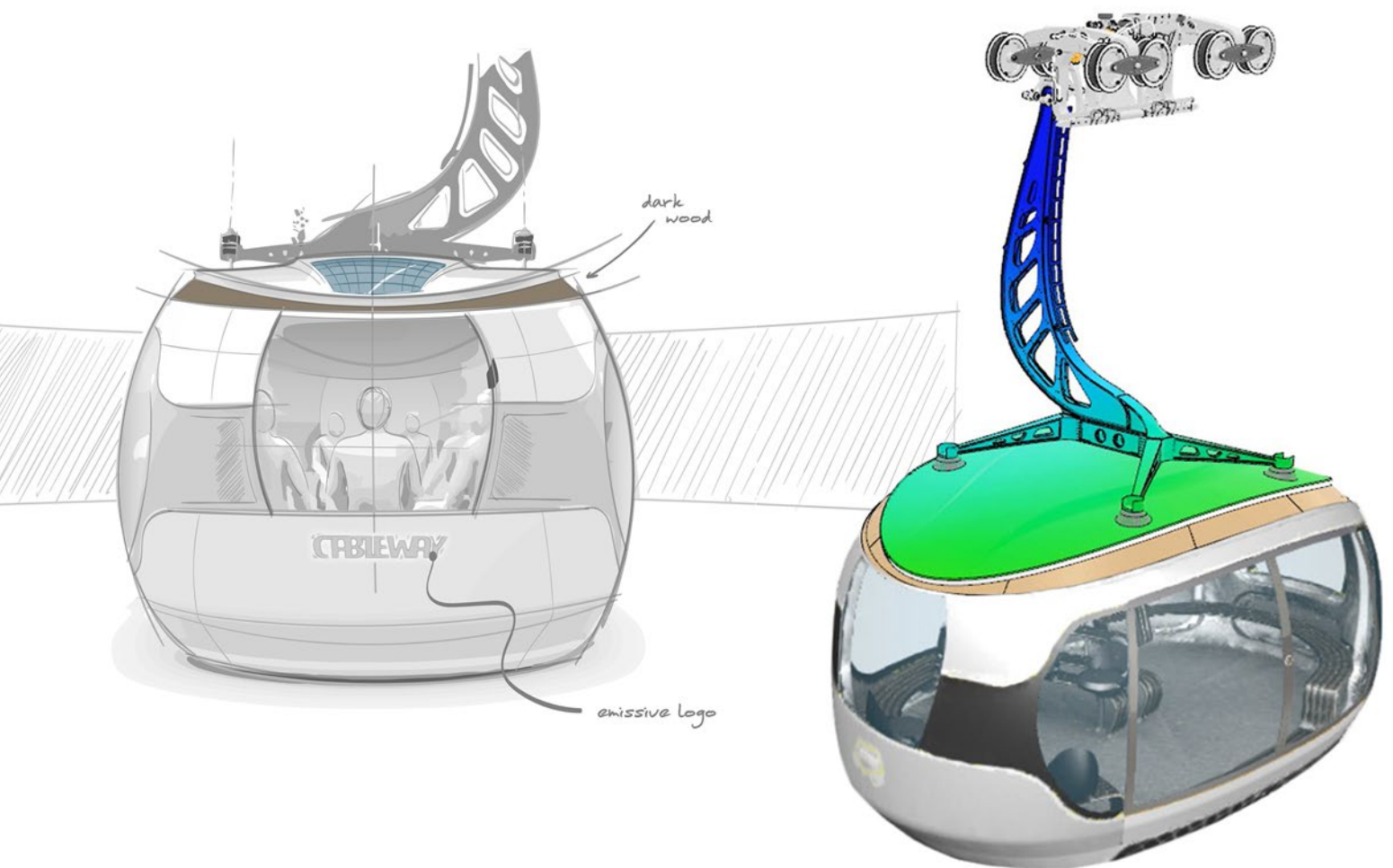


IMPROVE STRUCTURAL PERFORMANCE OF PRODUCTS, FASTER LEVERAGING ADVANCEMENTS IN SIMULATION FOR DESIGNERS



EXECUTIVE SUMMARY

An increasing number of companies are cutting design time and costs while accelerating innovation by making physics-based simulation an integral part of their design process. Accurate simulation results are able to guide early design decisions, reduce the reliance on expensive physical prototypes, minimize the risk failures during physical testing and drive optimization to improve factors such as weight and strength.

Despite these benefits, some companies still implement simulation only at the end of the design process, or only as a diagnostic tool after things go wrong. This can be because of concerns about the compatibility of CAD and simulation tools, or due to reluctance of designers and engineers who are not trained to use simulation.

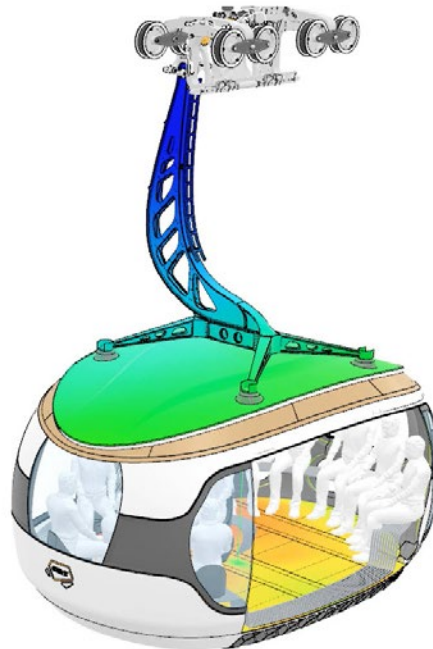
This whitepaper details the Dassault Systèmes SIMULIA structural simulation offering, based on proven Abaqus technology, and integrated with CATIA for 3D modelling and design. Because both SIMULIA and CATIA operate on the **3DEXPERIENCE**® platform, they can be used interchangeably. They are also connected to other Dassault Systèmes applications for data management and collaboration. The integration between CATIA and SIMULIA tools and the guided, easy-to-use, common user interface means that even non-experts can quickly set up and run simulations to gain insight into their design's performance at every stage of the process.

BENEFITS OF SIMULATION IN DESIGN

Computer-aided design and engineering technology has been maturing for decades, and today it is used to develop products from aircraft and cars to smartphones and bottles, to medical devices and athletic shoes. With design and simulation technology both widely accepted in industry, the next step for businesses looking for an advantage is to leverage the two technologies concurrently.

In structural simulation, the mechanical behavior of an object or system is modeled using physical equations in order to calculate phenomena such as stress, torsion, contact, bending and buckling. This means that simulation can be used for a broad range of structural applications across all industries.

For example, it is used to analyze the distribution of stresses within a vehicle body and identify any potential weak spots or to model whether a tablet will withstand if dropped on a hard floor. The visualization capabilities of simulation software can graphically show the results on the product structure and its components, in a detailed way that physical tests cannot.



The linear and nonlinear structural performance of CATIA designs – from parts to assemblies – can be evaluated quickly using Abaqus-based structural simulation applications on the **3DEXPERIENCE** platform.

SIMULATION FOR CATIA DESIGNERS

CATIA, from Dassault Systèmes, is the world’s leading solution for product design and experience, used in many leading organizations in Automotive, Aerospace and a wide range of other industries. Alongside CATIA, Dassault Systèmes also develops simulation tools through its SIMULIA brand. The tight integration between CATIA and SIMULIA applications allows this state-of-the-art simulation technology to be implemented seamlessly in the design process.

SIMULIA’s structural simulation roles, based on proven Abaqus technology, are easily accessible within the intuitive, easy-to-use **3DEXPERIENCE** platform, which is also used by CATIA users. The simulation roles provide automatic meshing and interactive and guided workflows to help designers to quickly and accurately set up and run meaningful simulations.

For structural simulation, the workflows include accurate linear structural, steady state thermal, buckling and natural frequency simulations. All simulation types are accessible from the same interface, so different aspects of a design concept can be considered at the same time. The ability to model contact and bonded connections makes it easy to combine multiple different parts into a single simulation file. This scalable set of simulation roles offer basic to advance simulation power –if required for scenarios that are more complicated.

In the case of Globe Trailers, the company needed to double production volume of their Lowboy Trailers in order to meet high demand. The company selected Dassault Systèmes’ **3DEXPERIENCE** platform due to its ability to provide integrated design and simulation capabilities with a single view of the truth available globally in real time.

Whether in the office, working from home or on business travel, the platform is always accessible. This enables the designers and engineers at Globe Trailers to work with team members in remote locations. In the past, Globe Trailers engineers would have to export the analyses, transfer the files, which could be very large—and then the other team member would have to re-import the models to work on them. The **3DEXPERIENCE** platform makes it easier to share information and collaborate quickly and effectively on design performance reviews.

In addition, time is also critical for Globe Trailers. If there is an issue, they need to solve it within hours, so the shop can build the trailer without delay. Their design team found the unparalleled flexibility and robustness of the simulation roles helped them perform simulations faster and optimize their design, while saving time and money.

Traditional Development Process



Simulation Driven Design Process



EVALUATING PERFORMANCE OF NEW DESIGNS

In the electronics industry, consumer expectations are extremely high for functionality, robustness performance, and reliability. Manufacturers, as in other industries, are under pressure to develop and deliver innovative new products in shorter amounts of time and at lower costs, while meeting government regulations and performance requirements.

According to a recent survey of 272 manufacturers conducted by Tech-Clarity, an independent research firm that focuses on engineering software, 44% of those responding said that the decisions that impact competitiveness have gotten harder.

The majority say it is the very requirements that help them improve competitiveness, deliver higher quality and improve product performance that have made design decisions harder. Plus, as the



Making stronger, safer, more reliable trailers

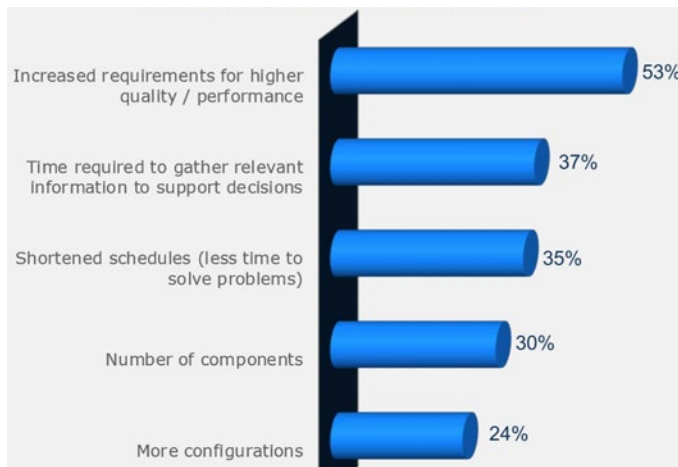
Discover how Globe Trailers was able to combine design and simulation on the **3DEXPERIENCE** platform to optimize production workflows and meet business goals for higher-quality products and faster time to market.

*“Using the **3DEXPERIENCE** platform on the cloud, we collaborate globally to make stronger, safer and more reliable trailers than anyone else.”*

— Jeff Walters, VP of engineering, Globe Trailers

[Read the case study and view the customer video](#)

WHY DESIGN DECISIONS ARE MORE DIFFICULT



Source: Tech Clarity Report; HOW TO SURVIVE AND WIN NEW MARKETS BY GETTING EVEN MORE VALUE FROM SIMULATION

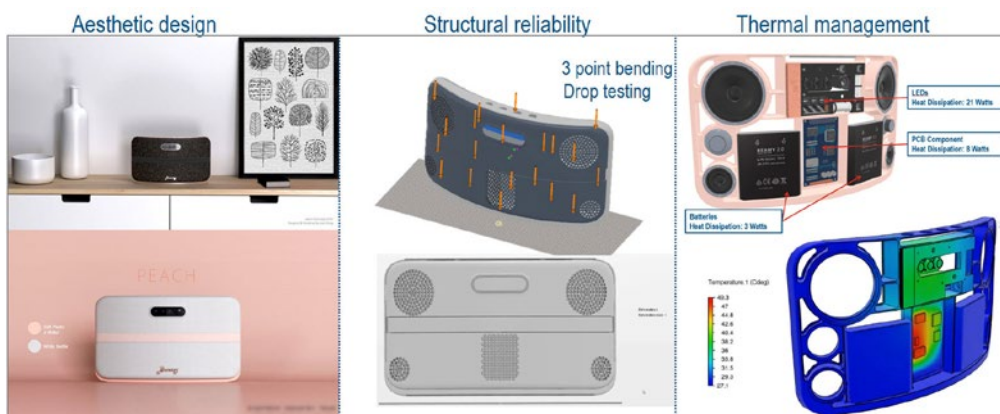
products themselves become more complicated there are even more factors to consider. Evaluating multiple design configurations, and meeting functional requirements takes additional time, yet shortened development schedules mean engineers have less time to spend on analyzing the impact of their choices. According to Tech-Clarity's report, this puts designers in a nearly impossible situation, continually trading off between quality and time, without driving up product cost.

Simulation for Designers from Dassault Systemes provides product development teams with a more efficient and streamlined process for designing and virtual testing their product performance, which helps reduce the time and costs of physical testing. Models from CATIA and other tools are able to be used for structural simulation without the need for specialist simulation expertise, thanks to guided simulation setup through a customizable User Assistant panel for fast adoption and reduced learning curve.

Virtual prototypes can be created without the need for sourcing materials and building machining. This means that creative ideas can be tested virtually much earlier in the design process without the time and cost of constructing prototypes.

"What if?" design studies also become more powerful when the real behaviour of these alternatives can be simulated. KPIs can be met without having to shut down promising ideas early, and even very unconventional concepts can be tried out to ascertain their feasibility and potential. Understanding the behaviour of more of the design space allows faster and more disruptive innovation.

Even later in the design process, simulation still plays a role in supporting and reducing the number of physical prototypes needed. Increasingly, regulators are permitting the use of simulation in the certification process where once only physical test results were accepted, and even when a real prototype is needed, simulation can be used to ensure that potential issues have been addressed before committing to manufacturing.



Accelerate performance-based decisions and reduce physical prototypes by using the same model for design and simulation, with shared data management and collaboration apps, to bring innovative products to market faster.

Another benefit of design integrated simulation is that, when used in combination with process management tools, it can automate many of the more tedious and time-consuming parts of design. For example, automated simulation methods can explore numerous different design variations in order to find the right balance between strength and weight without the need for the engineer to manually create each test case. By letting the computer do the work, users can also find novel solutions to problems that usual design techniques might not have discovered, such as by finding a more efficient way to support the structure.

Taken together, these benefits of design integrated simulation enables individual designers to work more efficiently with less trial and error. And ultimately, it enables product developers and manufacturers to cut design times and costs without compromising on quality.

ACHIEVING REAL BUSINESS VALUE

Also according to Tech-Clarity’s survey, as companies face increased product complexity and are challenged to make informed design decisions quickly, they are finding significant value in a cloud based platform solution that supports the integration of design simulation.

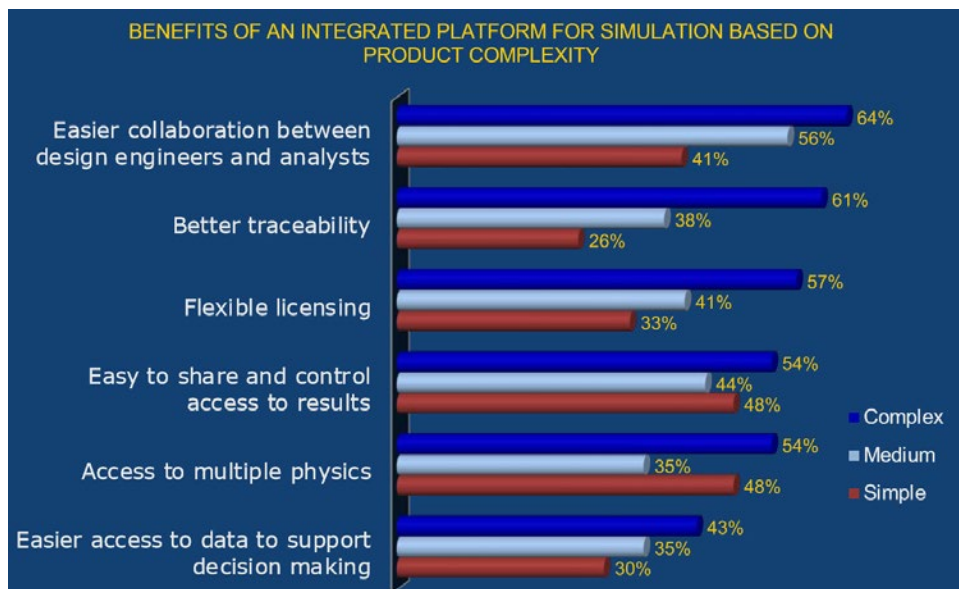
As their survey results show in the graph below, manufacturing companies cited several benefits of an integrated platform. Top among those benefits are easier collaboration between design engineers and simulation experts, especially when faced with complex product development.

Additional benefits reported include:

- better traceability,
- flexible licensing,
- access to more physics applications
- easier access to data to support decision-making.

Dassault Systèmes’ **3DEXPERIENCE** platform integrates many different applications in a common environment, while also offering a single shared source of truth for all CAD models, simulation results, reports and other data. Sharing data like this saves time and avoids the errors associated with using the wrong version. Design changes are immediately reflected in the simulation model and multiple simulation scenarios can reference the same design.

The applications available on the platform can run in the cloud, making design and simulation software available anywhere, without the need for high-end hardware on site. Data security is paramount, and with **3DEXPERIENCE** platform, access to designs and simulations can be easily controlled, making them available to only those who need them. Once the simulations are complete, reports, graphs and animations can be generated and shared with anyone located anywhere in real-time.



Source: Tech Clarity Report; HOW TO SURVIVE AND WIN NEW MARKETS BY GETTING EVEN MORE VALUE FROM SIMULATION

CONCLUSION

Simulation for Designers unlocks huge potential for innovation in the design process. As shown by a number of case studies, integrating simulation in the design process can significantly accelerate development while cutting costs. The ability to connect SIMULIA simulation applications directly to CATIA on the **3DEXPERIENCE** platform allows for seamless and guided workflows that enables designers—who aren't simulation experts—to use the technology easily, quickly and accurately.

While maintaining full control over sensitive data, simulation results can be shared quickly among team members anywhere, whether working in the same office, from home offices or in other countries.

Dassault Systèmes' Simulation for Designers roles enables companies in any industry to evaluate if their design is on course to meet performance and reliability KPIs sooner in the development process. This helps them ensure that their products meets necessary functional requirements and government regulations sooner to avoid unpleasant surprises during testing or manufacturing. Ultimately, it enables them to bring high-quality, innovative products to market faster and more competitively.

KEY FEATURES

Easy to access and easy to use

- Guided simulation setup
- Automatically maintains associativity between design and simulation
- Ensures design-decision traceability
- Efficient what-if scenarios during the design process

Powerful structural simulation technology

- Based on Abaqus technology for linear, nonlinear, static, quasi-static, dynamics, sliding contact interactions, large deformations, large strain validation
- Material calibration for accurate material behavior modelling

Collaborative, secure platform in the cloud

- Share simulation results and collaborate on your design projects from anywhere
- Single, centralized, secure location on the cloud for all your engineering data
- Cloud computing for handling validation of larger models without taxing your local machine

Our **3DEXPERIENCE**® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit www.3ds.com.



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