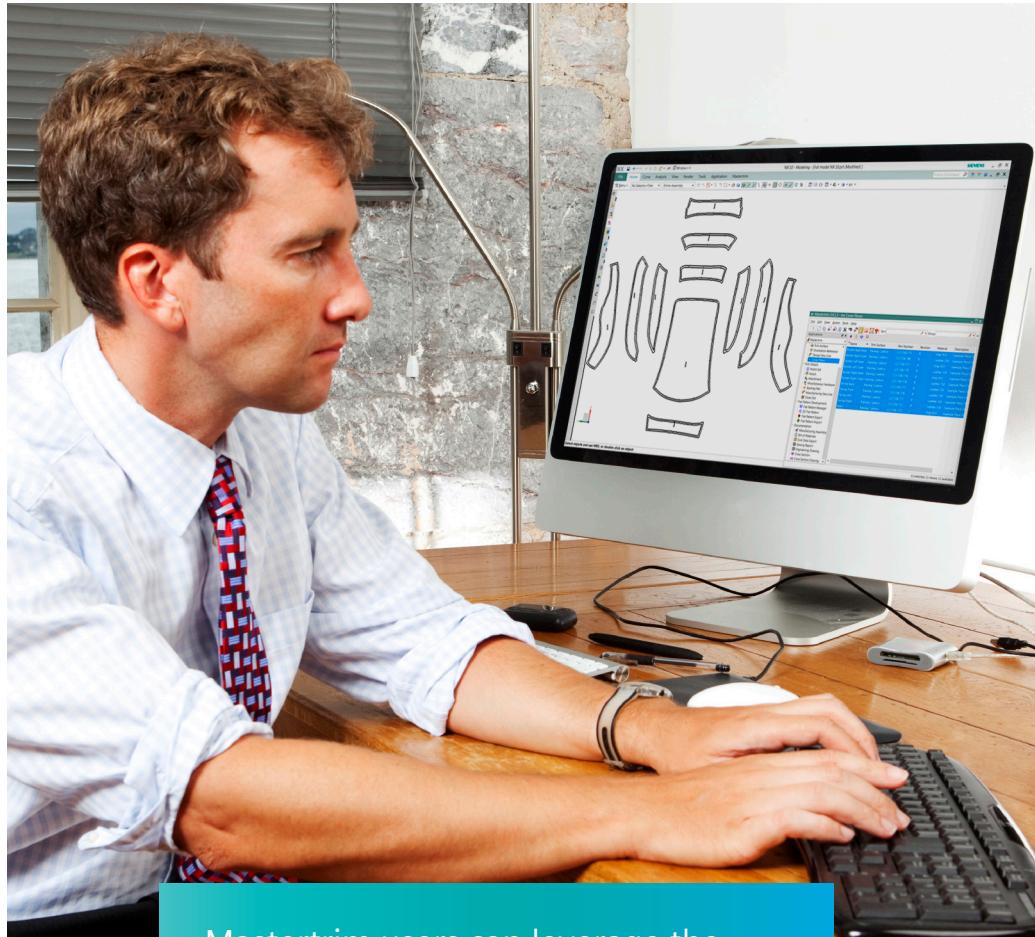


Save time and material when producing flat patterns

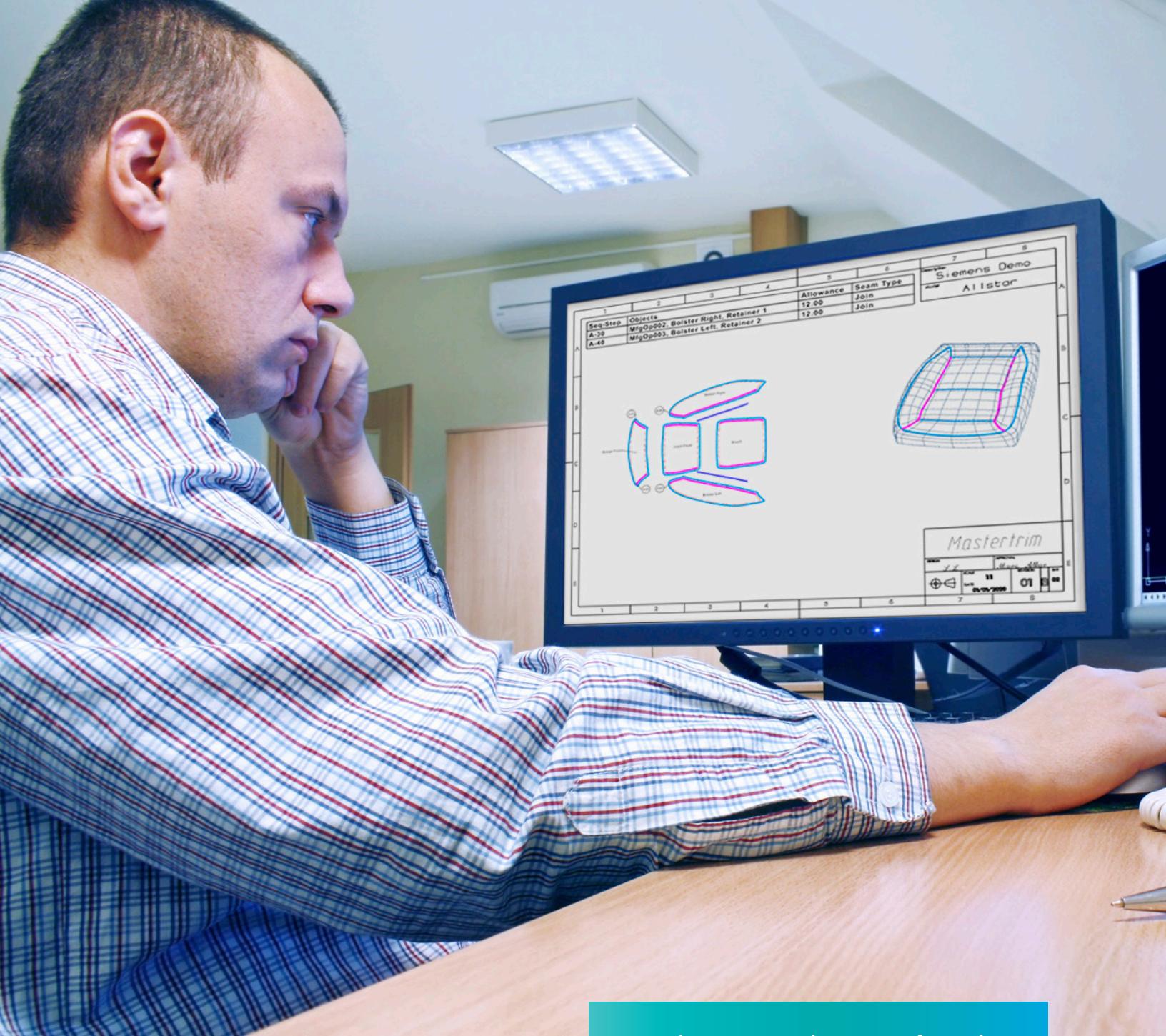
Manufacturers often rely on long lead times and guess-and-check methods for 2D pattern fit. However, they can save time and material by developing accurate production flat patterns with Mastertrim.

Mastertrim users can leverage the seat trim digital twin to automatically develop 2D flat patterns. This avoids having to wait for a foam bun and the usual trial-and-error flat pattern creation process, wasting time and material. Rule-based automation of notches and sew specifications allows users to ensure that flat patterns are generated based on company-defined rules.

Using Mastertrim also enables you to capture modifications needed to account for shrinkage and expansion as well as seam allowances, notches and grain direction. Manufacturing design details such as attachments, clips and labels can also easily be added, reducing the time it takes to prepare a design for manufacture.



Mastertrim users can leverage the seat trim digital twin to automatically develop 2D flat patterns.



By using Mastertrim, manufacturing is able to simplify downstream operations and communicate effectively with the manufacturing floor and suppliers.

The manufacturing process

Increasing productivity and reducing errors with Mastertrim

The Mastertrim digital twin enhances communication of the seat trim definition between design and manufacturing. For instance, manufacturing can identify producibility issues such as wrinkling and communicate this to designers before a prototype is manufactured.

One of the greatest benefits of the seat trim cover digital twin is demonstrated when users are able to automatically generate the data and customized detailed documents needed for trim cover manufacturing, saving a tremendous amount of time by increasing productivity and reducing errors.

By using Mastertrim, manufacturing is able to simplify downstream operations and communicate effectively with the manufacturing floor and suppliers.

Benefits

- Enables storage of details in the digital twin for easy reference and manipulation
- Enhances the connection and communication between design, engineering and manufacturing
- Facilitates a concurrent process so no foam model is needed for initial development of flat patterns
- Saves significant time and material when developing final production patterns
- Saves time by automatically generating documents and data from a single source
- Reimports and relinks edited or legacy patterns so all benefits of the digital twin for automatic data and document creation can be realized without a 3D CAD trim model



Features

- Easily define notches with rule-based notch creation
- Author locations for a variety of items, including attachments, clips and labels
- Advanced algorithms generate highly accurate 2D patterns from 3D definition
- Flat patterns that include seam allowance, notches and grain direction can be exported directly to 2D editing and cutter nesting software
- Manufacturing operations are virtually defined and visually represented in Mastertrim
- Automatically create manufacturing documentation, including sewing reports and BOM
- Import 2D legacy flat patterns to generate and update documents and costing

Facilitating accurate, feature-driven manufacturing costing

An imprecise assessment of manufacturing cost can play havoc with your go-to-market plan. As such, it is critical to have accurate, feature-driven cost modeling so you can quickly calculate manufacturing costs based on design and manufacturing details.

Using Mastertrim facilitates the manufacturing costing process by exporting data directly into a manufacturing cost model, enabling quick calculations based on company-specific parameters and requirements, thus making it easy for users to shorten the time it takes to accurately forecast manufacturing costs.

Details such as the length and type of each sewing operation, critical manufacturing notes, attachment types, attachment sewing process, quantity of notches, types of notches, areas of patterns, material costs driven from databases, sewing machines and more can be included in the cost calculation.



It is critical to have accurate, feature-driven cost modeling so you can quickly calculate manufacturing costs based on design and manufacturing details.

Customize and generate manufacturing documentation



Manually creating manufacturing documentation is time-consuming and often inaccurate. The solution is to leverage the digital twin to automatically generate manufacturing documentation.

Mastertrim allows users to quickly generate customized sew documents for manufacturing that include 2D and 3D part and piece images, highlighting sew operations, standard title blocks, diagrams and logos as well as tables and form elements. Users save time because documentation is generated automatically from the digital twin, thus allowing for changes to be made easily and as needed.

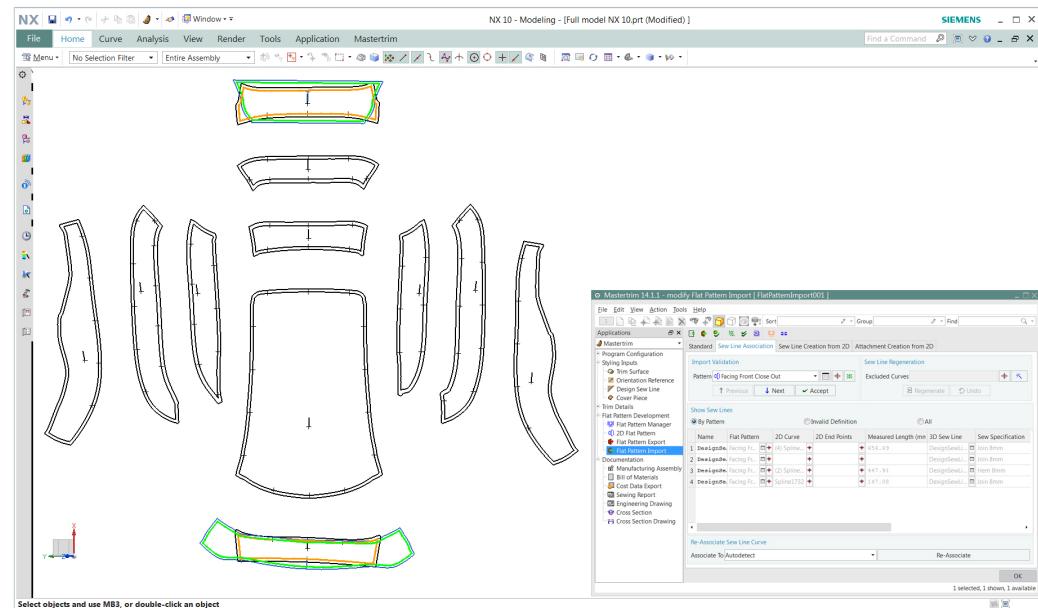


Seamlessly exchange data between 2D pattern editing and nesting software

Exchanging data between 3D and 2D systems for editing and nesting can be time-consuming and error prone. Using Mastertrim enables you to seamlessly exchange data with your choice of 2D pattern editing and nesting software.

With Mastertrim users can format patterns for editing in the 2D editing software of their choice. Existing 2D flat patterns can be imported into Mastertrim and then edited or

used to measure area, perimeter and lengths as well as generate documents and cost data. This provides a two-way link between 2D editing applications and Mastertrim, allowing legacy data to be brought into the digital twin so a new design can be started based on a previously defined set of flat patterns.





About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Digital Factory Division, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, Siemens PLM Software works with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

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