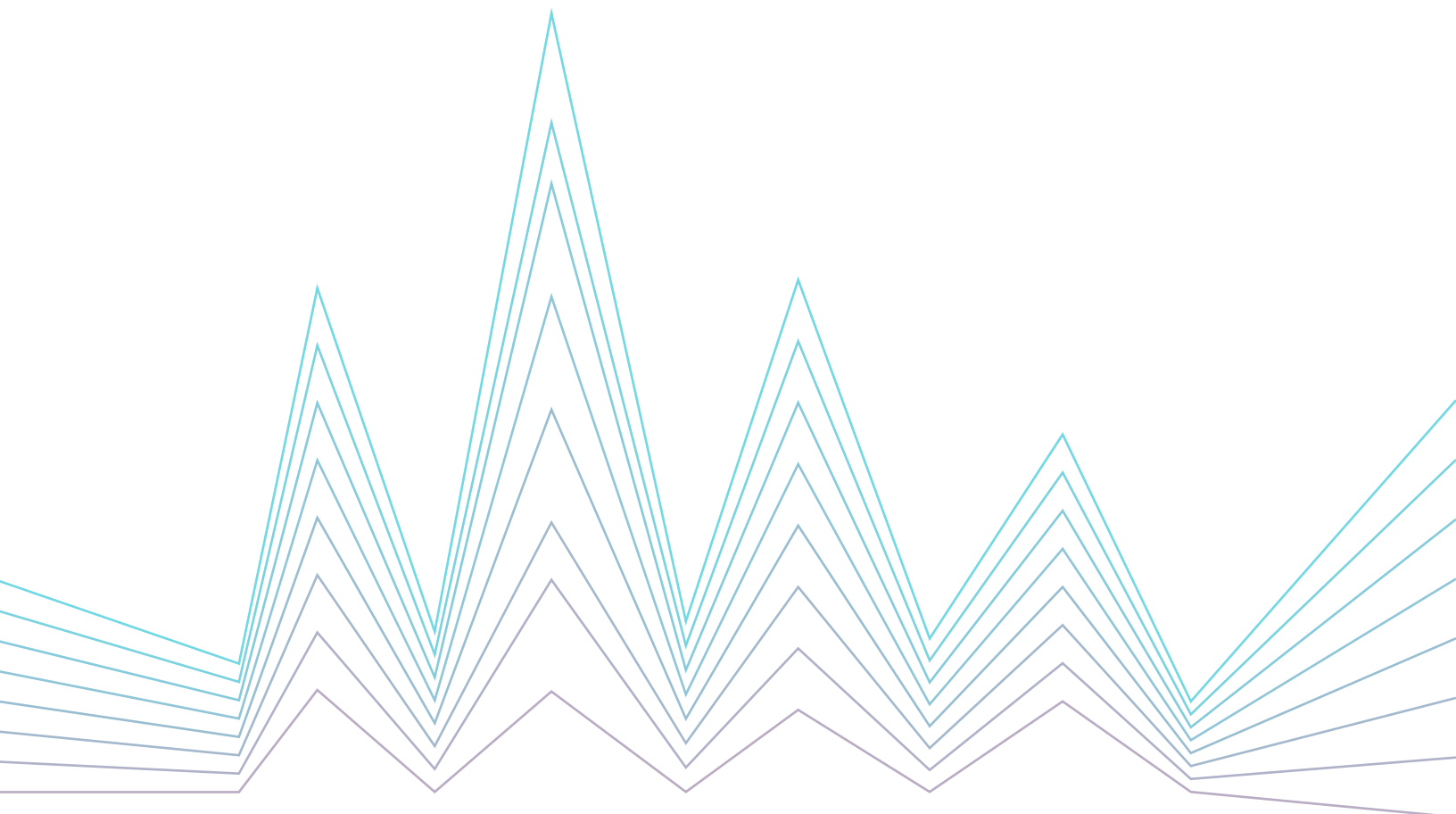


Why Engineering Simulation is Critical to Your Smart Product's Success in the Internet of Things

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GROUP

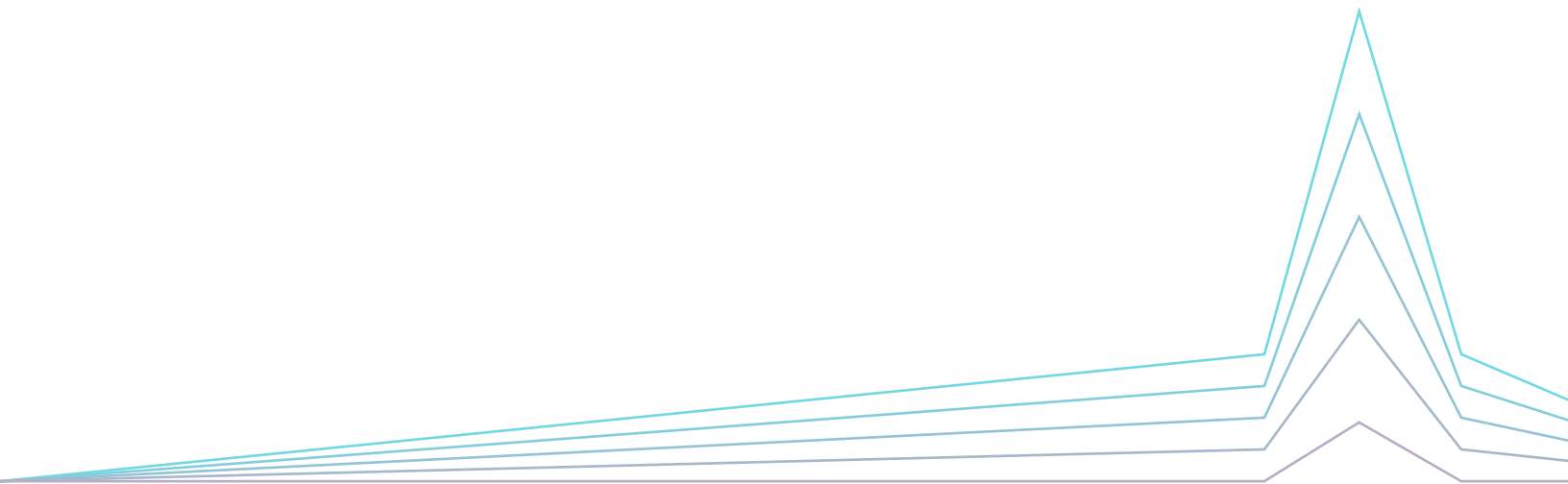
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1 | Introduction

The Internet of Things is a powerful, but often misunderstood term that describes the connectivity between products where information is exchanged in real time between other products and users. The push for smart(er) products is not a new concept for designers. Embedding software and electronic systems into a product can be traced back to the 1960's with the Apollo program. However, present-day development of smart products comes with new challenges. The main issues being the expansion of software, the replacement of mechanical systems with electronic components, and the resulting integration between the three.

The goal of this movement from less mechanical to more electronics and software is to generate highly durable, quality products in smaller, faster packages that meet their fiscal targets. In order to do so, companies must constantly evolve their product development processes. All developers know simulation is a helpful tool in product design. However, developers of successful products understand the crucial role that platform-based simulation plays in their success, and the dangers of designing products using siloed workflows.

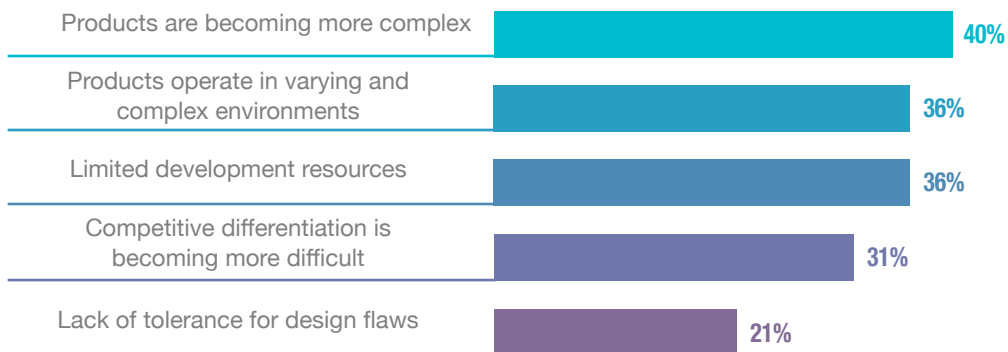


2 Complexity is Growing Rapidly

New product development is the engine that fuels growth in companies. Over a third of a company's revenue is attributed to new products (37% of total revenue from recent Aberdeen research). However, bringing any product to market is not an easy task. Delivering under short timelines with a high profit margin and high quality targets gives product developers little room for error.

Companies need an improved understanding of product behavior to discover the innovations that will position their future products for success

Figure 1: Top Product Specific Challenges



Aberdeen Group, July 2015
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In particular, smart product designers for IoT products face unique challenges, a large part of which is due to increased complexity. Almost half of the survey respondents pointed to complexity as their top challenge.

Now, we know that complexity is a major concern for companies. Still, the question arises: what is this complexity comprised of and where does it affect the product? In smart products, this equates to generating high functionality in small form factors, seemingly opposing stylistic aspects. Because of this dichotomy, five critical factors must be followed for success. Meaning, designing with reliability, durability, integration, sensing, connectivity, and "SWAP-C," (size, weight, power, and cooling) in mind.

3 | Defining the Best-in-Class

To identify best practices for product development, Aberdeen measured survey participants' ability to meet their product goals and overall profit margins on new products. Aberdeen categorized participants as Best-in-Class (top 20% of aggregate performers) or All Others (bottom 80% of aggregate performers).

Product Development Summary



Best-in-Class companies are **53%** more likely than their peers to use simulation to create a virtual prototype

The Best-in-Class clearly have much tighter control over their new product development and introduction (NPD). Even in the face of rising complexity and limited resources, these companies must deliver low-cost, quality products on time. When those targets are met, success is reflected in the rise in profit margin. Best-in-Class companies more than double their increase in profit margins.

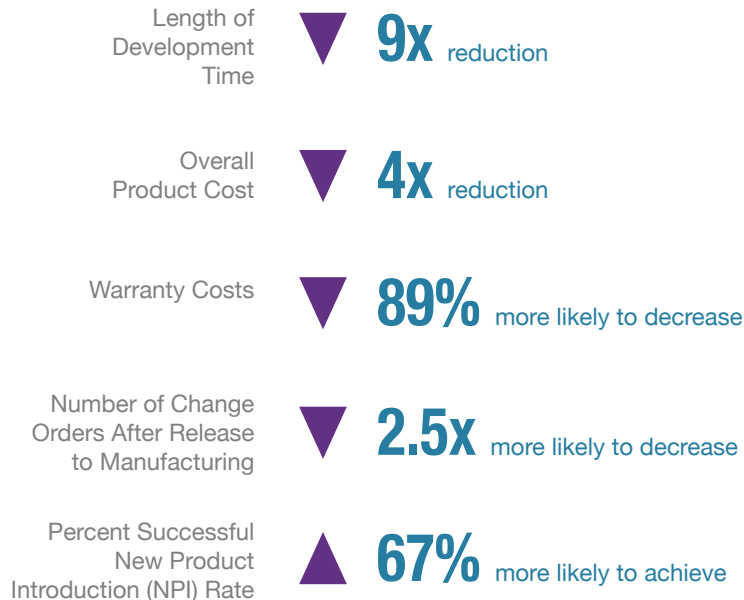
4 | The Power of Simulating Product Behavior

Virtual simulation is the analysis or simulation of a product's behavior in a virtual environment, creating a virtual prototype of the product design. Best-in-Class companies are 53% more likely than their peers to conduct their simulations in this virtual environment. On top of that, only 5% of the Best-in-Class indicate they will not implement software tools eventually, a stark difference from the Industry Average and Laggards. The power of simulation software shows itself when examining the metric performance of companies that use simulation versus those who do not.

The Benefits Cannot be Overlooked

SIMULATION vs NO SIMULATION

Simulated Environments Experience:



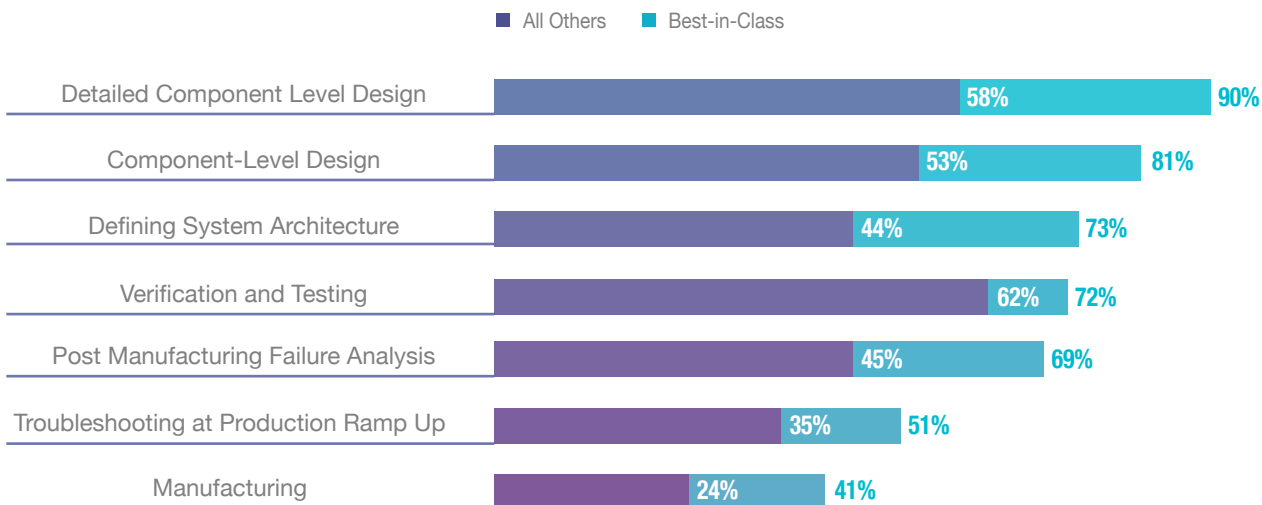
The push to more innovative and complex products helps to differentiate products from competitors; it also results in designers being forced to make trade-off decisions between speed, cost, and quality. Simulation allows designers to make better decisions in a faster timeframe, which ultimately leads to success.

5 Utilizing Simulation throughout Development

Where Best-in-Class companies start to separate themselves is in their reliance on simulation throughout the product ideation and design process. Every company understands that simulation is a helpful tool, but only the Best-in-Class realize its critical value towards meeting their revenue goals. To maximize development efforts, Best-in-Class companies simulate to analyze component and system-level behavior, as well as subsystem interactions before physical prototyping. Best-in-Class companies know that simulation early on leads to reduced errors downstream, saving time and money. They understand that simulation is not just a useful engineering exercise, but a critical step in new product success.

87% of respondents indicated that they expect to handle larger – in terms of resolution, components, parts, etc. – simulation models in the future

Where Are You Using Simulation?



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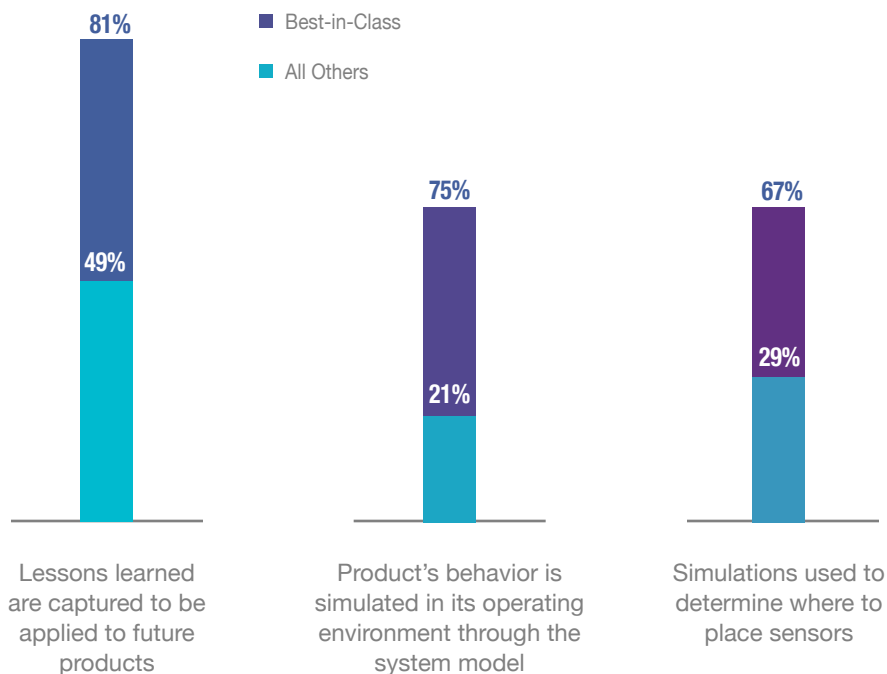
Designers are also able to quickly explore the performance of numerous design alternatives at a rapid pace. This ability to analyze multiple alternatives allows for an important practice: optimizing the design (for cost, quality, or performance). While the Best-in-Class are far outpacing their competitors in all stages of product development (especially early in a product's lifecycle), improvement is needed by every maturity group when it comes to simulating the production and manufacturing phase. With the right software, simulation can become an integral part of the design process, not some separate function with its own tools and processes.

6

Applying Simulation to Make Products ‘Smart’

The overall strategy for product development is shifting as the importance of embedded software and systems engineering rises. The difficulty companies find in changing to more software and hardware, and less mechanical components is in the implementation of “smart” functionality. Best-in-Class companies overcome this challenge by simulating and modeling their designs.

Smart Products Enable the IoT



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Not only are products themselves becoming more elaborate, the environment that they operate in is also increasing in complexity. As a result, Best-in-Class companies are more than three times more likely than their peers to use simulation to predict how a product will perform in its operating environment. Through the combination of these capabilities, successful companies are able to produce smart, connected products that form the foundation of the IoT.

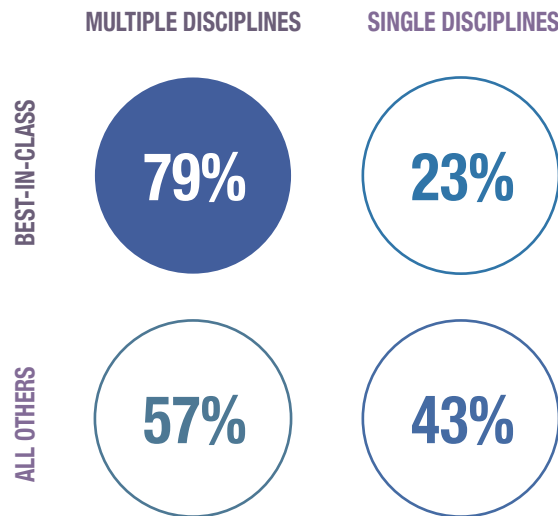
7 | Breaking Down Barriers Across Engineering Disciplines

A major factor of success can be attributed to the culture of a company. One of the top challenges cited by respondents is a lack of collaboration. Isolation in the workplace is problematic with increasing product complexity. A product made without collaboration will lead to integration issues, especially when subsystems are built and over-designed from each team adding their own safety margins. The resulting delivery is adversely affected by way of product shipment delays, cost overrun, and reduced product reliability.

39% of respondents indicated that a lack of collaboration is the top product development challenge they face daily

Taking a Holistic Approach to Product Development

TEAM MEMBERS INCLUDE ENGINEERS FROM:



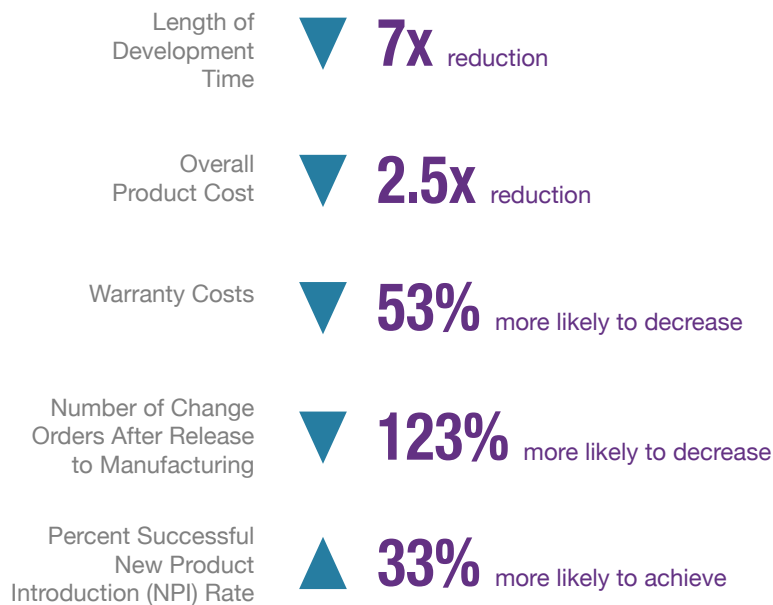
Best-in-Class companies have taken steps to eliminate those silos by creating cross-functional groups. In forming these teams, Best-in-Class companies are able to approach development in a holistic manner, ultimately leading to a product that meets its intentions, quality, and revenue targets.

The benefits of taking a holistic approach to development, like the Best-in-Class, cannot be overstated. In fact, when examining companies that have teams made up of multiple disciplines versus those who still design in a silo, the impact becomes clear.

The Benefits Cannot be Overlooked

HOLISTIC DEVELOPMENT vs SILOED DEVELOPMENT

Holistic Development Experiences:



For all of the yearly metrics listed, companies with a holistic development approach are greatly outperforming those designing in silos. One of the most telling metrics listed is the change in ECOs after release to manufacturing. What this shows is that companies designing across disciplines are able to fix their designs before they get to production, unlike those who only focus on one discipline and fix their products afterwards.

New product development represents a company's largest potential for reward, but also carries with it significant risk. It's widely known that simulation is good engineering, but the Best-in-Class companies fully comprehend the vital role simulation plays in new product introduction success.