



---

**AUGUST 2003**

---

---

**AMR RESEARCH REPORT**

---

**Improving Innovation and Cash Flow in  
Aerospace and Defense**

*by AMR Research Staff*

Aerospace and Defense manufacturers recognize that managing program risk based on cost, schedule, and technical functionality is critical to keeping current projects and winning future opportunities. As they pursue strategies with global partners and suppliers to distribute risk and leverage core competencies, prime contractors and suppliers find that their supporting IT infrastructures are constraints. Those that best manage the cost and resources required to transition the legacy infrastructure to the global product development environment required for future programs will be the most successful.

© Copyright 2003 by AMR Research, Inc.

No portion of this report may be reproduced in whole or in part without the prior written permission of AMR Research. Any written materials are protected by United States copyright laws and international treaty provisions.

AMR Research offers no specific guarantee regarding the accuracy or completeness of the information presented, but the professional staff of AMR Research makes every reasonable effort to present the most reliable information available to it and to meet or exceed any applicable industry standards.

AMR Research is not a registered investment advisor, and it is not the intent of this document to recommend specific companies for investment, acquisition, or other financial considerations.

# Improving Innovation and Cash Flow in Aerospace and Defense

by AMR Research Staff

**The Bottom Line: A&D manufacturers must use a cost-neutral approach to transition their legacy product development IT infrastructure, considering IT services to reduce the cost of existing environments and provide the resources to transform the program management environment.**

## The innovation challenge

A&D manufacturers are under considerable pressure to improve program performance. Whether serving commercial or defense customers, they must complete their programs with the latest technology innovations and within severe cost and schedule constraints. Economic conditions have been particularly harsh on commercial manufacturers, forcing them to drive cost from products and create innovative products and services for their installed customer base. Boeing and Airbus are in a fierce battle for global market share, where price wars squeeze margins and force cost reductions down through the supply chain. Meanwhile, defense contractors have seen an increase in demand balanced by intense cost containment programs dictated by the Department of Defense. All this must be managed under the scrutiny of a financial investment community that expects high asset utilization from an asset-intensive industry, requiring efficient use of resources through lean design and manufacturing strategies.

Faced with these challenges, defense contractors are pursuing strategies to distribute program risks across alliance partners and suppliers, leveraging their partners' core competencies, and getting them to share the investment burden on long programs. The DoD has been pushing harder on its acquisition reform policies, requiring improved visibility into program information and requesting contractors to demonstrate processes for managing large programs with reduced risk. This calls for improved collaboration across program partners on design, schedule, and earned value cost reporting. The DoD is seeking increased discipline for analyzing tradeoffs between cost and feature enhancement requests from the Armed Services, enforcing strategies such as Cost as an Independent Variable (CAIV) on programs like the Joint Strike Fighter to ensure that design or feature change requests have a cost directly associated with them.

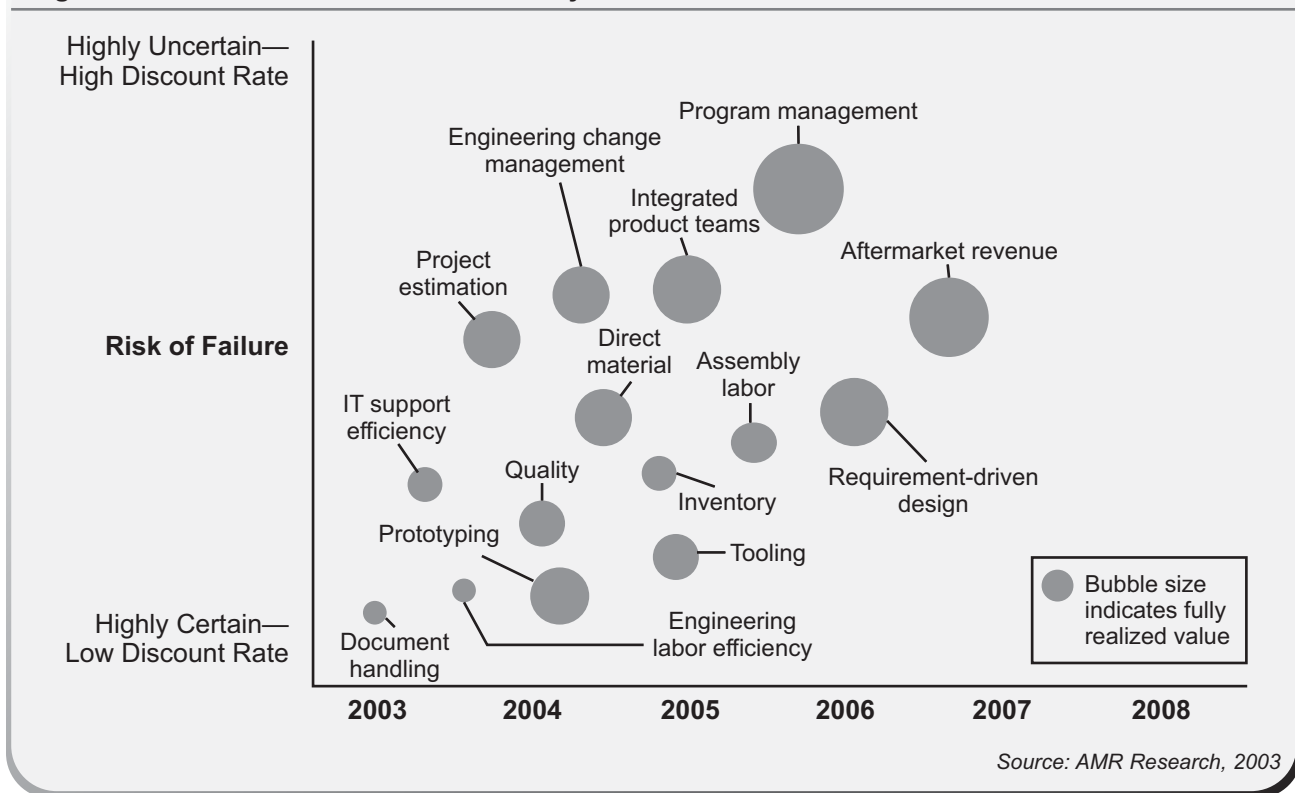
Improving Time-To-Market (TTM) of the latest technology innovations has been a point of contention with Services such as the U.S. Air Force, which has grown weary of the long development cycles associated with traditional military programs. New approaches, such as spiral engineering, are being promoted, where technology enhancements will be released incrementally, ensuring the Armed Services have the most up-to-date capabilities at their disposal. This new environment is forcing A&D contractors and their partners to assess collaboration on programs to speed the innovation process while minimizing program risk.

## The value of transforming the innovation infrastructure

As A&D manufacturers strive to meet these new challenges, they must improve the flow of design and program information across a distributed program team of external partners. Long gone are the days of a single company housing all the capabilities needed to meet a program's requirements, yet many of these companies have decades-old legacy IT systems. Sharing data across disparate design information systems is now an obstacle, requiring manufacturers to revamp their design IT infrastructures to achieve this new goal.

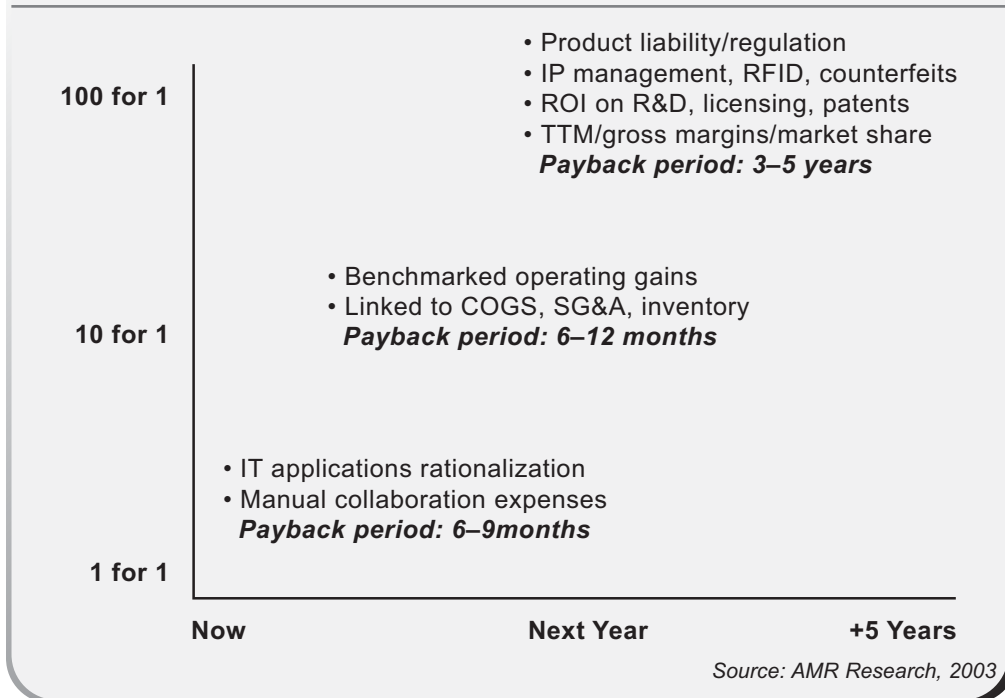
While manufacturers inherently understand the strategic benefits of improving the innovation process, they often struggle with building the business case. A&D executives under financial scrutiny for margin improvements will not accept a long-term vision without shorter term incremental ROI. Therefore, champions driving investment in technology to improve product development and program management must identify projects that deliver value throughout the transformation process (see Figure 1).

**Figure 1: Little wins lead to ultimate victory**



For long-term survival, A&D manufacturers must transform the way they develop products. Those that achieve this transformation fastest will be the market leaders in the industry, winning new programs while improving margins with cost efficiencies. However, developing a pay-as-you-go strategy will help pay for the long-term transformation. A recent AMR Research study on the value of PLM breaks this strategy into three primary buckets of value (see Figure 2).

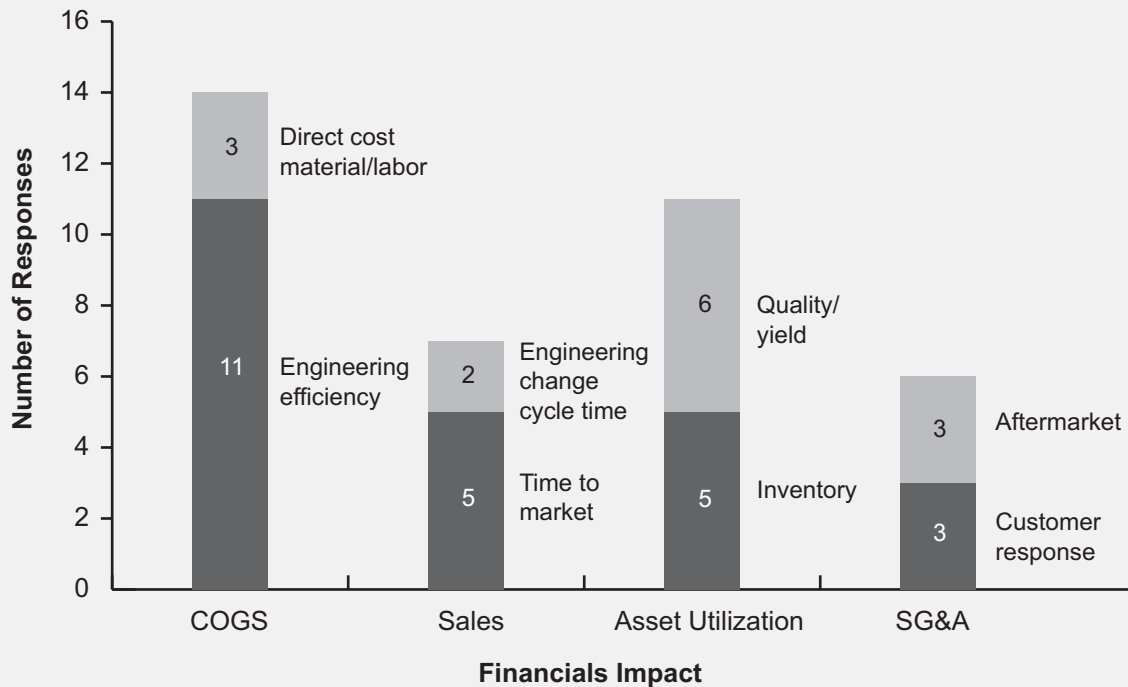
**Figure 2: PLM payback schedule—three levels of impact**



Building a successful business case requires a roadmap for transforming the process to meet the business' long-term needs. This roadmap to success works best when ROI benefits are broken into measurable elements that progress toward the strategic business transformation. A recent AMR Research study of A&D and other industries indicates that successful PLM initiatives break down into three categories from a financial perspective.

- **Infrastructure savings**—This accrues immediately after go-live. Most users' as-is PLM environment spans many, often dozens of, separate systems. Much of the interaction between these systems is manual, with redundant data entry and hard copy via courier very common forms of integration. Coupling this with a general freeze in new IT spending leaves PLM with a simple first gate—any new spending should replace existing spending, delivering lower Total Cost of Ownership (TCO) for PLM infrastructure within six to nine months.
- **Improvement in established operating metrics**—This accrues 6 to 12 months after go-live. Our research finds a number of widely used and generally well-benchmarked operating metrics applied to PLM initiatives (see Figure 3). Any organization intent on performance improvement in areas associated with product development, launch, and retirement should be able to identify several such metrics and tie PLM projects and owners explicitly to them.
- **Strategic competitiveness impacts**—This accrues three to five years after go-live. PLM's impact on a company's strategic position can be very compelling. 10% of PLM initiatives we reviewed were begun with little or no formal financial ROI analysis, relying strictly on the strength of strategic arguments. While this has worked to get some moving, long-term projects have a tendency to lose their way (and momentum) unless some benchmarks can be pointed to along the way as indicators of improvement.

Figure 3: A&D operating metrics targeted in PLM business cases



Source: AMR Research, 2003

### Timing and scale of impact pose ROI problems for PLM champions

Each of these three classes of benefit has problems in terms of developing a sound ROI argument. Infrastructure savings fail, in the words of one manufacturer, to “move the needle”—in other words, \$40K here or \$100K there just doesn’t merit attention when C-level executives have so much else to worry about.

Improvements to operating metrics suffer from process dependencies. PLM tools that should allow for better part selection or faster quote-to-cash cycle time work only if users across functions adopt them. Typically, therefore, the champion pushing to move forward on a PLM initiative is obliged to secure a lot of political buy-in before taking the first material step.

Strategic competitiveness is too far away in time and too complicated a financial impact model to pass muster as a legitimate ROI input. Some companies we have worked with accept the value of this benefit on faith and move forward despite a weak ROI analysis.

The value of PLM stretches beyond traditional internal product development and must be viewed in terms of its internal, customer-facing, or supplier-facing impact. A&D prime contractors and Tier 1 manufacturers must leverage the expertise of lower tier suppliers to design out product and supply chain cost and improve quality, while suppliers need to respond faster to changing customer program requirements. All tiers of the supply chain need to improve the efficiency of internal engineering organizations, sharing data to create innovative designs while leveraging common platforms and components.

**Table 1: Case examples of internal, customer-facing, and supplier-facing impact of PLM**

<b>Internal</b>	<b>Business</b>
110 hour design process takes 1 to 2 hours today—90%+ improvement	Engineered Systems
7% to 14% improvement in engineering non-value-added time—10% reduction in ECO cycle time	Defense Programs
Design cycle time reduced 25%	Weapons Systems
Concurrent product and process design speed the time-to-market	Automotive
<b>Supplier-Facing</b>	<b>Business</b>
Allowing suppliers access to CAD files reduces the lead time in developing tooling by 80%	Semiconductor Equipment
2% reduction in direct materials costs	Defense Programs
50% increase in component reuse, resulting in 5% to 15% decrease in prices for standard parts	Aircraft
<b>Customer-Facing</b>	<b>Business</b>
30% reduction in cycle time for complex custom order taking, pulling in live CAD models, cost models, thermal models all linked	Custom Electrical Switch Gear
Order volume increase 40%—order errors decreased 75%	Semiconductor
Eliminated almost 100% of customer order errors; cut down purchasing order cycle time by 30 minutes per transaction; 100% elimination of sending out-of-date product records to customers	Electromechanical Machinery
50% customer RFQ to prototype cycle time reduction	Bearings and Motion Control

Source: AMR Research, 2003

## The cost of transforming innovation infrastructure

Naturally, the benefits of transforming the product development process do not come for free, and the complexity of this transformation grows with the complexity of the organization's size, product attributes, and functional silos. Typical investments for transforming the innovation process are shown in Table 2.

Investing in technology to improve the innovation process is not new to A&D manufacturers, resulting in considerable existing investment in legacy systems. These systems are a bucket of homegrown applications, mainframe, and older commercial applications that often function in silos or require significant IT support for integration and maintenance. Boeing, Northrop Grumman, and Lockheed Martin have thousands of seats of Computer-Aided Design (CAD) and Product Data Management (PDM) applications across their global operations. Table 3 provides a comparison of this environment for a variety of industries, while Figure 4 provides a before-and-after representation of simplifying this complex environment.

**Table 2: PLM investment range**

<b>PLM costs</b>	<b>High</b>	<b>Average</b>	<b>Low</b>
Core PDM, per user seat license* (net)	\$6K	\$3K	\$0.5K
Implementation costs (multiple of SW)	2X	1X	0.5X
Maintenance costs (per year, percentage of license)	22%	18%	12%
<b>Additional costs</b>	<b>High</b>	<b>Average</b>	<b>Low</b>
Database licenses	\$200K	\$125K	\$50K
Internal allocations (multiple of SW)	3X	2X	1X
<b>Specialty Applications (per deal)</b>	<b>High</b>	<b>Average</b>	<b>Low</b>
Product portfolio management	\$1,500K	\$500K	\$50K
Implementation costs (multiple of SW)	2X	1X	0.5X
Component supplier management	\$2,000K	\$500K	\$100K
Implementation costs (multiple of SW)	4X	3X	0.5X
Configurators	\$3,000K	\$600K	\$120K
Implementation costs (multiple of SW)	4X	2X	1X

\*Deployments may be supplier-facing, customer-facing, or internally oriented.

Source: AMR Research, 2003



**Table 3: Complex disparate infrastructures are currently supporting the innovation process**

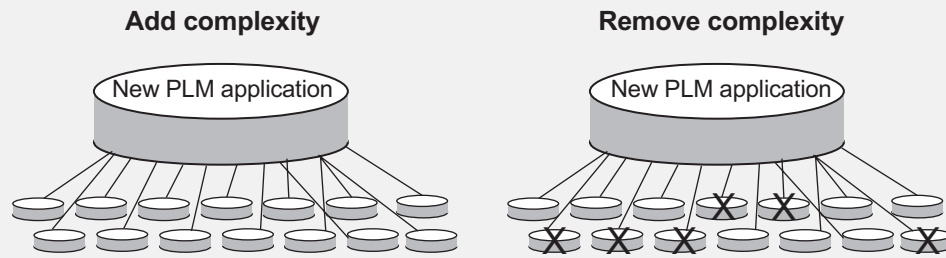
<b>Legacy Product Development Systems Across Industries</b>	<b>Automotive</b>	<b>A&amp;D</b>	<b>High-Tech</b>
Contract Management		◆	
Earned Value Management		◆	
Program Management	◆	◆	
Portfolio Management			◆
Project	◆	◆	◆
Parts Database	◆	◆	◆
Military Specifications		◆	
Material Specification	◆	◆	◆
Configuration Management	◆	◆	
Requirements Management	◆	◆	◆
Drawing File Server	◆	◆	◆
Bill of Materials (BOM)	◆	◆	◆
Mechanical Computer Aided Design (MCAD)	◆	◆	◆
Electrical CAD (ECAD)	◆	◆	◆
Computer-Aided Engineering (CAE)	◆	◆	◆
Government Procurement		◆	
Spreadsheets	◆	◆	◆
Adobe Documents	◆	◆	◆
Software Development	◆	◆	◆
<b>Typical number of disparate systems in a \$1B company</b>	<b>10 to 15</b>	<b>20 to 30</b>	<b>5 to 8</b>

Source: AMR Research, 2003

**Common Issues:**

- Custom homegrown supported by internal IT specialists
- Stand-alone applications requiring point-to-point integration
- Manual transfer of data between systems
- Minimal Internet access
- Limited ability for electronic collaboration with external partners

**Figure 4: Reducing complexity in innovation infrastructure**



Project costs	<ul style="list-style-type: none"> <li>• Software license</li> <li>• N point-point integrations</li> <li>• Process, data definition</li> <li>• Training</li> </ul>	<ul style="list-style-type: none"> <li>• Software license</li> <li>• N-X point-point integrations</li> <li>• X data conversion/transfer</li> <li>• Process, data definition</li> <li>• Training</li> </ul>
<b>Comp cost index</b>	<b>100</b>	<b>90</b>
Ongoing costs	<ul style="list-style-type: none"> <li>• New app maintenance</li> <li>• N existing apps maintenance</li> <li>• N point-point integration maintenance</li> <li>• HW/infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• New app maintenance</li> <li>• N-X existing apps maintenance</li> <li>• N-X point-point integration maintenance</li> <li>• Reduced HW/infrastructure</li> </ul>
<b>Comp cost index</b>	<b>100</b>	<b>80</b>

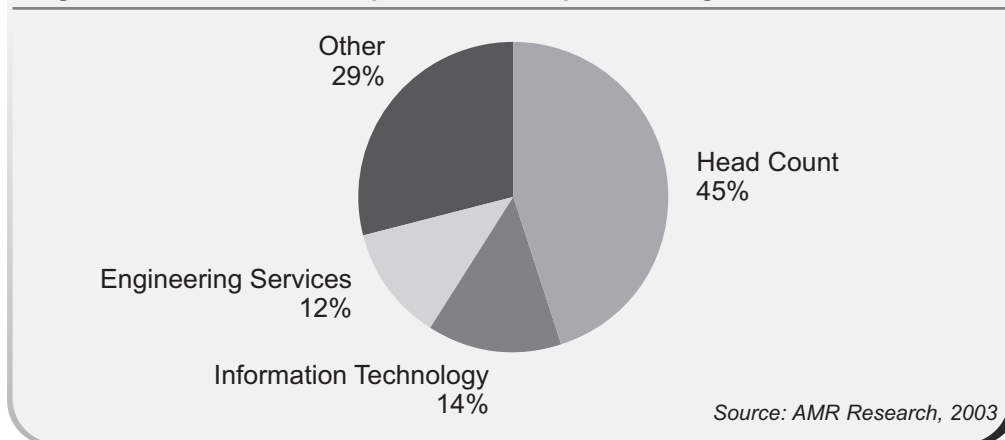
Source: AMR Research, 2003

It is common within A&D to have 10 dedicated IT personnel supporting every 100 engineers. Considerable investment is required to keep these professionals trained on the latest technologies, and they are often too busy with day-to-day firefighting to take on the more strategic requirement of transforming the product development environment. In fact, AMR Research discovered during its recent study that, given the technical expertise of A&D engineers, it is common to find them supporting their own systems environment. This of course raises the question of whether this is an appropriate use of talented resources. As A&D manufacturers are pressured to speed innovation while managing program risk, they are asked to do more with the same or fewer development dollars. A&D manufacturers dedicate anywhere from 2% to 4% of revenue to product development. This combines with additional IT and support costs to create a significant investment in the product development operation. A typical allocation of this full investment for A&D is shown in Figure 5.

### **What is your cost containment strategy over the next five years?**

As A&D manufacturers transform their IT infrastructure to support global program management strategies, they face cost and resource constraints because of the pressure to improve profit margins. While new technology investment must be carefully managed, the risks associated with a fragile legacy infrastructure cannot be taken lightly.

**Figure 5: Allocation of the product development budget—A&D**

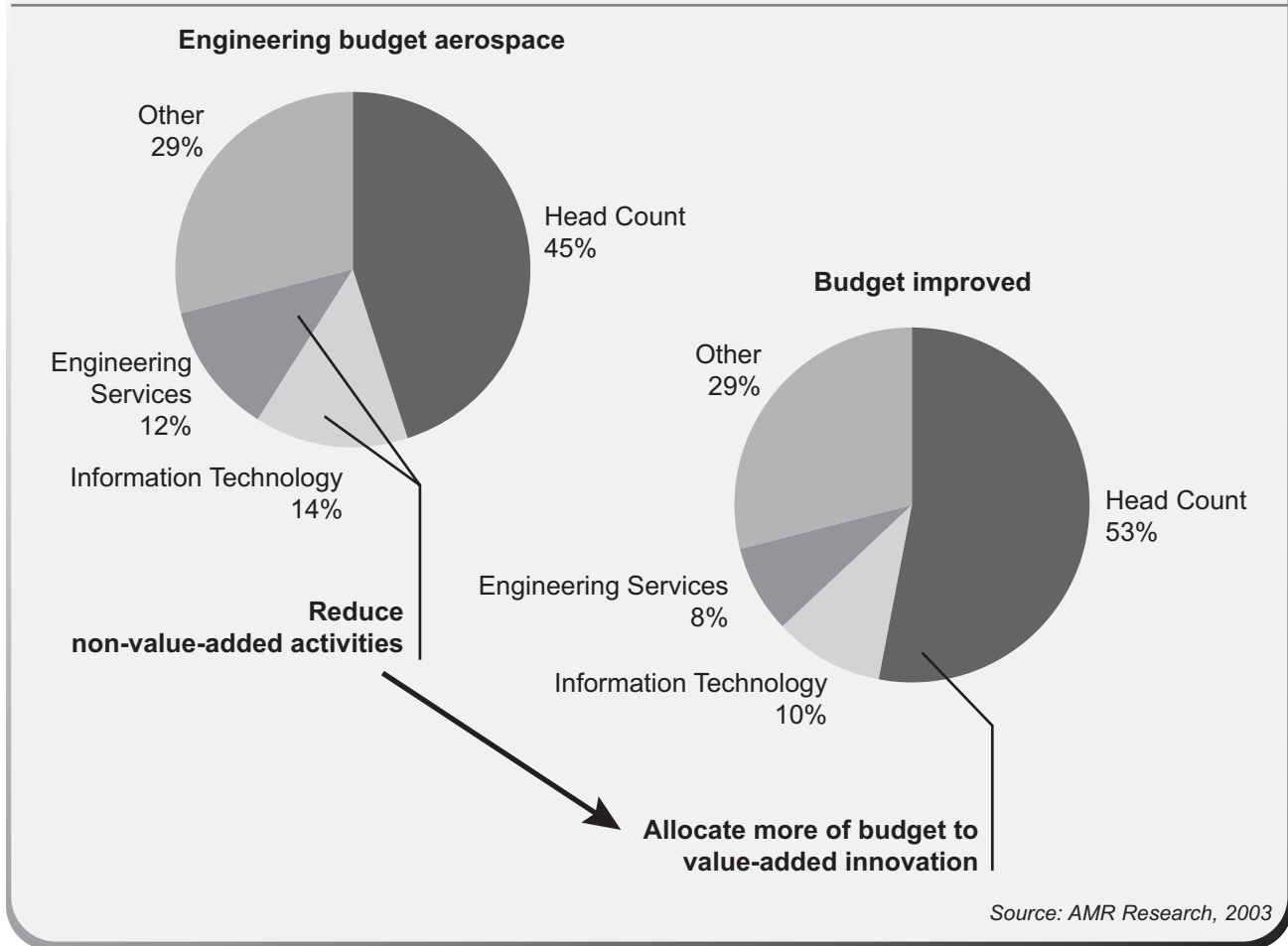


If IT budgets can't grow much more and R&D spending is expected to be more efficient, then some sort of cost containment strategy is needed. Several issues unique to the innovation infrastructure demand special attention when developing a strong cost containment approach that will enable transformation:

- **Higher degree of system complexity**—The drivers of system complexity include the fact that engineering, R&D, and product design are technically sophisticated user groups that are often willing and able to buy their own tools, independent of corporate IT. The resulting proliferation of CAD tools, parts databases, and engineering process controls makes for massive heterogeneity in application programming languages, databases, hardware, and networking protocols. This makes integration difficult and system upkeep expensive.
- **More expensive downtime**—The high cost of engineering and other product development human resources implies a greater burden on the organization when systems go down. The ratio of support personnel to users in engineering environments is often as high as 1 for 10. The interdependency of tasks in a typical product development environment makes matters worse. Problems in any phase of engineering may become huge overall program slip-pages as successor tasks wait and delays accumulate.
- **Wider partnering adds to communication costs**—Increasing outsourcing of manufacturing and design stands to increase infrastructure costs as new partners are added and more product information is exchanged.

Faced with the requirements to do more with less, manufacturers must shift the allocation of product development investments toward optimizing the use of engineering talent and less toward IT and support services. This calls for managing the current IT investment more efficiently, implementing process change, and successfully deploying appropriate technology to support process improvement (see Figure 6 on page 10).

**Figure 6: Reducing IT support costs frees funds for transforming the innovation process**



### **Cost-neutral ways are needed for creating an innovative product development infrastructure**

In a recent AMR Research survey of more than 100 manufacturing companies across industries, 65% reported that their product development IT budgets will be flat or increase slightly, and only 12% reported that their budgets will increase by more than 5%. A&D was an exception to this average, where 20% of survey respondents reported that their budgets would increase by more than 5%, versus 6% and 7% of Automotive and High-Tech respondents, respectively. Regardless of the level of budget growth, users interested in transforming their product development organizations in order to maintain competitive advantage will have to find creative cost-neutral ways.

Because of budget constraints, users are not able to spend huge budget increases on hiring new IT employees to effect a product development transformation. They must instead find projects that allow them to cut operational costs while investing in process and technology improvements. However, finding resources with the necessary skills while maintaining the status quo is difficult, if not impossible, for most users. One A&D survey respondent described how many product development process improvements identified through its Six Sigma program were not being implemented because of an IT resource bottleneck. For many companies, effectively leveraging the efficiencies of scale and skill and the cost advantages of offshore resources that can be delivered by outsourced service providers is an efficient way to overcome their staffing hurdle.

Developing internal support for using outsourced services while transforming product development IT requires the following:

- **Define core processes that should not be outsourced and non-core processes that can be outsourced.** Not everything done in product development is a core process, and successful companies can identify potential areas for cost savings based on a realistic assessment of their competitive advantages.
- **Develop a realistic financial analysis of the costs and benefits involved.** The cost analysis must include not only implementation costs, but also the ongoing maintenance and operations costs. AMR Research finds that most people ignore the ongoing maintenance and operational costs in their analysis, grossly underestimating their actual costs. The benefit analysis must capture the potential cost savings for IT and product development that result from the transformation.
- **Address user attitudes about the risks associated with changing product development tools and the way IT supports product developments.** Issues that must be addressed include the perceived risks such as loss of control, reduced service levels, and increased costs resulting from using outsourced resources.

## **Develop the business case based on outsourcing existing non-core pieces of product development IT support**

Most users responded that they needed to see at least a 30% cost savings from an outsourcer to compensate for the perceived risk of outsourcing a core competency. However, since most users within product development organizations are skeptical that a large IT outsourcing arrangement can deliver 30% savings, many quickly dismiss outsourcing IT support for product development. AMR Research believes that by selectively outsourcing rather than outsourcing everything, a business case can be constructed that shows a positive return.

Rather than attempting to outsource all of IT for product development, selective outsourcing can provide specific skills that prevent the launch of new strategic projects. For example, targeted elements of the product development environment that have been successfully outsourced include the following:

- **Data conversion**—The outsourcer redraws files from one format to another using offshore labor.
- **PDM help desk support**—The outsourcer provides help desk support for stable PDM applications.
- **Hardware preparation, setup**—The outsourcer manages the complexity of multiple suppliers and delivers a standardized configured platform to the user.
- **Legacy PDM application management**—The outsourcer maintains custom code for the few remaining groups required to use it.

In all of the above examples, the IT groups doing this outsourcing were able to save money because of better efficiencies provided by the outsourcing partner and, in the case of the data conversion example, because of lower cost offshore resources.

Essential to pursuing this strategy is the ability to segment product development activities into multiple categories:

- Core processes that are critical to the company's product development and provide competitive advantage
- Critical processes for product development that provides no competitive advantage; an example of this may be managing the ECO process or ensuring proper process data collection for regulatory compliance
- Commodity processes that provide little value such as managing access to a repository of legacy engineering drawings

Focus on outsourcing support for the critical and commodity processes. Use this activity to develop a relationship with an outsourcing partner, refine internal processes to better support working with an outsourcing partner, and provide demonstrated success with an outsourcing strategy.

## **Pragmatic approaches to managing costs exist**

When developing a strategy for transforming IT support for product development, it is necessary to compare in-house costs with potential outsourced costs. However, simple cost comparisons are not enough: Users must also factor in the risk associated with delayed and poor implementations. They also need to consider the benefits to be achieved by a higher quality and better maintained solution that consolidates and integrates applications. Table 5 details cost tradeoffs between in-house and outsourced resources.

**Table 5: Cost and benefit considerations for transforming product development IT**

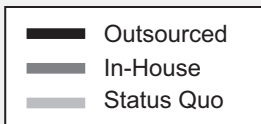
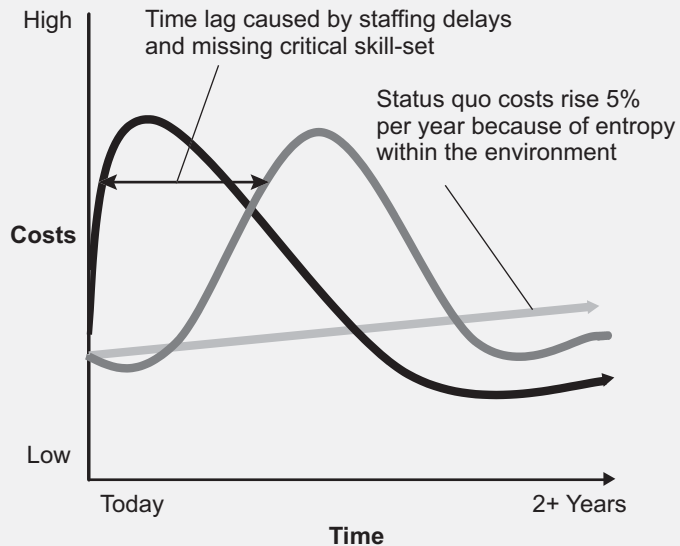
Decision Criteria	Factors to Consider
In-house labor costs versus outsourced labor costs	<p>Outsource labor costs are now undergoing a dramatic transformation as companies offer more offshore capabilities. Most large service companies now offer blended service offerings comprising a mix of local and offshore resources. Since offshore resources can be as low as 30% of onsite resources, substantially lower labor costs can be achieved through outsourcing.</p> <p>The skills provided by offshore labor are primarily for development and maintenance of custom code using standard tools (e.g., Java, C++, .Net) and development practices. Offshore labor has significantly fewer skills in project management and packaged application support. The actual labor rate savings provided by a mix of local and offshore resources will depend heavily on the mix project management, custom applications, and packaged applications. AMR Research has seen projects using blended outsourced resources cost in a range of 70% to 130% of estimated costs using in-house resources. However, outsourced projects done without offshore labor can cost 140% as much as similar projects done with in-house labor. For PLM-related projects, offshore savings will be most significant for application development and data conversions and less significant for ongoing application operations and maintenance.</p>
Startup costs and project delays	<p>When doing the transformation with existing in-house resources supplemented with permanent new hires, users must factor in the cost of project delays caused by delays in freeing up critical resources from current assignments or in hiring critical resources and project delays caused by in-house resources not having the necessary skills to quickly solve critical problems. For example, a user implementation of a new PLM system was about to miss its go-live date because the in-house staff no longer had the expertise to complete the integration with a legacy IMS. An outsourcing partner was brought in that could provide IMS expertise within 24 hours.</p>
Operational benefits from well-integrated systems	<p>In a study of the benefits of application integration, AMR Research found that companies with well-integrated application platforms spent 11% less on application maintenance and operations than companies with multiple non-integrated applications. Creating an integrated environment for product development applications involves integration with non-product development-specific applications such as the ERP, procurement, and supply chain planning applications. It is highly unlikely that the IT staff within product development will have the necessary expertise; a more efficient way to succeed with an integration strategy is to leverage skills of a services partner.</p>
Operational benefits from consolidated systems	<p>In a study of the benefits of application consolidation, AMR Research found that companies that have consolidated their applications down to a limited number save between 20% and 25% on operations. However, an effective consolidation strategy depends on an effective team with the ability to manage both the technical and organizational challenges necessary to reduce the number of little used customized applications. The most effective examples of consolidation projects used outsourced resources for about 25% of the project teams and focused the resources on the following:</p> <ul style="list-style-type: none"> <li>• Change management and facilitation for guiding team to best practices</li> <li>• Specialized technical knowledge (new products from vendor)</li> <li>• One-time tasks that could be done offshore (data conversion programs)</li> </ul>
Operational benefits from well-maintained systems	<p>Software vendors report that users running properly configured applications and systems running the appropriate latest service packages report significantly fewer defects than users running poorly maintained systems. One vendor reports that 80% of defects found and reported by users are duplicates of known defects that a user would not have experienced had it been running the latest appropriate service packages. Because they have multiple clients running similar applications and technologies, outsourced service providers can leverage maintenance expertise across multiple users—that is, they know the proper service packages and configurations because they install them at multiple sites.</p>

Source: AMR Research, 2003

**Figure 7: Cash flow comparisons for product development IT strategies**

Depending on the mix of offshore and onshore resources, outsourced development can range from 70% to 140% of the cost using in-house resources

Depending on the mix of offshore and onshore resources and the scope of the transformation, outsourced operations can cost 20% to 30% less to operate compared to an in-house project.



Source: AMR Research, 2003

Figure 7 compares the cash flow associated with maintaining the status quo, transforming with in-house and outsourced resources.

When developing a specific plan for transforming your product development organization's technical infrastructure, you need to quantify the following items:

- How many product development applications does your company currently operate, and what is the average number of users per application?
- Who supports the applications, and how many of the support people are hard-to-replace experts?
- What are the maintenance requirements (scheduled and unscheduled) for your product development applications?
- Are the support service levels and problem resolution times for the applications acceptable?
- What is the service-level performance of these systems?
- What is the percentage of custom applications compared to packaged applications, and how stable is the integration between systems?
- What does all this cost in terms of hard costs and opportunity costs?



Alternatives exist when selecting an outsourcing partner to assist with the transformation. When selecting an outsourcing partner, consider the following:

- **Specific application expertise**—Outsourcing saves you money when the outsourcing partner has access to skills that allow it to perform the outsourced tasks more efficiently. You should not pay for nonexistent expertise.
- **Integration expertise**—Successful integration is key to reducing operating costs and achieving better product design efficiencies.
- **Operations expertise**—Look for specific abilities to manage complex environments with well-structured Service-Level Agreements (SLAs).
- **Global labor delivery process**—You want access to lower cost offshore resources, but you don't want the management burden of directly managing these resources. Look for a provider that can offer a blend of onshore and offshore resources.

## User attitudes are a critical barrier for transforming product development IT

When asked about interest in outsourcing aspects of IT support for product development, 51% of A&D IT and engineering managers expressed no interest in PLM application maintenance or hosting, and 56% expressed no interest in PLM application infrastructure maintenance or hosting. However, digging deeper into these attitudes and comparing them to automotive and aerospace manufacturers, which generally have more experience with outsourcing the innovation infrastructure, reveals some ambivalence.

**Table 6: Interest in outsourced services**

Outsourcing Type	No Interest in Outsourcing	Somewhat Interested	Very Interested	Already Outsourcing This Activity
PLM application development	46%	29%	5%	20%
PLM application maintenance or hosting	51%	27%	7%	15%
PLM application break/fix support	56%	20%	5%	20%
PLM infrastructure managed services (hardware, app servers, etc.)	56%	12%	7%	24%
PLM infrastructure break/fix support	59%	15%	2%	24%
Other application maintenance or hosting	37%	29%	7%	27%
Other application break/fix support	39%	33%	5%	23%
Help desk	51%	7%	10%	32%
Product design work	51%	29%	7%	12%

Source: AMR Research, 2003

In interviews with A&D manufacturers, there were mixed messages concerning outsourcing engineering IT. A&D engineering groups feel that IT support of their applications is an extension of their engineering capabilities, the lifeblood of the business, and engineering down-time is very expensive. Yet, if there is confidence in the response time for support, then the engineering groups interviewed expressed an interest in getting the most up-to-date capabilities. One respondent commented, "The government is pushing us for improved electronic processes, but support of existing point applications interferes with these strategic initiatives. IT is the bottleneck to moving forward."

Where A&D manufacturers do show a combination of interest and relatively low levels of existing outsourcing is in the development and break/fix support of PLM applications. In PLM application development and break/fix support, the percentage claiming to be somewhat interested and very interested in outsourcing is 20% to 30%, while the same functions are currently outsourced in only 20% of user situations. The implication of these figures and detailed interview findings is that A&D manufacturers do see some value in targeted domain expertise specific to PLM applications, which were primarily challenging to IT and engineering resources internally because of their lack of integration skills. When developing your transformational strategy, you should look for areas for which a high interest but low outsourcing penetration exists as a starting point.

A&D manufacturers' relatively high level of response in claiming no interest in PLM application development outsourcing (46% versus 6% among automotive companies and 67% among high-tech) appears to reflect the prevailing habit of turning to outsource services providers to fill in narrowly defined skill gaps. One senior engineering IT executive was typical, saying "We look to outsiders for gap filling. The internal IT organization steps up to support any approved projects. It can decide how much to use outsiders." Users also want to shape development direction for the packaged applications vendors supplying their software. One noted, "We need some of our skin in the game with our applications suppliers." Another said, "Outsourcing buffers us from our apps providers." This may seem a benefit when considered in light of application rationalization, but there seems to be meaningful distinction between older, or lesser applications from small, nonstrategic vendors and the more critical relationship sought with leading applications vendors that can serve as a foundation layer or product information backbone.

Control for continuous improvement is a key concern for engineering and IT groups. According to one A&D IT director, “We need to be able to continuously improve the efficiency of IT support, and we may lose that in a complicated outsourcing contract.” Yet both engineering and IT groups felt they needed additional skills for application development, particularly for new technologies, but expressed concern about support of legacy systems. There was general agreement that additional capabilities for project management would be helpful in transitioning the engineering process. When asked what benefits from outsourcing were important, A&D user responses strongly highlighted expertise in the latest PLM applications. Expertise in PLM deployment was cited as extremely important by 43% of respondents, and expertise in the latest technologies was cited as very important by 44% of the respondents.

**Table 7: Value of outsourcing**

<b>Outsourcing Benefit</b>	<b>Not at All Important</b>	<b>Somewhat Important</b>	<b>Extremely Important</b>
Expertise in PLM deployment	20%	38%	43%
Expertise in PLM application upgrades	15%	46%	39%
Expertise in application-to-application integration	20%	42%	39%
Resources for day-to-day operations and application management	28%	40%	33%
Reduce cost of PLM software deployment	22%	39%	39%
Reduce cost of PLM software upgrades	20%	42%	39%
Reduce cost for day-to-day operations and management	20%	44%	37%
Reduce integration cost	22%	39%	39%
Expertise to respond to change requests from the product design group	20%	46%	34%
Resources to react to changes in demand for IT	20%	51%	29%
Expertise in the most current technologies	17%	39%	44%
Ability to leverage relationships with application vendors	20%	54%	27%
Reduce assets on books	22%	49%	29%

Source: AMR Research, 2003

**Table 8: Attributes of outsourcing partner**

<b>Outsourcing Partner Selection Criteria</b>	<b>Not at All Important</b>	<b>Somewhat Important</b>	<b>Extremely Important</b>
Demonstrated expertise	12%	27%	61%
Price relative to in-house cost of providing the service	12%	51%	37%
Financial stability of outsourcing partner	22%	54%	24%
Price relative to other potential outsourcing partners	17%	22%	61%
Partner's ability to provide training, change management, and project management	20%	54%	27%
Potential partner's relationship with application vendors	12%	37%	51%
Previous relationship with outsourcing partner	18%	45%	38%

*Source: AMR Research, 2003*

Among the most interesting observations to emerge from the survey data are the relatively weak importance scores attached to cost savings relative to in-house costs. Detailed interviews, at all levels and across functions in A&D, almost automatically start with the comment, "It's all about cost." The conversation, however, gradually moves toward the idea that certain critical skills are lacking in-house and that outsiders are attractive for their ability to deliver those skills. It is clear that users need to address costs first and foremost, but that they recognize the strategic importance of this technology environment and will, in the end, gravitate to demonstrated skills with PLM applications in the field. One CIO commented, "cash is king," but also remarked that the company doesn't have a good understanding of its costs today.

Successful transformation requires the support of executive management, product development staff, and IT staff. Ensuring support depends on a transformation plan that realistically addresses their concerns. The reasons most users give for not wanting to outsource their product development IT support and strategies for addressing these concerns are in Table 9.

**Table 9: Common concerns with outsourcing IT support for product development**

User Concerns	Strategies for Addressing Concerns
<p><b>Cost savings do not materialize</b>                      (Users have seen too many outsourcing deals for which promised savings never materialize)</p>	<p>When developing cost / benefit model be sure to include both deployment and ongoing operational costs as well as cost savings achieved with IT operations and savings achieved within product development. Consider outside help for benchmarking current costs.</p>
<p><b>Outsourcing support for core competencies is a poor strategy</b>                      (90% of the companies surveyed feel that product development is either a core competency or that they have a capable product development organization and can't risk damaging product development)</p>	<p>Although product development may be a core competency, not every activity within product development is core to the company. Users need to clearly identify core activities, critical but not core, and low-value activities within product development and focus initial outsourcing efforts on the low-value and critical but not core activities.</p>
<p><b>Loss of control and response latency</b>                      (Having to negotiate for extra support rather than telling an employee down the hall to go do it—despite comprehensive SLAs, resolving problems will take too long)</p>	<p>Ensure that SLAs are carefully prepared and define escalation paths and criteria for managing non-standard service requests. Also ensure that outsourced resources are balanced between higher cost on-site resources to address control and latency issues and lower-cost off-site (or off-shore) to address cost concerns. Finally, benchmark response times for current in-house procedures to ensure that outsourced service levels equal or exceed.</p>
<p><b>Loss of expertise</b>                      (Loose access to tool experts that assisted engineers with design techniques if the tool support was outsourced)</p>	<p>Ensure that outsourced tasks are focused on low value and critical but not core tasks where local expertise is not providing competitive advantage. Also balance onsite and offsite resources so that core tools support remains local.</p>
<p><b>Encroaching bureaucracy</b>                      (Managing change via an SLA would result in an overly bureaucratic organization)</p>	<p>Develop a partnership relationship with the outsourcing partner and develop a shared risk and reward structure around business objectives. Nothing cuts through bureaucracy like rewarding someone for exceptional service. Invest in the necessary training to ensure that line management has the necessary relationship management skills to successfully manage an outsourcing relationship.</p>

Source: AMR Research, 2003

## CLOSING COMMENTS

### **A structured approach to cost-neutral transformation of product development is essential for future growth**

A&D manufacturers with nonoptimal product development organizations need to transform these organizations or risk becoming noncompetitive in their market. To effect this change, users must develop four steps:

- **Strategic goals**—Company-specific, CEO-level drivers to competitive position
- **Distinctive capabilities**—Unique skills will complete the transformation
- **Cost containment**—Infrastructure savings based on tapping global scale and low-cost resources; integration competence to leverage existing systems; and organizational will and skill to rationalize applications, systems, and people
- **Risk mitigation**—A mechanical approach to controlling buyer risk, including SLAs, process operating benchmarks, and financing terms

### Research methodology

The findings in this Report are based on surveys conducted by AMR Research of more than 100 IT and engineering managers from companies within the Aerospace and Defense, Automotive, and High-Tech industries. Information gathered from the surveys was supplemented with in-depth interviews of more than 50 product development, IT, and financial control managers.

AMR Research is a strategic advisory firm that provides business and technology executives with the critical analysis and practical advice needed to manage resources, mitigate risk, and increase business value. The company's industry-specific research initiatives focus on key trends, issues, and developments in Enterprise Management, Customer Relationship Management, Supply Chain Management, and other strategic business applications and enabling technologies that drive the market. AMR Research, founded in 1986, is headquartered in Boston with an office in Irvine and European headquarters in London. More information is available at [www.amrresearch.com](http://www.amrresearch.com).

Your comments are welcome. Reprints are available. Send any comments or questions to:

AMR Research, Inc.  
Two Oliver Street, 5th floor  
Boston, MA 02109  
Tel: +1-617-542-6600  
Fax: +1-617-542-5670  
[www.amrresearch.com](http://www.amrresearch.com)

1920 Main Street, Suite 310  
Irvine, CA 92614  
Tel: +1-949-477-5353  
Fax: +1-949-477-5350

Whittaker House  
Whittaker Avenue  
Richmond, Surrey TW9 1EH  
United Kingdom  
Tel: +44 (0) 20 8822 6780  
Fax: +44 (0) 20 8822 6790

## ACRONYM LIST

Acronym	Definition
A&D	Aerospace and Defense
BOM	Bill of Materials
CAD	Computer-Aided Design
CAE	Computer-Aided Engineers
CAIV	Cost as an Independent Variable
COGS	Cost of Goods Sold
DoD	Department of Defense
ECO	Engineering Change Order
IMS	Inventory Management System
IP	Intellectual Property
IT	Information Technology
PDM	Product Data Management
PLM	Product Lifecycle Management
R&D	Research and Development
RFID	Radio Frequency Identification
RFQ	Request for Quotation
ROI	Return on Investment
SG&A	Sales, General, and Administrative
SLA	Service-Level Agreement
TCO	Total Cost of Ownership
TTM	Time-to-Market