



Using Product Analytics to Keep Engineering on Schedule and on Budget

November 2010

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Executive Summary

As companies look forward to an economic recovery, they are cautiously anticipating profitable growth. In order to achieve this growth, companies must balance factors such as time, cost, quality, and compliance. Accomplishing this requires better insight into how product development decisions impacts these things. This report offers guidance to obtain visibility to support better decision making which will ultimately lead to greater profitability.

Best-in-Class Performance

Aberdeen used the following five key performance criteria to distinguish Best-in-Class companies:

- 87% of products met product cost targets
- 7% decrease in product cost
- 90% of products met quality targets at design release
- 85% of products launched on time
- 83% of products met revenue targets

Competitive Maturity Assessment

When compared to competitors, firms enjoying Best-in-Class performance shared several common characteristics that support better decision making including:

- 35% more likely to track product and schedule performance across the entire product portfolio
- 48% more likely to expand delivery of critical metrics to managers which include schedules, cost, compliance, and performance
- 60% more likely to increase visibility to cost drivers within engineering and beyond

Required Actions

In addition to the specific recommendations in Chapter Three of this report, to achieve Best-in-Class performance, companies must:

- Evaluate the cost impact of Engineering Change Orders (ECOs) within the change workflow
- Utilize feature-based cost modeling
- Analyze multiple sources of cost

Research Benchmark

Aberdeen's Research Benchmarks provide an in-depth and comprehensive look into process, procedure, methodologies, and technologies with best practice identification and actionable recommendations

How Does Your Performance Compare to the Best-in-Class?



- Compare your processes
- Receive a free, personal PDF scorecard
- Benefit from custom recommendations to improve your performance, based on the research

[Take the Assessment](#)

Receive Your Free Scorecard

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Chapter One: Benchmarking the Best-in-Class

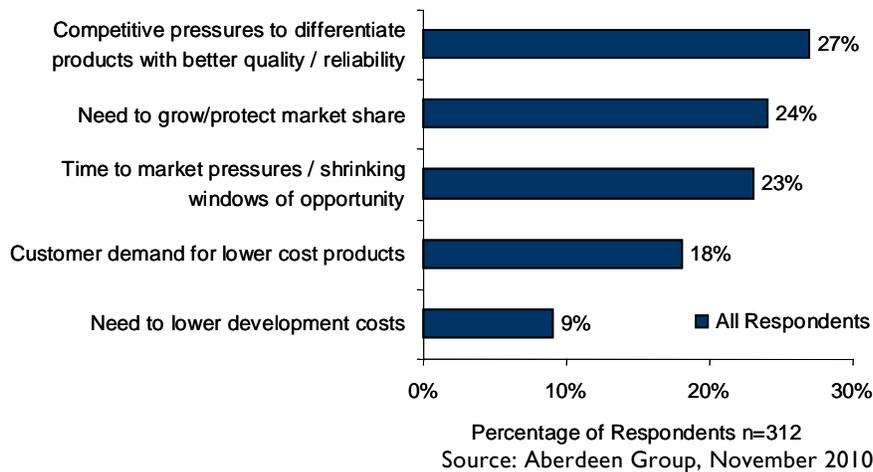
Aberdeen's July 2010, *Balancing Risk and Opportunity in Today's Economic Climate* report found that 80% of companies surveyed expect revenue growth in the coming year. At the same time, Aberdeen's October 2010 *Where Have All the Jobs Gone?* report found that in 2009, manufacturers reduced 6% of their workforce and year to date for 2010 reported another 2% reduction. With pressure to achieve profitable growth, yet fewer resources to achieve that growth, it is critical that companies find ways to work smarter. This study investigates ways to achieve just that.

Research from Aberdeen's *Managing the Innovation Portfolio: Enabling Engineering Success to Boost Profits* report finds that executive support is critical to the development of new products. In addition, companies that are most successful are 17% more likely than their less profitable competitors to make sure executives have visibility into project health. What are the best ways to accomplish this? What do management and engineers need access to in order to balance development schedules with factors such as product cost, compliance, and performance? To answer these questions, Aberdeen studied the experiences of 312 companies in October and November 2010 through a survey and interviews.

The Business Need for Better Insight

To understand the external factors driving managerial decisions, survey respondents were asked to pick the top business pressure driving their company to have better insight into decision making during product development (Figure 1).

Figure 1: Top Business Pressure Driving Better Decision Making in Product Development



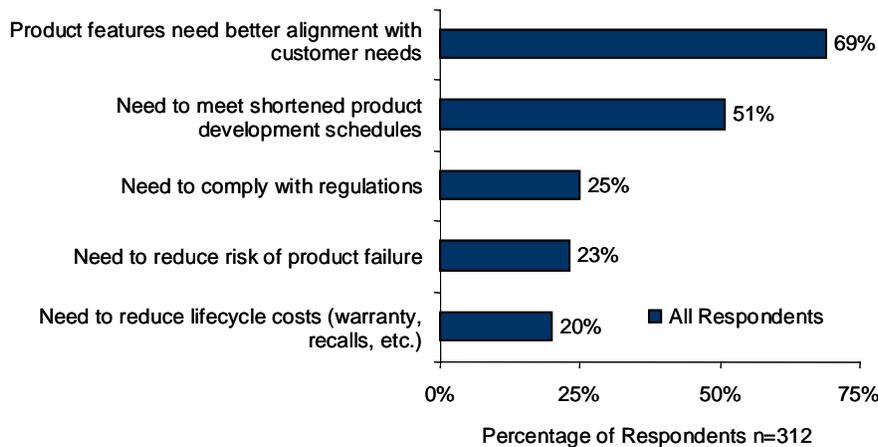
"It's difficult to know if the selling price will support the product cost. It would be useful to identify what we can sell products for up front and design according to that. Currently, we are identifying high costs too late in the process to be able to do much about it."

~ Vice President, Product Development and Engineering, Consumer Durable Goods Manufacturer

Interestingly, there really isn't an overwhelmingly predominant pressure: quality, time, and cost all are important. This means companies need to balance the implications of decisions equally against all three pressures, creating a need for better methods of simultaneously evaluating how they are impacted. Growth is also an important pressure, showing that companies are trying to improve what they have now. This is difficult without a way to truly understand what will make the biggest impact on what they have in place.

To understand this impact on the products themselves, survey respondents were asked to pick the top two product specific pressures driving better insight into decision making (Figure 2).

Figure 2: Top Product Pressure Driving Better Decision Making in Product Development



Source: Aberdeen Group, November 2010

The top pressure on the product is getting the right features in the product that customers want, followed by getting that product to market as quickly as possible. Ultimately, addressing both of these pressures drives revenue. This is followed by pressures to comply with regulations and then meeting quality expectations for the product by reducing the risk of product failure and keeping lifecycle costs down. Not successfully addressing these pressures can significantly hurt the profitability of new products or even worse, create delays in bringing products to market which decreases the window of opportunity for the product to bring in revenue.

What Are the Biggest Hurdles for Making the Right Decisions?

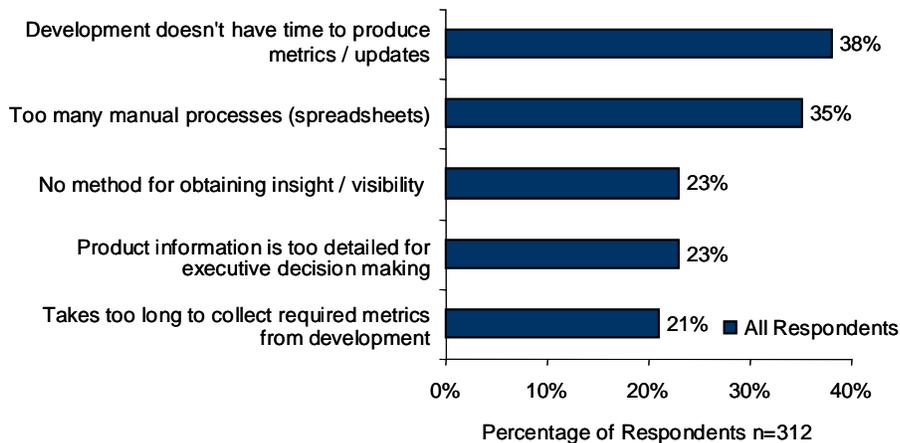
As the pressures indicate, a variety of factors must be considered to make the best decisions during product development. Time, cost, quality, performance, and compliance are all critical while at the same time, it is essential that the product requirements that will drive customer demand

“Designing components with incomplete specifications and missing information was creating a real challenge for us. We are working to create a better flow of information from marketing to engineering. There is still work to be done, but already the flow of information is much better.”

~ David Copher, Design Engineer, Quality Tank & Construction Co., Inc.

make it into the final product. In order to weigh all of these factors, engineers and management must have access to the right information. What is hardest about collecting this information? Figure 3 displays these top challenges. Respondents were asked to pick their top two.

Figure 3: Top Challenges for Decision Making in Product Development



Source: Aberdeen Group, November 2010

What is very interesting is that most of these challenges boil down to one thing: time. Engineers are so busy with their day to day work, stopping to provide status updates or put together needed metrics is just a distraction, preventing them from getting their design and development work done. In addition, it takes too long to go to all of the individual developers and engineers to obtain the needed information. In fact, survey respondents report spending **18% of their time** just providing status updates and preparing for design reviews. **That is nearly an entire day, once a week, wasted on unproductive time.** Even just cutting this time in half would result in significant productivity gains. This time sink is further aggravated by the very manual processes used to collect this information. Then when it is collected, it is not in a format that is easily digested by an executive level person. The information is so technical or detailed that executive level people just do not have the time to fully absorb it or follow it enough to put it in the context of the company's business goals. However, in order to address the top pressures on the business, they require access to this information so that they can be making the right decisions. Given that lack of time already creates significant pressure on the product development team, obviously this creates a real problem. Clearly there is a need to streamline access to needed information to the right people at the right time so that the right decisions can be made.

The really striking thing about these challenges is that nearly a quarter of the respondents do not even have a way to collect the information they need to make the right decisions. Having no method for obtaining insight

“We did not have a good understanding of cost drivers that resulted in inaccurate and late product cost roll-ups. Rigorous reviews have provided much earlier indications of cost variances.”

~ Rick Brault, Principal Engineer, R&D Systems, Brady Corporation

during development puts companies at a significant competitive disadvantage because they have no way of knowing how the decisions they are making will ultimately impact the company's profitability.

Just to provide some context of how quickly lack of visibility to catch problems and make good decisions can drive up cost, consider the following as reported by survey respondents:

- ECOs cost 75% more after release to manufacturing than they do if implemented before release to manufacturing
- Each new part number added to the enterprise costs \$4,405

Visibility to make better decisions up front to avoid or catch potential problems that will result in late ECOs will save significant cost for the company. In addition, adding just five new part numbers for a new product adds over \$20,000 to the cost of the product. The ability to make better decisions about reusing existing parts or identifying existing supplied components that will work as well has a tremendous impact on the overall profitability of a product.

The Maturity Class Framework

To understand successful approaches to better decision making in product development and the business impact it has upon companies, Aberdeen benchmarked the performance of study participants and categorized them as either Best-in-Class (top 20% of performers), Industry Average (mid 50%), or Laggard (bottom 30%). Given that the top pressures on product development are about quality, time, cost, and revenue, five key performance measures that indicate success with addressing these pressures were used to distinguish the Best-in-Class from Industry Average and Laggard organizations. The performance of each of these tiers is displayed in Table I.

"A continued pressure of ours is that product pricing gets set before the costs are known. We aim to deal with this problem by improving upfront cost estimating and continually tracking project scope creep."

~ Director of Product Development and Engineering, Automotive Manufacturer

Table I: Top Performers Earn Best-in-Class Status

Definition of Maturity Class	Mean Class Performance
Best-in-Class: Top 20% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 87% of products met product cost targets ▪ 7% decrease in product cost ▪ 90% of products met quality targets at design release ▪ 85% of products launched on time ▪ 83% of products met revenue targets
Industry Average: Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 62% of products met product cost targets ▪ 1% decrease in product cost ▪ 73% of products met quality targets at design release ▪ 56% of products launched on time ▪ 58% of products met revenue targets

Definition of Maturity Class	Mean Class Performance
<p>Laggard: Bottom 30% of aggregate performance scorers</p>	<ul style="list-style-type: none"> ▪ 25% of products met product cost targets ▪ 3% increase in product cost ▪ 37% of products met quality targets at design release ▪ 23% of products launched on time ▪ 25% of products met revenue targets

Source: Aberdeen Group, November 2010

One of the top pressures on product development is to lower product cost. The Best-in-Class are successfully doing this by making better decisions to keep product cost down. As a result, they are 39% more likely than the Industry Average to meet product cost targets. In addition, the Best-in-Class have also seen a 7% decrease in their product costs over the last two years while at the same time, the Industry Average saw only a minor 1% decrease and the Laggards actually saw an increase in product cost, putting them at a competitive disadvantage.

While it is impressive that the Best-in-Class have been able to take cost out, they are not doing this at the expense of quality. They are 23% more likely than the Industry Average to meet quality targets. This means they have visibility to balance what could often be conflicting criteria to arrive at an optimal solution that not only lowers cost, but also meets customer expectations in terms of quality.

Even as the Best-in-Class are able to obtain the needed information to balance cost and quality, they are simultaneously addressing the challenge of time. They are 52% more likely than the Industry Average to release products on time. This means they are collecting the information they need, without adding to development time. They also have the ability to identify bottlenecks in the process so they can make adjustments as needed so that products are still released on time.

Because the Best-in-Class do such a good job of managing their process, they launch their products on time. This means they optimize their window of opportunity to bring in revenue for the product. Consequently, they are 44% more likely than the Industry Average to meet revenue targets. This also means they are successfully implementing the requirements customers want which drives demand for the product to bring in the expected revenue.

The Best-in-Class PACE Model

Making the right decisions during the development process to achieve corporate goals requires a combination of strategic actions, organizational capabilities, and enabling technologies that are summarized in Table 2.

“We were having difficulty with scheduling the design process so we implemented a scheduling system. This has improved the workflow and made project status more visible.”

~Lindon Lawn, Technical Manager, EHS Manufacturing

Table 2: The Best-in-Class PACE Framework

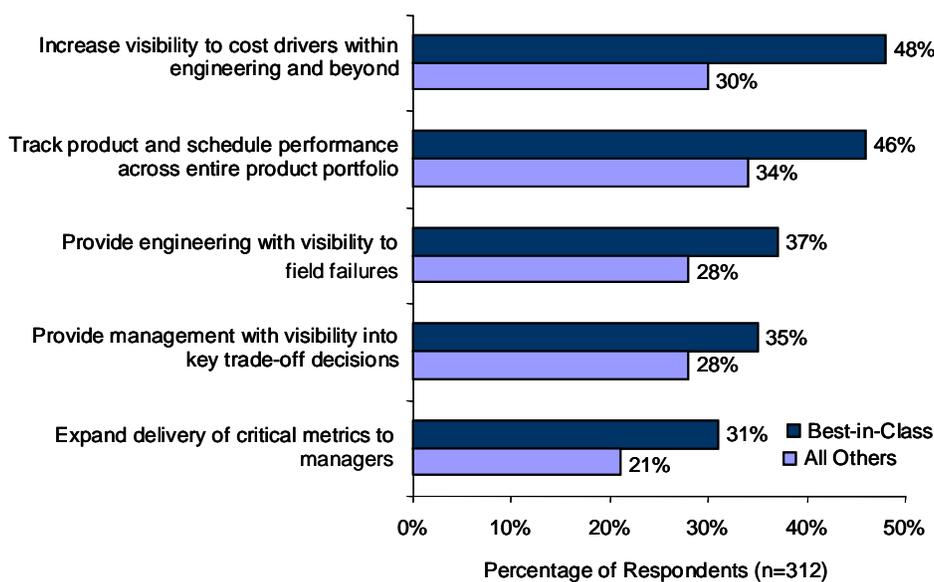
Pressures	Actions	Capabilities	Enablers
<ul style="list-style-type: none"> ▪ Increase profit 	<ul style="list-style-type: none"> ▪ Expand delivery of critical metric/measurement data to managers ▪ Increase visibility to product cost drivers within engineering and beyond for cross-functional stakeholders 	<ul style="list-style-type: none"> ▪ Cost assessment and estimation starts with the preliminary BOM ▪ Corrective / Preventative Actions and lessons learned are compiled and communicated ▪ Multiple sources of cost are analyzed to support decisions about the product ▪ Engineering Manager/Supervisor monitors product compliance ▪ A dashboard view of all projects is available in a central location ▪ Real time visibility to substances used in supplied components ▪ The cost impact of ECOs is analyzed and reviewed in the change workflow 	<ul style="list-style-type: none"> ▪ Product cost management and estimation ▪ Closed-loop Corrective Action System or QMS ▪ Risk / Safety Analysis ▪ Integration with ERP, PLM, or corporate databases ▪ Customizable Reporting tools ▪ Feature-based cost modeling ▪ Failure rate prediction tools

Source: Aberdeen Group, November 2010

Best-in-Class Strategies

Given the performance benefits enjoyed by the Best-in-Class, they are clearly doing a better job of addressing and balancing the top pressures of time, quality, and cost to bring in more revenue. They are doing this by getting better insight during product development so that they can make the best decisions in the interest of the company's profitability. The top strategies implemented by the Best-in-Class are shown in Figure 4.

Figure 4: Best-in-Class Strategies to Improve Decision Making



Source: Aberdeen Group, November 2010

Fast Facts

- ✓ ECOs **cost 75% more** after release to manufacturing than they do if implemented before release to manufacturing
- ✓ Each new part number added to the enterprise **costs \$4,405**
- ✓ **18% of development time** is spent providing status updates and preparing for design reviews

The strategies followed by the Best-in-Class are very focused on getting the right information to the right people at the right time. This ensures that both engineering and management are more empowered to make the right decisions.

To address the pressure of needing to meet customer expectations for lower priced products, the Best-in-Class are 60% more likely than their competitors to provide engineering with visibility into cost drivers. Forty-one percent (41%) of survey respondents report that products costing more than budgeted to produce is one of the top issues to have a negative impact on the success of a product. With a better understanding into what will drive up product cost, engineers can make better informed design decisions to keep product cost down. However, the Best-in-Class do not stop there. They also make sure cross-functional stakeholders have visibility to cost drivers. This enterprise wide approach to increase visibility to cost means everyone can do their part in contributing to keeping costs in check which results in an overall boost in profitability.

The Best-in-Class are able to address time to market pressures by tracking schedule and performance across the entire product portfolio. With an understanding of the performance of the entire portfolio, they can recognize bottlenecks and take corrective action when needed. They also have better insight into how shifts in resources will affect other projects, helping them to better prioritize where efforts should be focused.

To meet demands for higher quality and reliability, the Best-in-Class are 32% more likely than competitors to provide engineering with visibility to field failures. This helps them learn from previous mistakes so that they can avoid similar failures in the future. They can also incorporate additional scenarios in future test plans to ensure a future failure is not repeated, improving the quality assurance process overall.

Finally, the Best-in-Class ensure management has access to critical information so that they can better manage their teams. To ensure conflicting criteria such as time, cost, quality, and performance are properly balanced, the Best-in-Class are 25% more likely than their competitors to provide management with visibility into key trade-off decisions. They are also 48% more likely than their competitors to make sure that management has visibility into critical metrics. Not only does this empower them to provide critical oversight to ensure key design criteria and requirements are met, but this also makes it possible to have early visibility into problems such as not meeting regulatory compliance. Early visibility means they can take corrective action and avoid problems that will have a negative business impact, such as stop shipments.

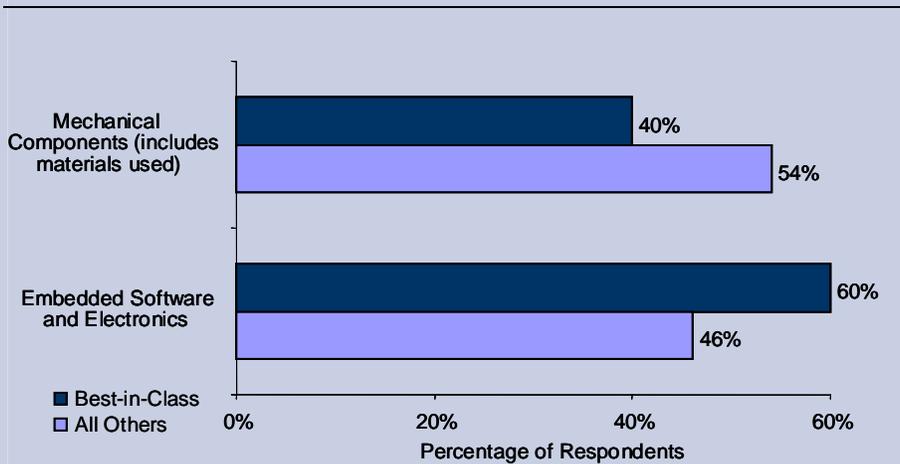
"We implemented metrics and a methodology for data collection in response to poor design metrics for labor usage and schedule performance. These changes highlight problem areas so they can be dealt with."

~ Engineering Manager,
Aerospace and Defense

Aberdeen Insights — Strategy

As shown in Figure 1, one of the top business pressures driving better decision making is to grow and protect market share. As found in Aberdeen's December 2009 *Product Innovation Executive Strategy Guide*, innovation is critical to growing and protecting market share. An interesting trend is where companies are focusing their efforts to add innovation to their products. Best-in-Class discrete manufacturers are 30% more likely than competitors to use electronics and embedded software to bring innovation to their products (Figure 5).

Figure 5: Where the Source of Innovation Is Coming From



Source: Aberdeen Group, November 2010

Figure 5 represents a very interesting trend for discrete manufacturers; they are replacing mechanical components with electronics and software. This strategy offers a lot of advantages. Software is more flexible and can easily be used to tailor product offerings to customer preferences, helping companies address the top product pressure to better align product features to customer needs (Figure 2). Software also costs less to physically produce so companies avoid some of the \$4,405 cost for each new part number added to the enterprise. However, while incorporating embedded software and electronics offers many advantages, as found in [System Engineering: Top Four Design Tips to Increase Profit Margins for Mechatronics and Smart Products](#), a new set of challenges is introduced.

continued

“By continuously reviewing the requirements and monitoring incremental development cost throughout the process, we were able to achieve 10% savings on product development cost and 98% compliance with the requirements.”

~ Vinay Mehta, CEO,
PoleVault Technologies

Aberdeen Insights — Strategy

Because multiple engineering disciplines (mechanical, electrical, and software) are now involved, there is an inherent lack of cross functional knowledge that must be overcome. In addition, each engineering discipline uses its own design tools, making it difficult to predict integrated system behavior. Finally, the level of complexity introduced by an integrated system makes it more difficult to ensure all design requirements are met. In fact, 41% of survey respondents report that a problem with meeting requirements is the number one issue to have a negative impact on the success of a product. All of these challenges mean that new approaches are required to ensure that engineers across disciplines, as well as management, have better visibility into the entire development process, especially into aspects of the design they are technically less familiar with, so that they can make the right decisions for the product.

The strategies implemented by the Best-in-Class to support better decision making are good business sense for any company developing products. However, as products and the processes to develop them become more complex, such as the case with system design, the number of factors that must be considered when making decisions increases. This means it becomes even more important that engineering and management have easy access to the information they need to make the right decisions.

“Schedule overruns were a challenge for us. We are now using better estimation and resource management tools and we have been able to reduce over runs by 5%.”

~ Vivek C, Project
Management Consultant

In the next chapter, we will see what the top performers are doing to achieve their success.

Chapter Two: Benchmarking Requirements for Success

Chapter One demonstrated the pressures driving companies to improve decision making. It also described the business opportunities offered by the successful execution of strategies to improve decision making. Chapter Two explores the capabilities and enabling technologies the Best-in-Class use to execute those strategies, allowing them to enjoy a competitive advantage.

Case Study — Taking Cost out of Supplied Components

For one industrial equipment manufacturer, better visibility to estimated costs has yielded significant cost savings in the supply chain. When designs are about two-thirds complete, they are ready to start getting bids for supplied components. The work is submitted to the cost management group which uses a cost management solution to generate an estimated cost. The software tool evaluates the CAD model and uses a database of information including material and manufacturing costs to arrive at an estimated cost. This takes only a few seconds for simple parts and up to a couple of hours for very complex assemblies.

“We have had extremely good success with this,” comments a cost manager at the company. “The estimated costs have less than a 5% margin of error. With a better understanding of what it should cost, we are more empowered when we work with our suppliers. When a quote comes back higher than our estimates, we can now have a fact based conversation about it. By using the results from our cost management software solution, it is much easier to renegotiate a lower price.”

In addition to saving cost, there are time savings as well. “Now that we have a better idea of what it should cost, we no longer need to send it out for multiple bids to try to find the best price,” explains the cost manager. “We only need to get one quote and because we are better informed, we know if it is priced right.” This makes it easier on the suppliers too because they are not wasting time quoting work they will not get. Even better, since they know they will likely get the work, suppliers are a lot more responsive with their quotes. This removes complexity from the bidding process, greatly reduces the time, and improves the overall relationships with the suppliers.

Eventually, the company plans to embed cost estimation in the design process as well. They will define target costs for new parts and enable design engineers to leverage the cost management solution so that they can make better informed decisions about cost while they do their design work. For now, they are very happy with the savings they are seeing so far. “Since implementing this process with our cost management solution, we have seen 10% savings on our products,” reports the cost manager. Knowledge is a very powerful thing.

Fast Facts

Compared to all competitors, the Best-in-Class are:

- √ **35%** more likely to track product and schedule performance across the entire product portfolio
- √ **48%** more likely to expand delivery of critical metrics to managers which include schedules, cost, compliance, and performance
- √ **60%** more likely to increase visibility to cost drivers within engineering and beyond

Competitive Assessment

Aberdeen Group analyzed the aggregated metrics of surveyed companies to determine whether their performance ranked as Best-in-Class, Industry Average, or Laggard. In addition to having common performance levels, each class also shared characteristics in five key categories: (1) **process** (the approaches they take to improve decision making); (2) **organization** (defined ownership of processes and collaboration among stakeholders); (3) **knowledge management** (how data is managed and exposed to key stakeholders); (4) **performance management** (metrics captured and tracked to improve business results); and (5) **technology** (the tools that provide visibility and support better decision making). These characteristics (identified in Table 3) serve as a guideline for best practices, and correlate directly with Best-in-Class performance across the key metrics.

"By establishing target cost estimates early, and monitoring actual costs throughout the development process, we've been able to trim the gap between target cost and actual cost."

~ Engineering Manager,
Industrial Equipment
Manufacturer

Table 3: The Competitive Framework

	Best-in-Class	Average	Laggards
Process	Cost assessment and estimation starts with the preliminary BOM		
	83%	65%	55%
	Corrective / Preventative Actions and lessons learned are compiled and communicated		
	80%	64%	43%
	Multiple sources of cost (currencies, logistics, locations) are analyzed to support decisions about the product		
Organization	Engineering Manager/Supervisor monitors product compliance		
	70%	66%	38%
Knowledge	A dashboard view of all projects is available in a central location		
	51%	42%	37%
	Real time visibility to substances used in supplied components		
Performance	Targets for critical product design criteria are defined up front		
	84%	62%	50%
	Defect growth is tracked		
	70%	55%	39%
	The cost impact of engineering changes is analyzed and reviewed in the change workflow		
	53%	29%	16%

	Best-in-Class	Average	Laggards
Technology	Technology currently in use to support decision making:		
	<ul style="list-style-type: none"> ▪ 71% Product cost management ▪ 64% Closed-loop Corrective Action System or QMS ▪ 56% Risk / Safety Analysis ▪ 53% Integration with ERP, PLM, or corporate databases ▪ 50% Customizable Reporting tools ▪ 46% Feature-based cost modeling ▪ 40% Failure rate prediction tools 	<ul style="list-style-type: none"> ▪ 52% Product cost management ▪ 54% Closed-loop Corrective Action System or QMS ▪ 52% Risk / Safety Analysis ▪ 46% Integration with ERP, PLM, or corporate databases ▪ 38% Customizable Reporting tools ▪ 23% Feature-based cost modeling ▪ 26% Failure rate prediction tools 	<ul style="list-style-type: none"> ▪ 30% Product cost management ▪ 36% Closed-loop Corrective Action System or QMS ▪ 32% Risk / Safety Analysis ▪ 32% Integration with ERP, PLM, or corporate databases ▪ 24% Customizable Reporting tools ▪ 11% Feature-based cost modeling ▪ 22% Failure rate prediction tools

Source: Aberdeen Group, November 2010

Capabilities and Enablers

Based on the strategies deployed to support better decision making, the findings of the Competitive Framework and interviews with end users, Aberdeen’s analysis of the Best-in-Class reveals where companies must focus to improve decision making to manage development schedules while meeting requirements for product cost, performance, and compliance. Processes, organizational responsibility, knowledge management, performance management, and technology all play a role in supporting this.

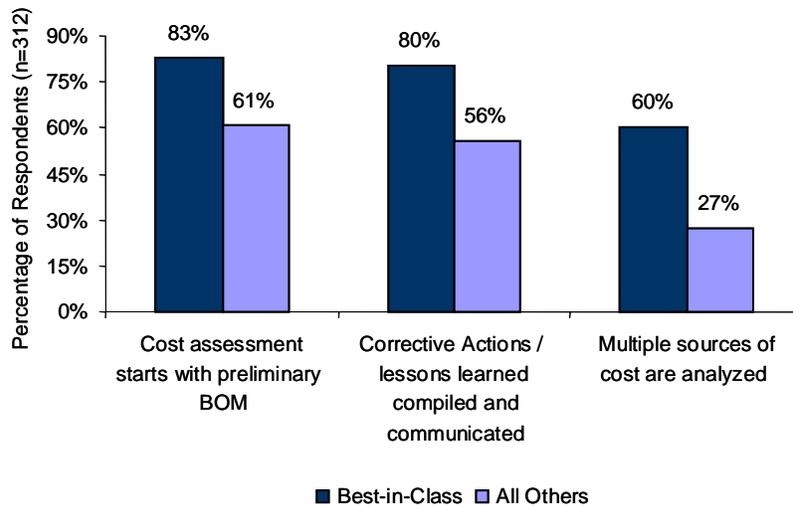
Process

Standard processes define how to take advantage of existing knowledge within the company. The most differentiated processes implemented by the Best-in-Class are shown in Figure 6.

"We were having challenges managing requirements to meet compliance regulations. We implemented a database to help us manage this and as a result, we have seen significant improvement in meeting customer expectations."

~ CEO, Consumer Electronics Company

Figure 6: Best-in-Class Processes for Better Decision Making



Source: Aberdeen Group, November 2010

The Best-in-Class have standard processes in place to assess cost. They are 36% more likely than their competitors to begin assessing cost with the preliminary BOM. Early assessments enable them to make adjustments if needed to ensure products meet cost targets. In addition to looking at the BOM, they are also 2.2 times more likely than competitors to evaluate different sources of cost such as currencies, locations, and logistics. Labor rates in different parts of the country and world impact how much it costs to produce a part in addition to the manufacturing equipment available at certain locations. However, cost savings in labor can be offset by shipping costs, both the raw materials needed to produce the product as well as shipping to distribution locations. The Best-in-Class take all of this into account so that they are able to make the best decisions about how to save cost. This results in their ability to reduce product cost by 7%.

Leveraging product analytics identifies opportunities for potential problems so that corrective action can be taken to avoid it. The Best-in-Class are 43% more likely than their competitors to take that even a step further. They make sure all stakeholders are able to benefit from the lessons learned through corrective actions so that they are enabled to continuously improve, enabling them to remain Best-in-Class and preserving their competitive advantage.

Organization

Needing to comply with product regulations is one of the top pressures driving better decision making. Being out of compliance can have serious repercussions on the profitability of a product and can even result in stop shipments and tarnished reputations. To address this, the Best-in-Class are 27% more likely than their competitors to empower management to monitor product compliance. This allows them to have visibility when

“Suffering from inadequate resource planning, we were able to gain a 30% improvement on committed schedule through better software and control on budgets.”

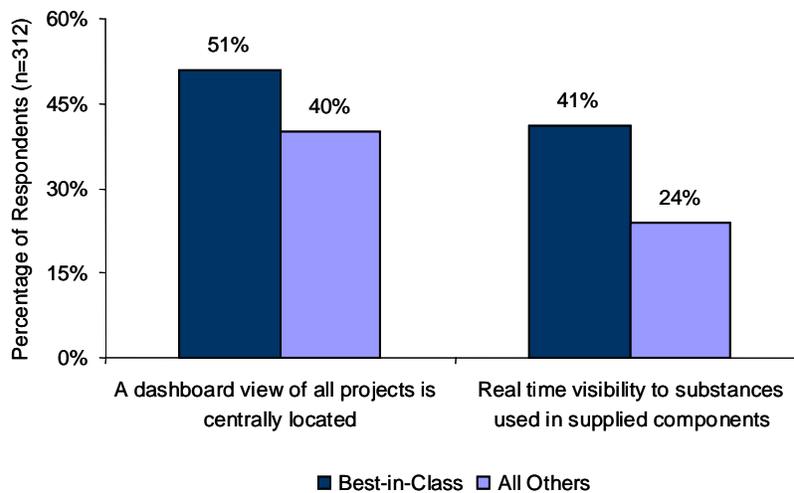
~ Jayesh Brahmhatt,
Procurement Manager,
Zygotech

products are not in compliance so that they can take corrective action prior to it becoming a major problem for the company that will hurt profit margins.

Knowledge Management

Product analytics capture knowledge about products and development processes. The key to making sure this knowledge is used to its fullest potential is how it is exposed to the right people. Figure 7 shows some of the most differentiated capabilities the Best-in-Class use to manage their knowledge.

Figure 7: Best-in-Class Capabilities to Manage Knowledge



Source: Aberdeen Group, November 2010

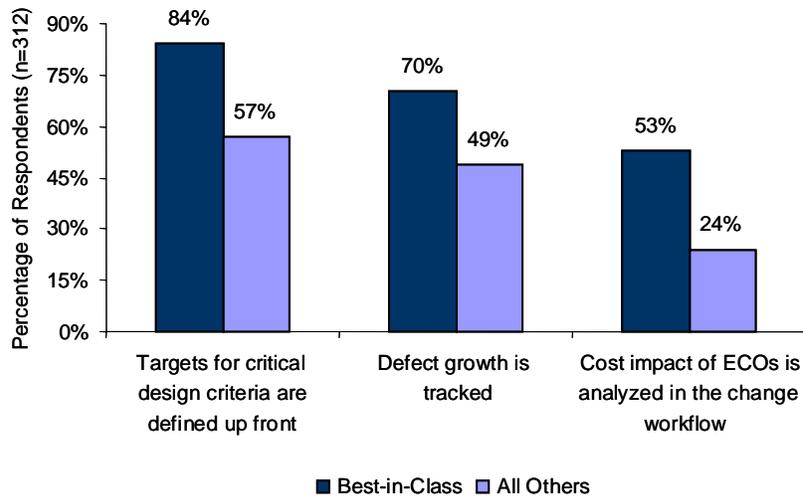
One of the top strategies of the Best-in-Class is to track and manage schedule performance across the entire portfolio. This allows them to better understand the pipeline of projects, balance that with the resources available, and make adjustments to ensure products are still released on time. A dashboard view of all projects makes it possible to easily execute this strategy and helps Best-in-Class companies launch 85% of their products on time.

To address the pressure of needing to comply with regulations, management monitors product compliance. They are able to do this with real time visibility into substances used in supplied components. This allows them to more easily identify when products are out of compliance so they know which components need to be replaced.

Performance Management

To improve the decision making process, it is important that performance measures be defined, monitored, and evaluated (Figure 8).

Figure 8: Best-in-Class Capabilities to Manage Performance



Source: Aberdeen Group, November 2010

The top product pressure is making sure features align with customer needs. This means clearly defining what is required of each feature so that engineers know the goals that must be met. The Best-in-Class are 47% more likely than their competitors to ensure that the targets for critical design criteria are defined up front. This also makes it easier to manage the development process as it is clear what is expected and it is easier to make trade-off decisions about cost and performance.

The Best-in-Class are also 43% more likely to track defect growth. This is a quality control measure that helps them ensure things are trending in the right direction to meet expected release dates. It also helps them address the top pressure to differentiate with better quality and reliability. By tracking the trend in defect growth, the Best-in-Class are better able to anticipate how likely it will be that quality targets at the scheduled release date will be met and make resource adjustments if needed. This contributes to their ability for 90% of their products to meet quality targets at design release while still meeting targeted release dates for 85% of their products.

Finally, the Best-in-Class are 2.2 times more likely to analyze the cost impact of an ECO within the change workflow. By making cost part of the criteria when evaluating a proposed ECO, the Best-in-Class are able to make better decisions about whether to implement an ECO and if approved, the most cost effective way to do so. Considering that ECOs cost 75% more after design release, it is easy to see how this step contributes to their ability to meet 87% of their product cost targets.

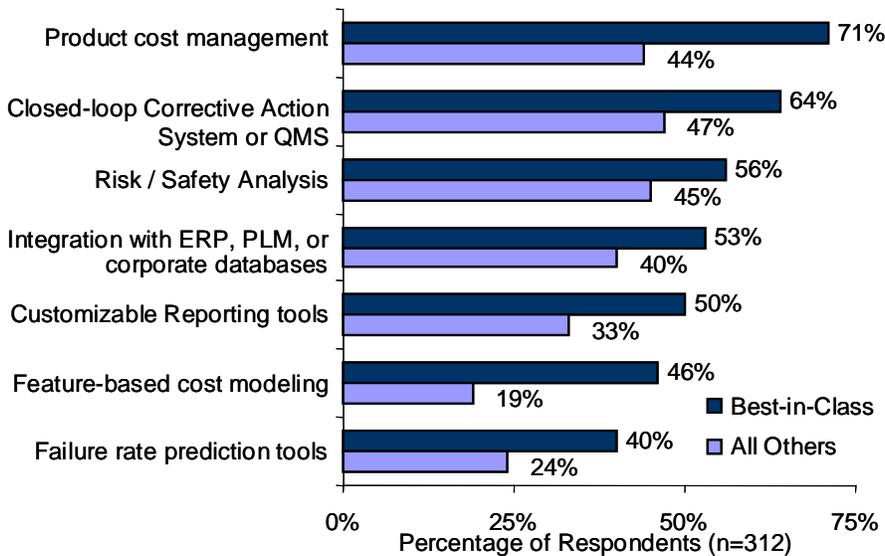
Technology

The Best-in-Class use a variety of technologies to give them the insight they need to make better decisions (Figure 9).

"We were unable to predict the true cost of design alternatives. By preparing offline cost analysis, we are able to make the appropriate decisions, and designs can move forward."

~ Engineering Staff, Automotive Manufacturer

Figure 9: Best-in-Class Technology Enablers



Source: Aberdeen Group, November 2010

To support their ability to manage cost, the Best-in-Class are 61% more likely to use a product cost management solution and 2.4 times more likely to use feature-based cost modeling. Product cost management solutions make it easier to estimate product cost prior to producing real parts. With better insight into what products are expected to cost, better decisions can be made to take cost out of products. These solutions also make it easier to assess different sources of cost outside of just the product design. Factors such as production locations, differences in currencies, and logistic costs can be evaluated. It is also easier to conduct make versus buy analyses. This level of insight makes it easier to make the right decisions to keep costs in check to boost profitability. Feature-based cost modeling makes it possible to look at a CAD model and estimate the cost to produce the part based on the features in the model. With this insight, engineers can make more informed decisions able how to model individual features that will make them more cost effective to produce.

In order to address the top pressure to competitively differentiate products with higher quality and reliability, the Best-in-Class leverage several tools. To maintain their competitive advantage, the Best-in-Class focus on continuous improvement and have processes in place to collect lessons learned and share them with the rest of the enterprise. This is supported with closed loop corrective action systems or Quality Management Systems (QMS). These solutions provide a central location to capture what was done to address quality issues, making it easier to apply those lessons learned to future scenarios. While it is important to reduce costs when possible, this can not be done at the expense of quality. To ensure this, the Best-in-Class use risk and safety analyses and failure rate prediction tools. This makes it easier for engineers to ensure safety criteria is met and also

"In order to re-tune to the needs of the market quickly, we gather user information across the industry. This has earned us with a reputation of being ahead of the pack."

~ CEO, Software Company

provides management with visibility to potential problems that expose the company to too much risk so that corrective action to keep this risk at acceptable levels.

Finally, to leverage product analytics to truly guide decision making, they must be capturing the right information and making it available to the right people. As the top challenges indicate, this must be done without consuming too much time. The Best-in-Class do this by integrating solutions to collect product analytics with existing enterprise solutions such as Enterprise Resource Planning (ERP) and Product Lifecycle Management (PLM). This makes it possible to capitalize on what is already known within the company by making it available to the right people. To further support this, the Best-in-Class are 32% more likely to use customizable reporting tools so that the right information is presented to the right people in a format that is easily digestible and can support decision making.

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Logically, it makes sense that better information leads to better decisions. However, what type of analytics should be accessed to support better decisions? To explore this question, survey respondents were asked to rank the importance on a scale of 1 to 5, with 5 being most important, for management to have access to various product analytics. The results are listed in Table 4.

Table 4: Importance of Visibility to Management

Metric	Score
Schedule Status	4.5
Product Cost	4.4
Product Performance	4.3
Compliance	3.9

Interestingly, not only are the above metrics important, but everything is pretty much equally important. Given how important this is, management must be monitoring these analytics, right? Not exactly.

Table 5: VP of Engineering Monitors

Metric	All Respondents
Development Status	60%
Product Cost	53%
Product Performance	55%
Compliance	43%

Source: Aberdeen Group, November 2010

continued

"Proper allocation and utilization of engineering resources has been a key challenge for us. By implementing a resource allocation tracking tool, we've been able to improve utilization and productivity of engineering resources."

~ Director of Marketing,
Industrial Equipment
Manufacturer

Aberdeen Insights — Technology

Table 5 shows to percentage of respondents who report that the VP of Engineering monitors the associated metric. Given how important companies rated these metrics, surprisingly, barely half of the VPs of Engineering do. Why is this? Figure 3 reveals the answer. Despite the importance and the impact these metrics have on profitability, it just takes too much time. For most, business was running smoothly. Products were getting out the door. Then a recession hit and many companies were forced to make cut backs. Now as they look to recover, they need to find ways to work smarter. This is a real opportunity for technology to help. With the right tools in place and the right capabilities to support them, many of the manual processes of collecting metrics can be automated. Not only will this reduce the 18% of time spent on preparing status updates, but management will have better information that can be used to impact the overall profitability of the company.

Chapter Three: Required Actions

Whether a company is trying to move its ability to make better decisions from Laggard to Industry Average, or Industry Average to Best-in-Class, the following actions will help spur the necessary performance improvements:

Laggard Steps to Success

- **Leverage customizable reporting tools.** Engineers report spending 18% of their time collecting information for status updates. The Best-in-Class are 2.1 times more likely than Laggards to use customizable reporting tools. This helps get the right information to the right people at the right time and will help to reduce time wasted manually collecting information for review.
- **Analyze the cost impact of ECOs.** Best-in-Class companies are 3.3 times more likely than Laggards to do this. This allows them to identify the most cost effective way to implement a change.
- **Take advantage of product cost management and estimation solutions.** This will support the ability to analyze the cost impact of ECOs. Laggards saw a 3% increase in product cost during a time when budgets are tight and customers are looking for lower priced items. Best-in-Class companies are 2.4 times more likely than Laggards to implement cost management solutions.

Industry Average Steps to Success

- **Analyze multiple sources of cost.** Simple decisions such as where to produce parts, which suppliers to use, and raw materials used all contribute to the cost of a product and impact profitability. Best-in-Class companies are 82% more likely than the Industry Average to do this.
- **Utilize feature-based cost modeling.** While there are many sources of cost, the geometry of the part itself has a significant impact on the cost to produce it. Feature-based cost modeling looks at CAD geometry to estimate the cost of producing the part. This provides powerful knowledge so that engineers can more easily evaluate design scenarios to arrive at the most cost effective solution. The Best-in-Class are two times more likely than the Industry Average to use this.
- **Evaluate the cost impact of ECOs within the change workflow.** By including cost estimates when evaluating an ECO, it is easier to understand how the change will impact profitability. This makes it easier to decide whether to move forward with the change and if so, which alternative would be most cost effective for the company. The Best-in-Class are 83% more likely than the Industry Average to do this.

Fast Facts

- √ 53% of top performers evaluate the cost impact of ECOs within the change workflow; 89% more likely than the Industry Average and 213% more likely than Laggards
- √ The Best-in-Class are more than twice as likely to utilize feature-based cost modeling as Industry Average and more than four times as likely as Laggards
- √ The Best-in-Class are 82% more likely than Industry Average to analyze multiple sources of cost

Best-in-Class Steps to Success

- **Define best practices for process and information flow.** Engineers report 18% of their time is spent preparing status updates. By defining best practice for information flow, collecting this information will be more streamlined. It also will make it easier to get the greatest return on solutions that support accessing product analytics. Forty-six percent (46%) of Best-in-Class companies report plan to implement this capability.
- **Automate the comparison of actual versus targeted goals.** Insight into how accurate estimates are will help to improve future estimates. Automating this makes doing this analysis less time consuming. Thirty-nine percent (39%) of Best-in-Class companies report planning to implement this capability.
- **Use a searchable knowledge base of reliability related information.** Best-in-Class companies recognize that differentiation through quality and reliability is a top pressure and 34% of them are responding by planning to implement this. This will make it easier to make better decisions to improve the reliability of products.

Aberdeen Insights — Summary

Within product development, access to the right information enables better decision making which will lead to greater profitability. However, lack of time is a big obstacle to collecting required metrics. By putting the right process, knowledge management, organizational, and performance management capabilities in place as well as supporting technology to automate the processes, much of the pain of time consuming tasks to prepare status updates can be avoided. Best-in-Class companies have recognized this and as a result are able to:

- Launch more products on time
- Meet cost targets as well as lower product cost
- Meet quality targets
- Bring in expected revenues

By following the practices of the Best-in-Class, other companies can better manage development schedules, take cost out of products, without sacrificing quality, meet compliance regulations, and ultimately bring in more revenue.

How Does Your Performance Compare to the Best-in-Class?



- Compare your processes
- Receive a free, personal PDF scorecard
- Benefit from custom recommendations to improve your performance, based on the research

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Appendix A: Research Methodology

Between October and November 2010, Aberdeen examined the use, the experiences, and the intentions of 312 enterprises in a diverse set of industries. Aberdeen supplemented this online survey effort with interviews with select survey respondents, gathering additional information on their strategies, experiences, and results.

Responding enterprises included the following:

- *Job title:* The research sample included respondents with the following job titles: Executive level manager (15%); VP/Director (16%); Manager (30%); Engineers (37%); and other (12%).
- *Industry:* The research sample included respondents from a wide cross section of industries. The sectors that saw the largest representation in the sample were: industrial equipment (30%), high tech (16%), automotive (15%), aerospace and defense (16%), medical devices (11%), consumer goods (11%), and telecommunications (4%).
- *Geography:* The majority of respondents (65%) were from North America. Remaining respondents were from Europe (20%), the Asia / Pacific region (12%), and from the rest of the world (3%).
- *Company size:* Twenty-eight percent (28%) of respondents were from large enterprises (annual revenues above US \$1 billion); 32% were from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 40% of respondents were from small businesses (annual revenues of \$50 million or less).
- *Headcount:* Nineteen percent (19%) of respondents were from small enterprises (headcount between 1 and 99 employees); 37% were from midsize enterprises (headcount between 100 and 999 employees); and 44% of respondents were from large businesses (headcount greater than 1,000 employees).

Study Focus

Respondents completed an online survey that included questions designed to determine the following:

- √ What is driving companies to improve product design
- √ The challenges of product design
- √ The actions these companies are taking to improve product design
- √ The capabilities and technology enablers they have in place to support product

The study identifies emerging best practices to support product design and to provide a framework by which readers could assess their own capabilities.

Table 6: The PACE Framework Key

Overview
<p>Aberdeen applies a methodology to benchmark research that evaluates the business pressures, actions, capabilities, and enablers (PACE) that indicate corporate behavior in specific business processes. These terms are defined as follows:</p> <p>Pressures — external forces that impact an organization’s market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, competitive)</p> <p>Actions — the strategic approaches that an organization takes in response to industry pressures (e.g., align the corporate business model to leverage industry opportunities, such as product / service strategy, target markets, financial strategy, go-to-market, and sales strategy)</p> <p>Capabilities — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing)</p> <p>Enablers — the key functionality of technology solutions required to support the organization’s enabling business practices (e.g., development platform, applications, network connectivity, user interface, training and support, partner interfaces, data cleansing, and management)</p>

Source: Aberdeen Group, November 2010

Table 7: The Competitive Framework Key

Overview	
<p>The Aberdeen Competitive Framework defines enterprises as falling into one of the following three levels of practices and performance:</p> <p>Best-in-Class (20%) — Practices that are the best currently being employed and are significantly superior to the Industry Average, and result in the top industry performance.</p> <p>Industry Average (50%) — Practices that represent the average or norm, and result in average industry performance.</p> <p>Laggards (30%) — Practices that are significantly behind the average of the industry, and result in below average performance.</p>	<p>In the following categories:</p> <p>Process — What is the scope of process standardization? What is the efficiency and effectiveness of this process?</p> <p>Organization — How is your company currently organized to manage and optimize this particular process?</p> <p>Knowledge — What visibility do you have into key data and intelligence required to manage this process?</p> <p>Technology — What level of automation have you used to support this process? How is this automation integrated and aligned?</p> <p>Performance — What do you measure? How frequently? What’s your actual performance?</p>

Source: Aberdeen Group, November 2010

Table 8: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
<p>Aberdeen research indicates that companies that identify the most influential pressures and take the most transformational and effective actions are most likely to achieve superior performance. The level of competitive performance that a company achieves is strongly determined by the PACE choices that they make and how well they execute those decisions.</p>

Source: Aberdeen Group, November 2010

Appendix B: Related Aberdeen Research

Related Aberdeen research that forms a companion or reference to this report includes:

- [Where Have All the Jobs Gone?](#); October 2010
- [Balancing Risk and Opportunity in Today's Economic Climate](#); July 2010
- [Cost Saving Strategies for Engineering: Using Simulation to Make Better Decisions](#); April 2010
- [The Successful Engineering Executive: How to Justify Budgets and Prepare for Tomorrow](#); January 2010
- [System Engineering: Top Four Design Tips to Increase Profit Margins for Mechatronics and Smart Products](#); October 2009
- [Managing the Innovation Portfolio: Enabling Engineering Success to Boost Profits](#); August 2009

Information on these and any other Aberdeen publications can be found at www.aberdeen.com.

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