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Simulation Software in Product Development
Drives Digital Transformation at Lightspeed

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*With the right support, opportunity knocks.*
- Anonymous

ptc + Ansys

DEFINING DIGITAL TRANSFORMATION

PTC defines digital transformation (DX) as a broad business strategy, applicable across all industries, to solve traditional business challenges and create new opportunities through the use of technology. We believe that introducing simulation early in the design process should be part of any discrete manufacturer's digital transformation efforts. Below, we discuss both our reasoning and the results of a three-year Ansys-sponsored study *Quantifying the Return on Investment in Simulation-Led Design Exploration.*

SIMULATION-LED DESIGN: WHAT IT IS AND WHY IT MATTERS

Simulation software has been around for decades, but it's been the province of specialized analysts with massive computing power. Using advanced physics, analysts test and validate models just before final physical prototyping – by which time 90% of product costs are already baked in. These simulation runs can take weeks. If a major design flaw emerges, the product team may find itself going back to the proverbial drawing board, an experience one designer said was akin to 'falling through a trap door'.

Our experience shows that manufacturers looking to cut costs, create better products, and get to market faster need to move simulation upfront in their design process. Don't be intimidated. Technology advances have democratized simulation, and tools now exist to serve the needs of non-specialists who need directional guidance or answers to basic questions. For example, Creo Simulation Live, powered by Ansys, runs in the Creo design environment and responds automatically in real time to any changes designers make to their model.

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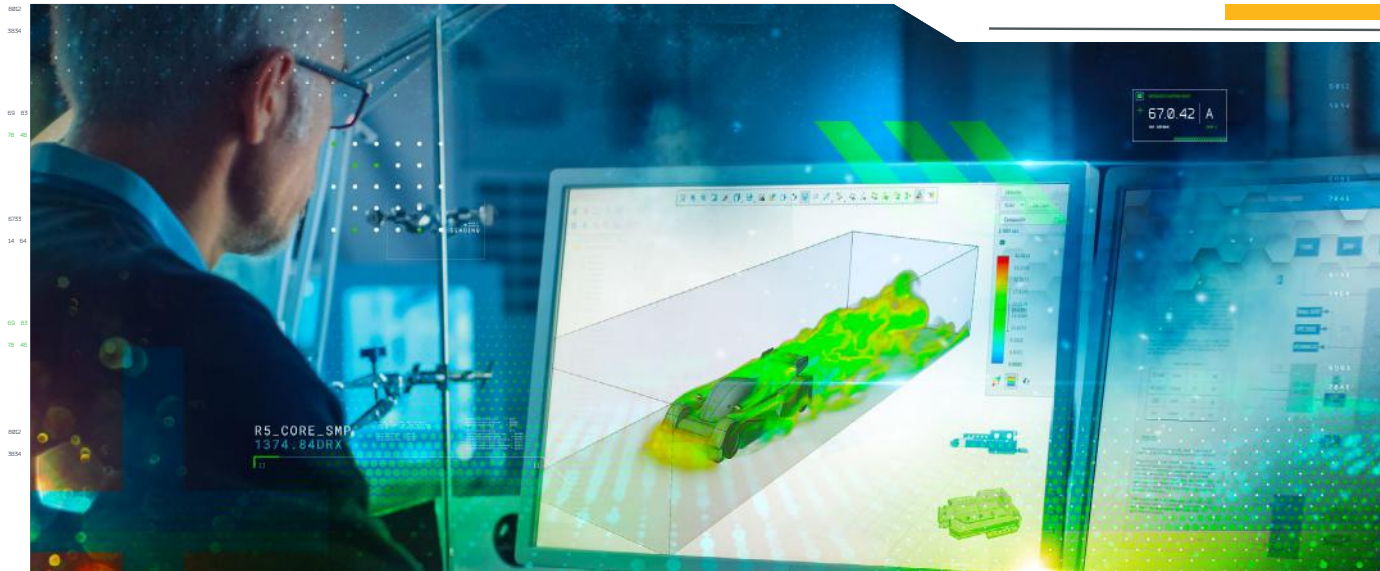
With simulation-led design, engineers can explore different designs and understand product performance during the concept and early design phases. Compared to the traditional iterative method of beginning with a model, simulating it and then going back to refine the model, using Ansys software for simulation-led design considerably shortens the time from concept to completion.

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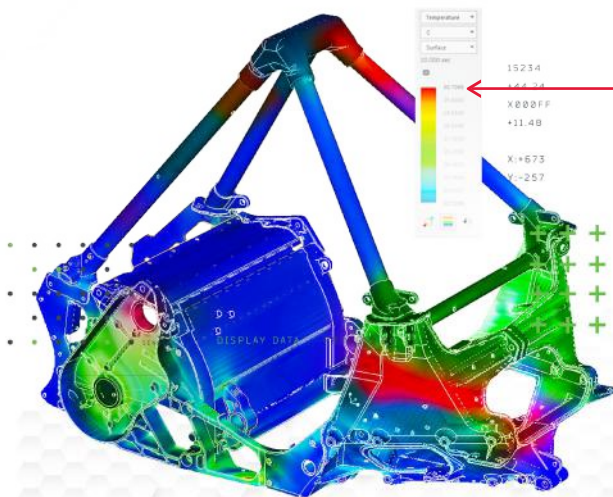
Red means "watch out." This example of structural simulation allows users to determine if an object will survive its operating environment or if the loading will result in permanent deformation or failure. The results are easy for non-specialists to interpret.

Consider what would happen if your product designers used simulation that was built into their CAD tool and did so from the first moments of design. Your designers could lead their design process informed by simulation. They could test basic scenarios, rapidly iterate, and advance their own models to the point where analysts can spend more time on issues that merit their expertise. What impact might that have on the economics of your product development efforts or on the likelihood that innovation emerges?
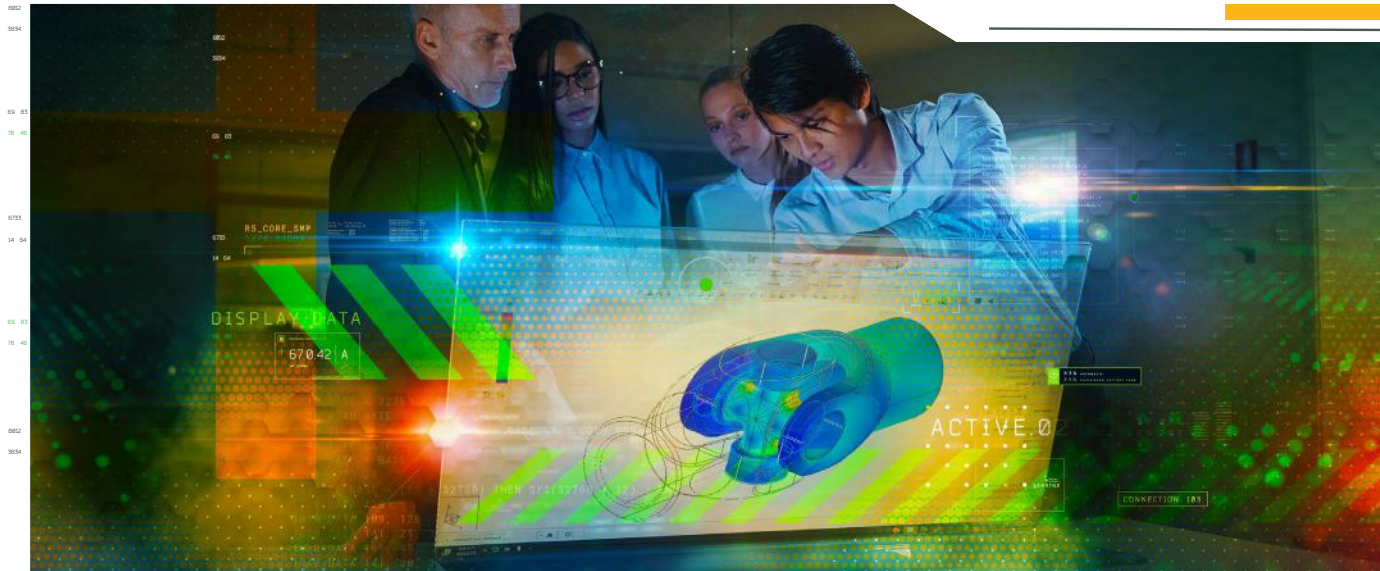
THE ECONOMICS OF PRODUCT DEVELOPMENT

Below is a generally-accepted diagram of costs as they unfold over the product lifecycle. For the executive focused on reducing the Cost of Goods Sold, the telling point is the upper right corner of the yellow box, the point where "Costs Committed" rise to 90% just before the start of production.

In contrast, the bottom left corner of the yellow box is where costs are lowest – and also where engineers make the tens or hundreds of cost-driving design decisions during early-stage development. It is here that simulation has the most impact on R&D efficiency and thus on costs.
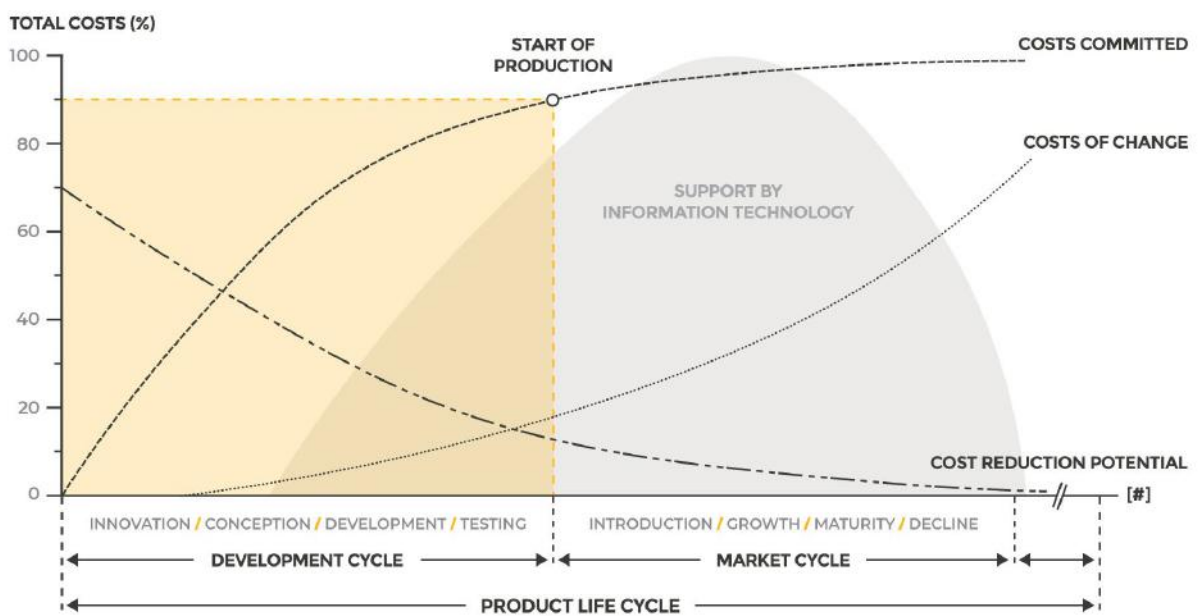
WE BELIEVE IT'S A POWERFUL, SIMPLE IDEA:

simulation in the initial stages of product design allows designers to find issues sooner and to fix them when it costs the least. Keep in mind that problems discovered midway through the design process can be 20-100X more expensive to deal with than if found and dealt with earlier. Simulation can also help minimize the costs of poor quality, expressed as the Costs of Change, which accelerate once the product makes it to customers. And who knows what original, productive ideas and solutions might emerge when design professionals could experiment and test much earlier and do it in the virtual world?

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TECHFIT Digital Surgery makes products that address traumatic injuries to bone. By necessity, each product is customized to the individual. TECHFIT has brought simulation up front in the design process because they must know whether the product will perform for an injured human being desperately in need of a unique design solution that will live in their bodies.

As the CEO put it: *The saying goes practice makes perfect, but without a good feedback loop, you can actually practice the wrong thing and become very good at doing something wrong. That's why we'd rather say 'iteration makes perfection.'*

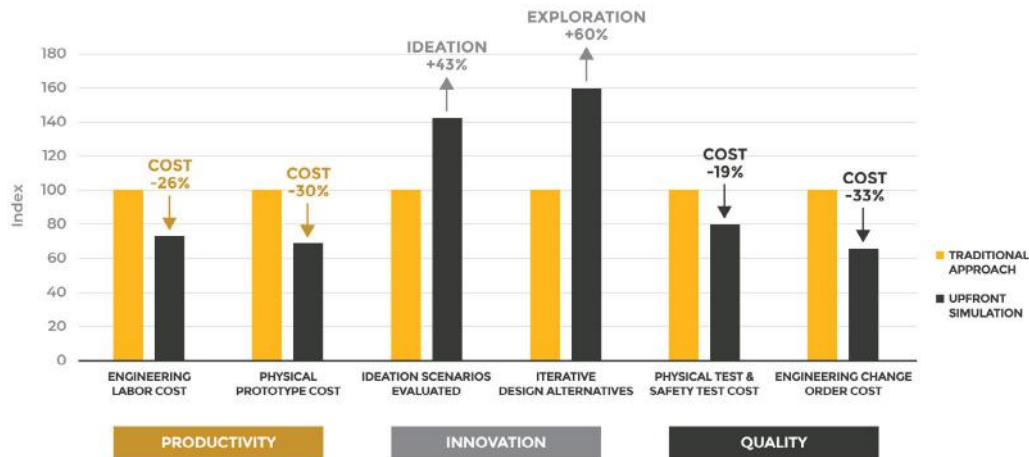# QUANTIFYING THE RETURN ON INVESTMENT IN SIMULATION-LED DESIGN EXPLORATION*

This Ansys-sponsored three-year study looked at large organizations that made it a key digital transformation priority to bring simulation upfront in the design process and proliferate it throughout their engineering population.

EXPLORE THE ANSYS ROI CALCULATOR BASED ON THE RESULTS OF THIS STUDY →

THE STUDY FOUND THE FOLLOWING BENEFITS IN PRODUCTIVITY, INNOVATION AND QUALITY:

- Improved engineering productivity, reducing labor and prototype cost by 26- 30%

- Increased product innovation, broadening design space exploration by 40-60%

- Decreased cost of quality assurance, by saving 19- 33% on testing costs

STRONG ROI FOR UPFRONT SIMULATION

Source: "Quantifying the Return on Investment in Simulation Lead Design Exploration", Mediafly, 2020

Productivity: *Upfront simulation compresses the design process by allowing for quicker insights and decision making by every designer and engineer participating in the process. This reduction in time-to-answers drives engineering productivity. Moreover, it results not only in significant engineering cost savings but also in improved time-to-market.*

Innovation: *Perhaps more profoundly, we find that upfront simulation drives a positive behavior change in design exploration because it allows for faster iteration and greater levels of it. Engineers are trained to be cautious. With real-time simulation engineers get answers in seconds or minutes and the cost of "asking a wrong question" is the click of an undo button.*

Quality: *Lastly, early insights led to more first-time-right engineering decisions, which drives down the cost of quality assurance. Engineering change orders become more expensive later in the design cycle, so any reduction in late-stage changes significantly reduces costs.*

SIMULATION-LED DESIGN

Simulation software cannot guarantee innovation or financial success, but it does create circumstances much more favorable to both. Our experience suggests that integrating simulation and putting it upfront in your design process can have a powerful impact on your finances and on your products as great designers get better and great designs become reality faster. That's digital transformation. Simulation should be a cornerstone of your digital transformational efforts.

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