

June, 2010

The Impact of Strategic Simulation on Product Profitability

Research from Aberdeen Group's *Cost Saving Strategies for Engineering: Using Simulation to Make Better Decisions* indicates that as the economy heads into a recovery, returning to profitability is top priority for many companies. This is driving them to look for ways to simultaneously reduce costs and deliver the products that customers want. Simulation analysis tools have proven value generating insight into the manifold and often conflicting demands on product development. When used effectively, these solutions go a long way toward enabling organizations to make decisions that result in consistently successful and profitable products. The following research brief provides an overview of the key components of the simulation strategy that enables companies to make these decisions.

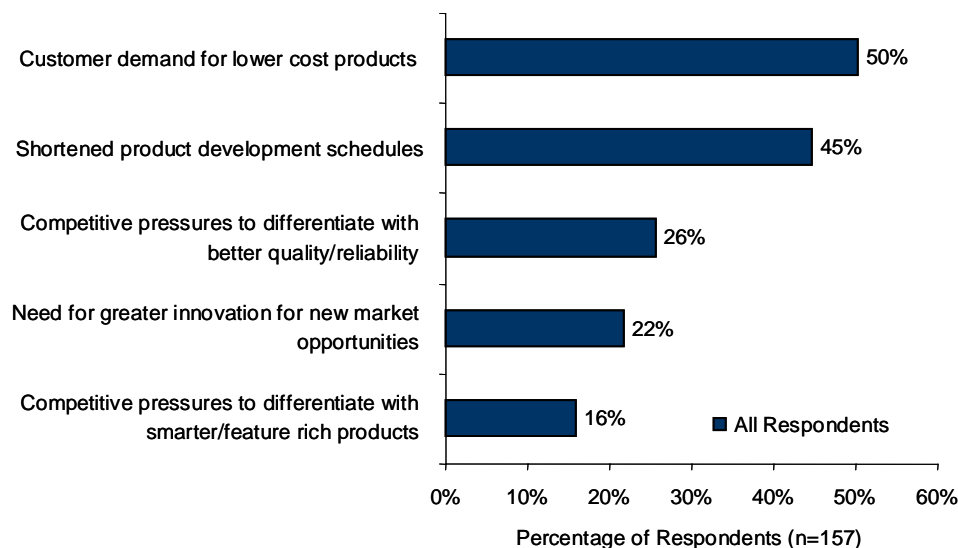
Research Brief

Aberdeen's Research Briefs provide a detailed exploration of a key finding from a primary research study, including key performance indicators, Best-in-Class insight, and vendor insight.

Business Demands and Challenges on Product Design

To understand the external factors driving companies to improve their design processes, survey respondents were asked to pick the top two pressures driving that improvement. A review of these answers demonstrates a key focus on responding to product demands (Figure 1).

Figure 1: Top Business Pressures Driving Product Design Improvements



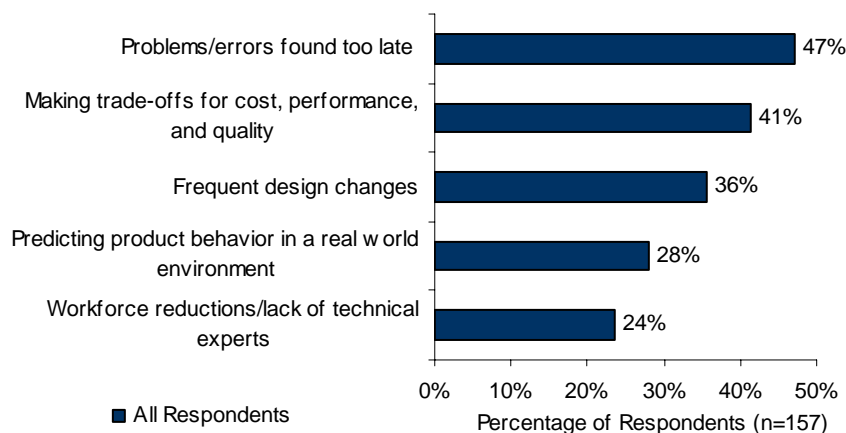
Source: Aberdeen Group, April 2010

Cited by 50% of respondents, customer demand for lower cost products is chief among these concerns, but it cannot be the only factor considered. The needs both to improve product quality and release more innovative products with more features represent critical product development requirements. These pressures often create competing demands that must be balanced in order to launch a successful product. Additionally, though driven by the need to grow revenue, shortened development schedules leave little time to balance the design parameters needed for a successful product launch.

Alone, balancing these pressures constitutes a considerable challenge. In fact, Aberdeen's research indicates that making these trade-offs is a top product design challenge (Figure 2). At the heart of this challenge lies the difficulty of anticipating how all the facets of a design will interact in the final product, which is apparent across Figure 2. Designs change throughout the development process and disparate systems involved often do not come together until very late in the process. This means many problems are only found when the fewest options are available to resolve them. This leaves engineers to choose the solution that works best given the constraints, not what is most economical or best for the design.

These issues have significant impact on how successfully innovation and additional features are incorporated into products. Without adequate understanding of the consequences of design decisions, major changes become risky. In this situation, more wary organizations will tend to play it safe and limit themselves to minor additions, even though this risks eroding product differentiation and competitive market advantages.

Figure 2: Top Product Design Challenges



Source: Aberdeen Group, April 2010

"The use of simulation has enabled the prediction of uncharacterized design innovation. It has also lowered our product cost and sped up development time."

~ Chun Eng Loke, Component Design Engineer, Intel Microelectronics

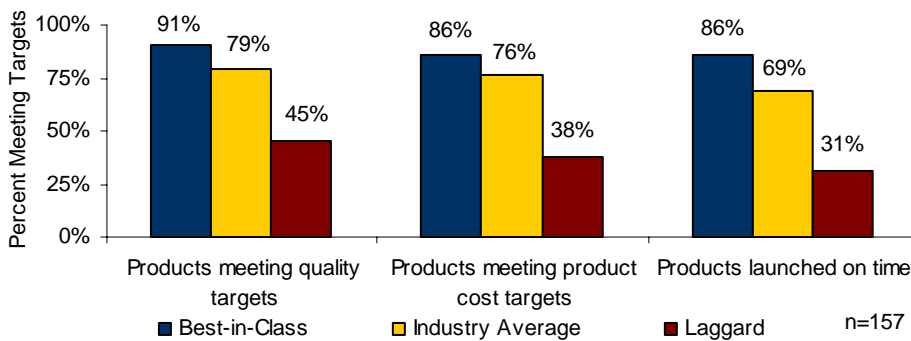
In order to respond to these challenges, engineers need access to other resources and tools that will provide them with the knowledge they need to make the best decisions for the product. Simulation provides a means by which to do this by delivering the insight needed to make the best decisions

throughout the design process. With this in mind, the challenge becomes: how can simulation be leveraged to drive the greatest results?

Aberdeen Analysis

To understand successful approaches to using simulation and its resulting business impact, Aberdeen benchmarked study participants as either Best-in-Class (top 20% of performers), Industry Average (mid 50%), or Laggard (bottom 30%). The performance of these tiers is displayed in Figure 3.

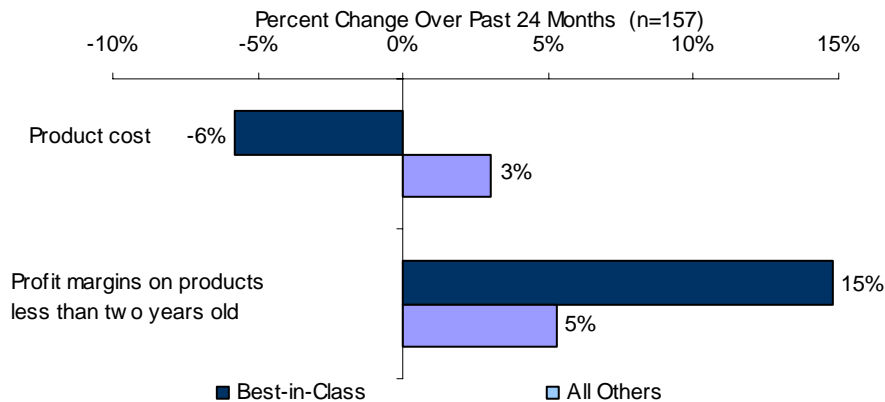
Figure 3: Performance Advantage of Best-in-Class



Source: Aberdeen Group, April 2010

The Best-in-Class have achieved greater consistency balancing competing needs of cost, quality and time, meeting these targets with an 86% to 91% success rate. Their competitors fall farther behind, with Laggards struggling to meet targets even 45% of the time. The Best-in-Class don't just maintain consistent performance; they have also achieved the greatest improvements, lowering product cost and driving considerable profitability gains on new products (Figure 4).

Figure 4: Performance Improvements Achieved



Source: Aberdeen Group, April 2010

Aberdeen Methodology

Aberdeen Group's survey-based analysis investigates the business impact of technology by benchmarking the performance of study participants. Key performance indicators used to assess Best-in-Class performance in Aberdeen's [Cost Saving Strategies for Engineering: Using Simulation to Make Better Decisions](#) study include:

- ✓ Percent of products meeting quality targets
- ✓ Percent of products meeting product cost targets
- ✓ Percent of products launched on time
- ✓ Percent change in product costs over the past 24 months

Case in Point: Simulation makes it Possible

For a manufacturer of complex food processing equipment, simulation is credited with making it possible to release a major new product line. The equipment is so costly to produce that only one physical prototype is feasible. The team was tasked with developing this new product line, but had to get it right the first time. They knew that simulation was going to be key to making this project a success and they integrated it with the design process starting early at the conceptual stage.

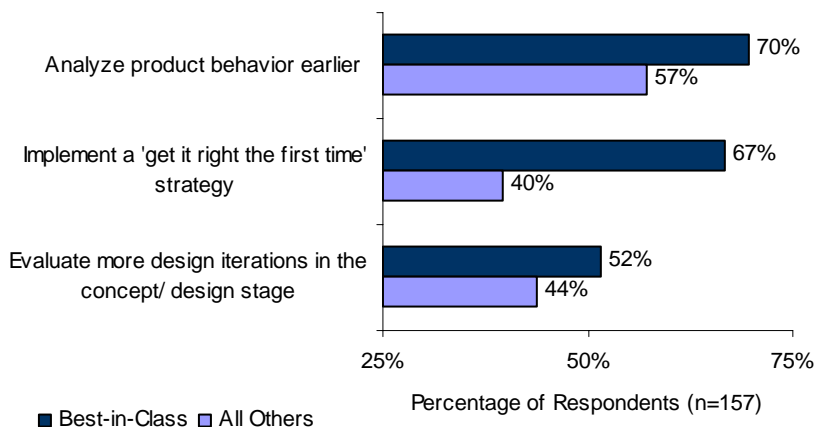
The equipment consisted of many different subsystems, each with different physical phenomena and design requirements that had to be considered. To address this complexity, the team developed one full virtual model which interacted with 15 different sub models. This enabled them to focus on different functions such as filling or sterilization. As the design evolved, there were many different aspects of design criteria that needed to be balanced such as cost, performance, manufacturability, and serviceability. The team was able to leverage simulation for trade-off analyses that enabled them to come up with the optimal solutions for the product.

The end result? Comments one of the technology specialists on the team, "The project has been extremely successful and it just wouldn't have been possible to do without simulation."

Best-in-Class Strategies: Simulate Early, Simulate Often

Analysis of Best-in-Class performers indicates a strategic emphasis on using simulation to gain better insight into product behavior from the very beginning of the design process as a key differentiator of success (Figure 5). Effective behavior prediction takes advantage of a variety of analysis types and often includes structural analysis, fluid dynamics, electromagnetic modeling, and fatigue analysis, to name a few.

Figure 5: Strategic Actions of the Best-in-Class



Source: Aberdeen Group, April 2010

Range of Analysis Performed

Findings from Aberdeen's [Cost Saving Strategies for Engineering: Using Simulation to Make Better Decisions](#) study demonstrate how the Best-in-Class combine multiple analyses types in their product assessments, including structural to fluid to thermal and others. As a result, these leaders create a more accurate understanding of the product in a real world environment. The most differentiated analyses used by the Best-in-Class include:

- √ Fatigue (44% more likely than their competitors)
- √ Thermal (42% more likely than their competitors)
- √ Kinematic (37% more likely than their competitors)
- √ Electromagnetic (33% more likely than their competitors)

"The most valuable thing we have done to improve our design process is integrate the analyst and the design engineer closely, early during the design phase. The result is 'real-time' analysis that influences the design while it is still developing."

~ Director of Product Development, Industrial Equipment

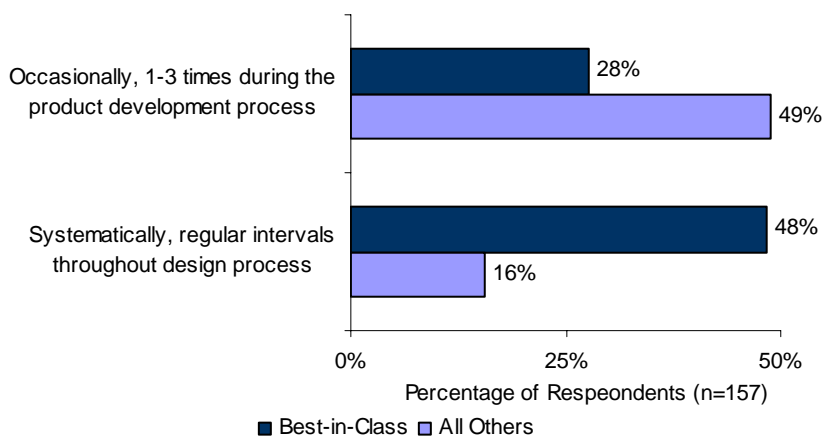
By beginning analyses from the earliest stages of the design process, the Best-in-Class enable themselves to make smarter design decisions when the design is most flexible. This means that the cost and delays created by late stage changes can be avoided while the greatest number of options can be considered. More alternatives can be assessed as well, ultimately resulting in the optimal combination of product cost, quality, and performance.

The Best-in-Class are also more likely to implement a 'get it right the first time' strategy. This refers to consistent use of simulation throughout the design process to correct product performance before any physical prototypes are built. By conducting these new simulations, these leaders ensure that their understanding of product performance evolves alongside the design. In fact, the use of simulation at regular intervals throughout design is one of the most differentiated characteristics of the Best-in-Class. Specifically, these companies are 3.1 times more likely than their competitors to take a systematic approach (Figure 6). Their less successful competitors, on the other hand, are more likely to use simulation occasionally, often no more than 1 to 3 times during the design process.

"Simulation gives us an idea of where our current design stands using a baseline simulation. That gives us a very good idea of where to start. Multiple iterations during the design keep us where we want to be and give us a very good idea of expected performance before the physical models are built. Correlating test data with simulation results also lets us know how close we can expect to be in the future."

~ Design Engineer, Oil and Gas Equipment

Figure 6: When Simulation Is Used



Source: Aberdeen Group, April 2010

Key Takeaways

There is no point in the design process where companies do not profit from intelligent decision-making. By integrating simulation analysis from the earliest stages of design, the Best-in-Class are able to make better decisions throughout the process. This enables these leaders to drive higher quality and lower cost products, as well as deliver the innovations and features that differentiate their products. Ultimately, this pays off in a 15% increase in profit margins on new products, three times that achieved by their peers. To achieve similar results, organizations must prioritize strategic use of simulation. Two core precepts lie at the center of this strategy:

- **Begin simulation analyses earlier** - The Best-in-Class are 68% more likely than their competitors to start earlier with a 'get it right the first time' strategy. Early insight means problems can be resolved when the most options are available, creating a more profitable balance of product cost, quality, and features.
- **Conduct simulation systematically throughout product development** - Most companies Aberdeen surveyed use simulation on an occasional basis. This means that as designs change, the knowledge that these companies gain from simulation becomes outdated. By contrast, the Best-in-Class are 3.1 times more likely than their competitors to leverage simulation on a systematic basis through a simulation-driven product development approach. This is the key to making better decisions throughout the process.

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research	
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