

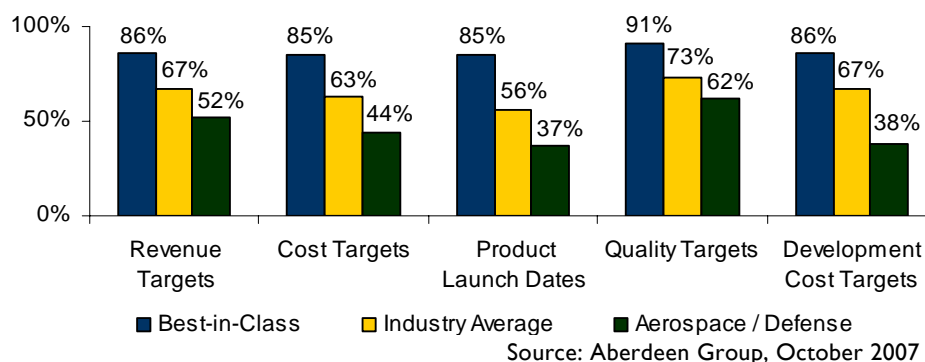
Global Design Strategies in the Aerospace and Defense Industry: The Road to Safe, Effective, and Parallel Development

Global design strategies have matured significantly over the last two years. Aberdeen Group's December 2005 *Global Product Design Benchmark Report* found that 79% of study participants were turning to global design chains in order to reduce costs. Aberdeen revisited the topic in October 2007 with the *Profitable Design Chains: Global Product Design Comes of Age* report and found that the weight of cost pressures had reduced significantly (46% of respondents), while market demand for rapid product development (47%) has risen to the top pressure. Manufacturers operating with the aerospace and defense sector indicate the same top of mind concerns, but with a lingering bias towards cost pressures (42% of A&D respondents) over the need to develop products more quickly (38%). However, while these manufacturers have begun to change how they think about global design, they are behind the Industry Average across manufacturing industries in the adoption of the capabilities that leverage a global design strategy to accelerate the product development process.

Aberdeen Analysis

During September and October 2007, Aberdeen Group examined the global design strategies of more than 170 enterprises. To gain an understanding of how manufacturers' can best take advantage of global design chains, respondents were benchmarked according to their performance across five Key Performance Indicators (KPIs) and divided among three performance categories: the Best-in-Class (top 20% of performers); Laggard organizations (bottom 30%), and the Industry Average (the remaining 50%). These measures included the percent of products meeting targets for revenue, cost, product launch, quality, and overall product development costs. A&D manufacturers show as underperforming the Industry Average of manufacturers across all industries in each measurement (Figure 1).

Figure 1: Performance Framework



Sector Insight

Aberdeen's Sector Insights provide strategic introspective and analysis of primary research results by industry, market segment, or geography

Sector Definition

For the purposes of this study, respondents that indicated that they operated within the aerospace or defense space were isolated and aggregated for comparison against peer manufacturers across industries in Aberdeen Group's performance framework.

Aerospace and defense manufacturers show particularly lower performance rates in their ability to meet product launch date, product cost, and product development cost targets. While at first glance, this may seem to paint a bleak picture of the performance of these manufacturers, it is directly associated with the inherent challenges of manufacturing products for aerospace and defense. The average level of the complexity of meeting these targets is often much higher than that of other industries, which in itself leads to lengthier product development processes. These two factors can create severe obstacles to an A&D organization's ability to forecast reasonable product development targets.

For example, with an average development cycle of five to 10 years, and potentially longer, it is difficult to predict how the market will change; what new technologies will become available; and what product competitors will release to the market. Responding to changing market conditions or adjusting for a competitive response can have a great impact on estimated costs and time tables. The complexity of the product itself and number of components involved can also mean that any change can have a significant impact on hundreds or even thousands of related components, which again, can have a significant impact on development budgets and project schedules.

The Aberdeen Competitive Framework Key

The Aberdeen Competitive Framework defines enterprises as falling into one of the three following levels of practices and performance:

- Best-in-Class (20%)* — practices that are the best currently being employed and significantly superior to the industry norm
- Industry Average (50%)* — practices that represent the average or norm
- Laggards (30%)* — practices that are significantly behind the average of the industry

The Challenges of Global Design

Of course, these challenges are simply related to the nature of product development for A&D. While turning to a global design strategy can provide the opportunity to lower the cost and speed up the processes involved in product development, it is a strategy that comes with a number of its own challenges that further complicate product development (Table I). Here too, A&D manufacturers show as roughly aligned with respondents across all sectors, reporting the same three top pressures as their peers, with a slightly higher focus on each.

Table I: Top Challenges on Global Design

Challenges	A&D	All Respondents
Protecting Intellectual Property (IP)	70%	61%
Retaining company knowledge of products or product design decisions	52%	44%
Keeping distributed designs synchronized	44%	40%

Source: Aberdeen Group, October 2007

Keeping distributed designs synchronized is a greater concern for A&D than it is for other industries. This is due to the complexity and number of components and subsystems involved in A&D products as well as the length of the development cycle. Similarly, retaining company knowledge of products or product design decisions is a bigger challenge for A&D than other industries. A&D tends to have a very heavy program focus which

contributes to the challenges. The different programs tend to be very autonomous and do not share information across programs. Another contributing factor is the aging workforce that is not being replenished with a fresh population of engineers from domestic universities as quickly as needed.

The greatest challenge, however, for A&D, is protecting product Intellectual Property (IP). This is an even bigger challenge for them than it is for other industries. Loss of product IP is a danger for any manufacturer, but it can be devastating within aerospace and defense. An IP breach can mean a loss of revenue-generating service business as well as the danger that competitors will be able to reengineer knockoff components that can be used to undersell the company, and may not even be approved by regulatory boards.

Strategic Actions

The strategic actions that A&D companies report as taking as part of their global design initiatives tend to be more related to their second highest challenge (retaining company knowledge of products or product design decisions) than their top concern of protecting IP (Table 2). Retaining company knowledge is a major concern due the aging workforce and limited availability of new talent to take their place. As such, they are focused on acquiring new talent and expanding their ability to access the specialized skills required in A&D development.

“The supply chain is our biggest issue because we are global and deal with thousands of suppliers and partners and everything has to work at the end of the day. To this end we have implemented formal processes including a consistent design philosophy, and good communication throughout the supply chain.”

~ Aerospace and Defense
Original Equipment
Manufacturer

Table 2: Top Strategies of Global Design

Strategic Actions	A&D	All Respondents
Leverage high talent, low cost design resources from global workforce	50%	51%
Access new sources for product innovation outside company	31%	28%
Increase design capacity beyond currently available local resources	27%	32%
Access specialized skills from global workforce	27%	20%

Source: Aberdeen Group, October 2007

The major action being taken in global design today is the utilization of the global engineering workforce, taking advantage of the different labor costs around the world. This is true for all industries, including A&D. After this, A&D companies are fairly evenly split between: accessing new sources for product innovation outside the company (31%), increasing design capacity beyond currently available local resources (27%), and accessing specialized skills from a global workforce (27%).

This is a direct reflection of the shrinking availability of aerospace engineers; a highly specialized skill set that requiring years of training seeing fewer

young people pursuing this area of specialized knowledge. This is one factor forcing A&D companies to look to other geographic areas for new sources of talent and innovation. In fact, A&D companies are 41% more likely than other discrete manufacturers to be looking to access specialized skills from a global workforce. Aerospace engineering is a highly specialized engineering skill set and the talent available is approaching retirement.

The Three Pillars of Effective Global Design

Aberdeen's October 2007 *Profitable Design Chains: Global Product Design Comes of Age* report found that there are three key areas where the Best-in-Class have developed the capabilities that allow them to overcome their challenges and most effectively leverage their global design initiatives: protect product IP, design in parallel, and coordinate the global design team.

Protect Intellectual Property

While protecting IP was the top challenge for A&D manufacturers, they are doing little to address it. Even though these companies reported IP as a challenge more often than their peers across other industries, they are well behind the Industry Average in terms of implementing capabilities that would help to protect IP (Table 3).

Table 3: The Competitive Framework - Protecting IP

	Best-in-Class	Industry Average	A&D
Sharing varied levels of design accuracy with different partners (based on need for detail)	63%	41%	35%
Product knowledge and IP retained by company	82%	69%	44%
Digital Rights Management (DRM) / design security	41%	19%	8%

Source: Aberdeen Group, October 2007

As A&D manufacturers look to access new talent in other global regions, it will continually become important to address this challenge. One way to keep data secure is to vary the level of design details shared with partners. Aerospace and defense manufacturers are behind other industries in taking advantage of this capability. Another step is to ensure that product knowledge and IP are retained by the enterprise. Here again A&D manufacturers fall behind the Industry Average.

The area that sees the greatest differentiation in its use by the Best-in-Class, however, is in the use of Digital Rights Management (DRM) solutions that help protect sensitive data and keep it secure. The Best-in-Class are twice as likely as the Industry Average and 4.6-times as likely as A&D manufacturers to take advantage of these tools. The use of DRM within A&D even shows as slightly behind Laggard adoption (11%). These

technologies have evolved significantly over the years. A&D companies place themselves at a disadvantage by not taking advantage of it. These technologies can provide them with increased control over the individuals who have access to the data as well as control how long access is available before it expires.

Design in Parallel

A&D manufacturers have been very slow to adopt the capabilities and technologies that enable globally dispersed teams to work on designs in parallel. The Best-in-Class have a number of things in place that empower them to do this (Table 4). These are capabilities that can better position A&D manufacturers to take advantage of global design chains in a way that allows them to improve the speed of their product development processes.

Table 4: The Competitive Framework - Design in Parallel

	Best-in-Class	Industry Average	A& D
Parallel development of different portions of design across design chain	65%	30%	33%
Formal review process after consolidating designs from across design chain	69%	47%	33%
Designers design with visibility to adjacent assemblies or subsystems (in context)	71%	51%	27%
Real-time, interactive design collaboration tools	59%	36%	23%
Design collaboration (visualization, review, markup)	76%	55%	38%

Source: Aberdeen Group, October 2007

The Best-in-Class are 97% more likely than A&D manufacturers to have parallel development of different portions of the design. With many people working on the design in parallel, the design process can be accelerated. A result of this for A&D is that a faster development cycle will be less affected by changing market conditions which lead to changes in the design and drive up costs. Enabling design teams to work in parallel also means that these companies become able to take advantage of specialized engineering skills at a global level.

In particular, A&D manufacturers are far less likely to take advantage of the collaboration tools that enable teams to work together. The Best-in-Class are 2.5-times as likely as A&D to take advantage of these tools. These tools mean that even geographically spread teams can more effectively work together. This means that these teams can efficiently work with each other's ideas, which ultimately leads to more innovative solutions in less time. Collaboration tools also help companies organize formal design review with disparate teams in a way that provides an opportunity to discuss conflicts and leverage the expertise of the entire team. By enabling global

collaboration in this way, A&D companies will also be better positioned to capture the knowledge and the reasons why design decisions were made which helps them adapt to the need to work with a global workforce to access specialized skills.

Coordinate the Global Design Team

Global design requires a greater degree of attention to the management of design tasks in a way that allows dispersed teams to effectively work on a single design. This need becomes more acute the closer companies come to realizing parallel development. It's no surprise then, that keeping distributed designs synchronized shows as a top pressure both among A&D manufacturers (44%) and across industries (40%). Implementing the capabilities to coordinate the global design team will help to address this pressure. The Best-in-Class approach this challenge in a programmatic fashion, adopting standardized processes and design tools such as formal program and project management to coordinate activities across the design chain (Table 5).

Table 5: The Competitive Framework - Coordination

	Best-in-Class	Industry Average	A& D
Standard design processes across global design chain (for both internal and external resources)	71%	37%	19%
Formal project and program management across design chain	63%	55%	32%
Central management and control over internal and external designers in design chain	63%	58%	33%
Product Lifecycle Management (PLM)	53%	33%	32%
Product Data Management (PDM)	82%	51%	54%

Source: Aberdeen Group, October 2007

Additionally, the Best-in-Class are more likely to utilize central data management solutions, which help to enforce synchronized design. This includes not simply Product Data Management (PDM) but also Product Lifecycle Management (PLM) solutions. PLM in particular, provides mechanisms to capture knowledge and the means to keep design data centralized and synchronized. Extended capabilities such as workflow help to keep processes on track. Given the length of the development process, the number of components, and the complexity of the design, adopting these capabilities and deploying the tools that support them could be a great benefit to A&D companies.

“Once you get everything in a common data management system, then you can take advantage of additional capabilities that lie on top of data management such as workflow and cross-disciplinary visualization.”

~ Engineer
Jet Propulsions Laboratory

Required Actions

A&D manufacturers can learn from the Best-in-Class to improve how they leverage global design chains in ways that can help speed their product development processes while addressing key challenges of global design. This includes taking steps to:

- **Invest in the means to protect IP.** Keeping design intellectual property secure was reported as the top challenge for A&D companies, yet they do not indicate doing much to address it. Without the capabilities in place to keep IP safe, these companies are inhibiting their ability to take advantage of some of the strategic benefits of global product development that the Best-in-Class enjoy.
- **Enable design teams to work in parallel.** Once they have mechanisms in place to protect IP, the Best-in-Class should look to the implementation of the processes and technologies that support parallel development. This will help to accelerate the design process and put companies in a better position to meet targeted launch dates and keep costs down.
- **Coordinate the global design team.** Getting to parallel design can pose significant challenges to the management of not simply design tasks, but all of the aspects of the design itself. Keeping the global team coordinated helps to keep the design in synch which can provide significant advantages to A&D manufacturers, given the length of time and the complexity of their products.

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

Related Research

<i>Profitable Design Chains: Global Product Design Comes of Age</i> October 2007	<i>System Design: New Product Development for Mechatronics</i> January 2008
<i>The Global Product Design Benchmark Report</i> December 2005	<i>Configuration Management for Aerospace and Defense</i> December 2007
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