



Aberdeen *Group*

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Electronics – Correct by Design Benchmark Report

January 2007

Executive Summary

The pressure is intensifying. To be competitive, electronics manufacturers, first and foremost, must get to market first – without sacrificing product reliability and performance. They are taking action to decrease lead times, but obstructing these attempts is an industry-wide skills shortage. This compounds other challenges, including finding design issues early, combating growing verification times, and meeting cost constraints. Yet some companies are experiencing success, significantly outdistancing their peers.

Key Business Value Findings

- Best in class companies hit their product development targets on an 85% or better average, including engineering design deadlines, development cost, product cost, revenue, product reliability, and performance. These leaders are, on the whole, more than twice as likely as their poorer performing competition to meet these targets.
- Best in class companies average 23% fewer post-prototype re-spins (redesigns) per product they develop than average companies. This holds true across all design disciplines benchmarked within the electronics industry.

Implications & Analysis

- Best in class companies use design for manufacturability (DFM) technology 50% more frequently than average companies – and use it in all aspects of product development, particularly during the initial design phase.
- Best in class companies spend less time in verification because they are almost 40% more likely than other companies to use advanced verification technologies and principles.
- Best in class companies are over three times more likely than laggards to have an integrated electrical design process and over six times more likely to have integrated their electronic design into their new product development (NPD) processes.

Recommendations for Action

- Expand the use of DFM across all design disciplines, implementing it both upstream and downstream in the process and not solely in layout and post-processing.
- Focus on reducing verification times, taking advantage of DFM and more advanced verification technologies.
- Integrate the engineering process across departments and with the NPD process, utilizing product lifecycle management (PLM) tools to link processes across departments and with supply chain partners.

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Chapter One: Issue at Hand

Key Takeaways

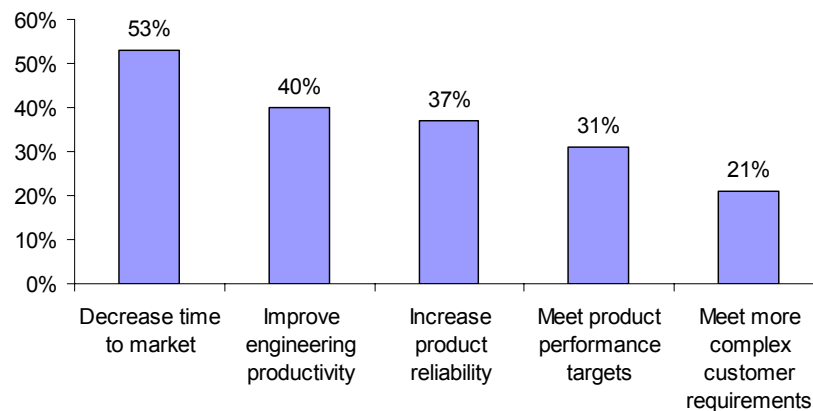
- To compete in the fast-paced global market, electronics manufacturers, first and foremost, must get to market first – without sacrificing either the reliability or performance of their products.
- To decrease lead times, companies are taking strategic action to expand design for manufacturability and increase design reuse, as well as improve electronic design and new product development processes.
- Obstructing attempts to improve time to market is an industry-wide skills shortage, which compounds other challenges such as finding design issues early, stemming increasing verification times, managing design complexity, being able to predict design schedules, and meeting cost constraints.

Electronics companies face intense competition in the global market. Customers demand innovative products, delivered to market at a blinding pace. Yet as companies try to improve processes to reduce lead times, they incur significant challenges that slow down development – from increasing test times to meeting more demanding product performance targets. As a result, companies are overspending their development budgets and missing their launch dates.

Pressure to Get It Done, Faster (and Better)

As electronics companies face pressure to be first to market, several countervailing pressures make it harder to seize the shrinking windows of opportunity (Figure 1).

Figure 1: Top Pressures Faced in Electronic Design



Source: Aberdeen Group, January 2007



The top pressure on business – cited by 53% of electronics manufacturers in Aberdeen benchmark surveys – is decreasing time to market. This is followed by the need to improve productivity (45%), driven by the need to reduce cost as well as time. Yet, while manufacturers are trying to meet these goals, other market pressures related to product quality – such as improving product reliability (37%) and product performance (31%) – as well as the need to meet more complex requirements (21%), are impeding attempts to accelerate development. As a result, manufacturers seem to be caught between a rock and a hard place: get to market faster but with better and, often, more complex products.

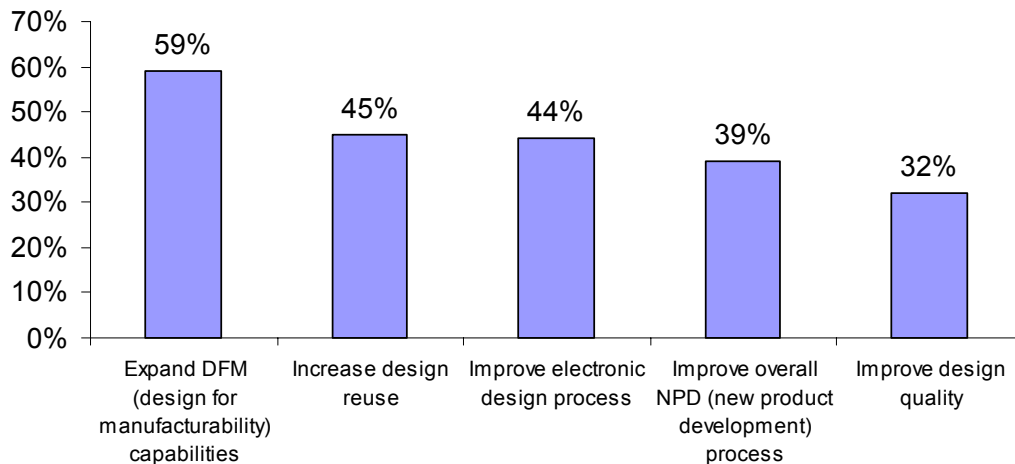
Gloucester Engineering

“Within the time-to-market window, the factors that affect us most include performance, reliability, quality, and cost. Customers want their products quicker, better, and at a lower cost.”

Martin Sferrazza
Vice President, Engineering

In response, electronics companies are taking many actions that reduce time to market (Figure 2).

Figure 2: Top Strategic Actions to Improve Electronic Design



Source: Aberdeen Group, January 2007

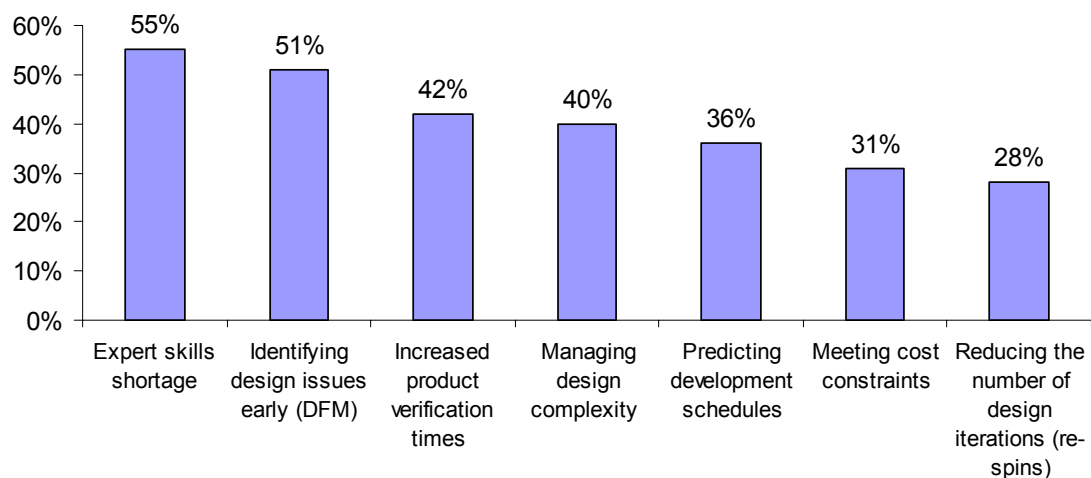
In particular, Aberdeen research shows that 59% of companies are expanding their design for manufacturability (DFM) capabilities. They are also increasing design reuse (45%) and improving electronic design processes (44%) along with new product development processes (39%). As seen in the research, companies are now looking downstream and designing by including manufacturing earlier in the process. Improving their new product development (NPD) processes and incorporating designs that have already withstood the design and manufacturing tests are some ways, in addition to design reuse, that innovative businesses are attempting to shorten their design cycle.

In fact, many of these actions address product quality as well. For example, by expanding their design for manufacturability process, companies can avoid late design changes that may affect performance negatively. Also, by reusing existing, proven designs companies are more assured of product reliability and performance as well as reducing their overall design time.

Challenges: People and Processes

Even though companies are taking direct internal actions to reduce time to market, the challenges facing them to improve development lead times are numerous. These are compounded when trying to meet reliability and performance targets as well (Figure 3).

Figure 3: Challenges Experienced in Electronic Design



Source: Aberdeen Group, January 2007

According to Aberdeen research, the top challenge frustrating attempts to improve electronics development is an industry-wide shortage of expert skills (55%). In addition, this problem intensifies other challenges. Having to do more with less is an increasing cry within engineering. That is why businesses are looking for ways to identify design issues early and decrease product verification times. The ability to manage design complexity and reduce the number of design re-spins is also a major challenge. Demand for new technologies has increased the complexity of design, such as emerging sub-100 nanometer technology, rapidly increasing gate counts and high-speed, multilayer printed circuit boards. In addition, re-spins – re

WaiGlobal

“Engineers are under so much pressure to get work out that they rarely have opportunities to experiment with new tools, try alternative approaches, or revisit their past work with an eye for opportunities to improve it. With the increasing tendency to run industry on a skeleton crew at rush capacity, the effectiveness of talent to propagate itself is also diminished.”

John Burrill
Automotive Engineering



working a design due to errors found in the product – add cost and time to the process and are a prime target for improvement. These challenges make it difficult to predict development schedules and stay within cost constraints.

In response to the pressures and challenges outlined here, companies have been investing in improving their electronic design processes. To better understand the approaches that they are taking and which ones are delivering the best results, Aberdeen surveyed benchmark respondents not only on the actions they are taking (as shown previously), but on the processes, organizational capabilities and technology enablers they have put in place to address pressures such as time to market, productivity, product reliability, and product performance.

Using Aberdeen’s PACE (see PACE Key at right) and Competitive Framework (see below) methodologies, survey respondents were classified into three levels of performance to determine which approaches are more prevalent in companies that are leading the pack in hitting key electronic design targets (see Chapter 2, Figure 4).

The following chapters highlight the results of this analysis, including the approaches that companies are taking and the results they are achieving.

PACE Key — For more detailed description see Appendix A

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:

Pressures — external forces that impact an organization’s market position, competitiveness, or business operations

Actions — the strategic approaches that an organization takes in response to industry pressures

Capabilities — the business process competencies required to execute corporate strategy

Enablers — the key functionality of technology solutions required to support the organization’s enabling business practices

Competitive Framework Key

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

Laggards (30%) —practices that are significantly behind the average of the industry

Industry norm (50%) —practices that represent the average or norm

Best in class (20%) —practices that are the best currently being employed and significantly superior to the industry norm

Source: Aberdeen Group, January 2007

Chapter Two: Key Business Value Findings

Key Takeaways

- Best in class companies hit their performance targets – for product cost, revenues, product reliability, engineering design deadlines, engineering development cost, and product performance – on an 85% or better average.
- Best in class companies are, on the whole, more than twice as likely to meet their product development targets as laggards – indicating a clear competitive performance gap between the top performers and their peers.
- Best in class companies average 23% fewer re-spins per product than average companies – across different design disciplines within the electronics industry.

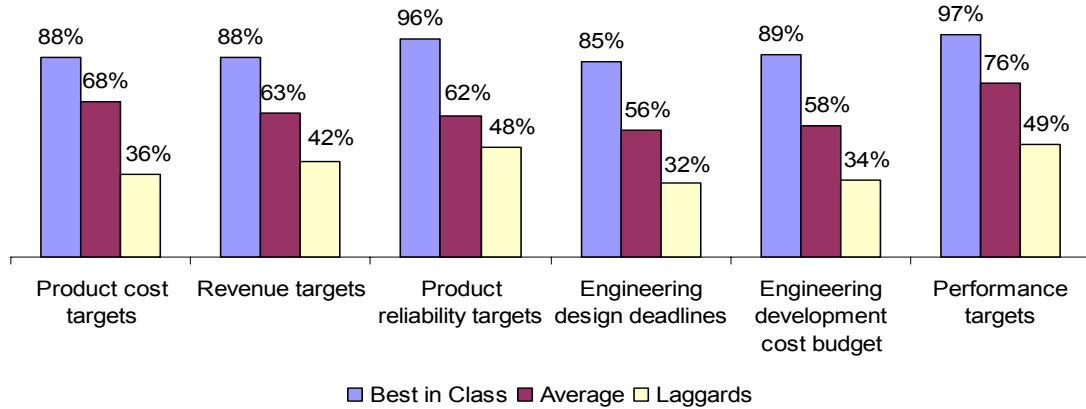
Despite the formidable pressures and challenges of bringing electronics products to market faster – while ensuring their reliability and performance – some companies are finding ways to succeed. To identify these companies, Aberdeen benchmarked electronics manufacturers on a series of performance metrics. These include the percent of time that they meet their targets for product cost, revenue targets, product reliability, engineering design deadlines, engineering development cost, and product performance targets. Based on an aggregate score incorporating all six metrics, those companies in the top 20% achieved “best in class” status; those in the middle 50% were “industry average”; and those in the bottom 30% were “laggards” in regards to their ability to manage and control engineering and product development performance. (See Competitive Framework Key, Chapter 1.)

Top Performers Hit Targets on an 85% or Better Average

The resulting findings show there is a clear performance gap between the best in class performers, the industry average, and the laggards (Figure 4).



Figure 4: Meeting Corporate Performance Targets



Source: Aberdeen Group, January 2007

Best in class companies are, on the whole, more than twice as likely to meet their product development targets as laggards. The most notable difference is in meeting engineering deadlines, giving these companies a market advantage over their competition. Overall:

- On average, best in class companies hit their engineering and product development targets at least 85% of the time as compared to industry average companies that perform at a maximum of 76%. As an example, let’s examine how the top performers hit engineering deadlines. This target is critical to time to market and was identified as the top pressure by respondents. Best in class hit these targets 85% of the time. Average companies, on the other hand, hit these targets only 56% of the time – a notable gap. Similar gaps exist for each of the individual metrics, each of which is important to bringing profitable products to market.
- When comparing best in class companies to laggards, the gap widens even further. Laggards hit the majority of their targets less than 50% of the time with some even below 40% (Figure 4).

CAE, Inc.

“Establishing metrics for product development across all disciplines within our company allows us the opportunity to measure ourselves against our performance and to make changes where necessary.”

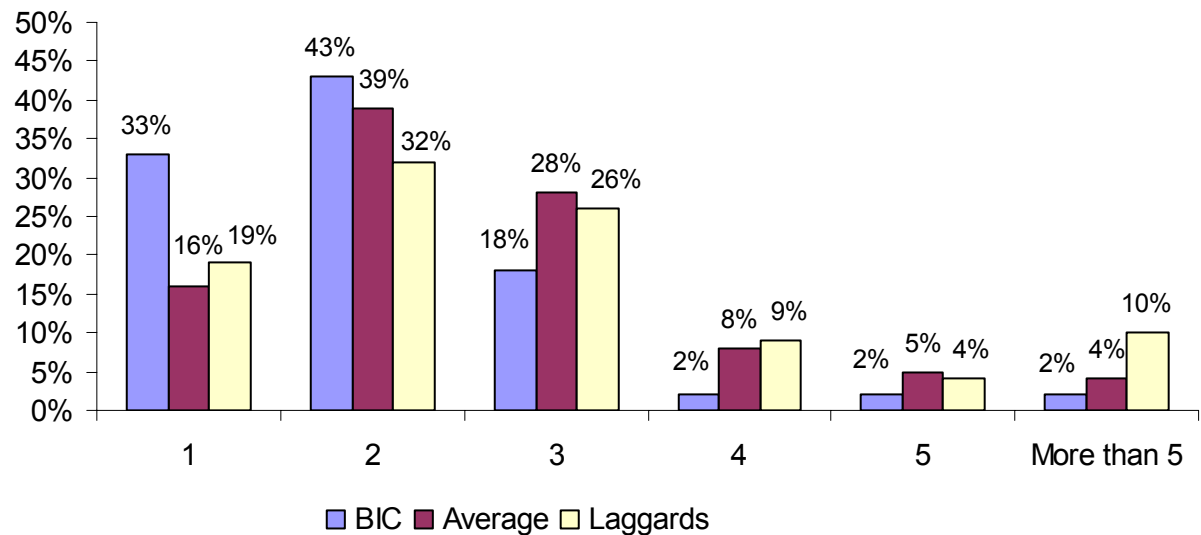
John Visconti
President.

One Key Benefit to Top Performance: Fewer Re-spins

Another facet of this performance gap is that best in class companies require fewer re-spins of their products. As companies are faced with decreasing development cycle times and engineering budgets, they are seeking ways to deliver designs to manufacturing sooner and with no errors. In particular, Aberdeen research shows the best in class average 23% fewer re-spins compared to average companies (Figure 5).

By developing product with fewer re-spins – or closer to correct by design – these leading companies are able to shave time and cost from their product development cycle times. Best in class companies are enjoying far fewer re-spins than their competition, which undoubtedly factors into their enhanced ability to meet the product development and engineering metrics identified above.

Figure 5: Average Number of Design Re-spins per Product



Source: Aberdeen Group, January 2007

In addition, this performance gap between best in class electronics companies and all others is consistent across all electronic designs such as integrated circuits (IC), field programmable gate arrays (FPGA), printed circuit boards (PCB), and system-level electronic designs.

In conclusion, it's clear that some companies are attacking the challenges of electronic design and gaining substantial revenue, cost, time, and quality benefits. One key is their ability to reduce design re-spins. The question is "What are the best in class companies doing that is different from the others, enabling them to design products with fewer re-spins and hit their product development targets more consistently?"

Astron

"Certain tools definitely reduce the number of re-spins, especially those that address both the integrity of the design as well as checking for manufacturability issues."

Andrea Solie
Verification Engineer



Chapter Three: Implications & Analysis

Key Takeaways

- Best in class companies utilize design for manufacturing (DFM) technology 50% more frequently than average companies – and use it in all phases of development before release to manufacturing, particularly in the early stages of design.
- More than two-thirds of the manufacturers surveyed report that products fail to meet engineering release dates because engineering verification times are too long. Yet best in class companies are spending less time in verification across all design disciplines (i.e., software, circuit, system, PCB or printed circuit board, IC or integrated circuit, and FPGA or field programmable gate array) – because they are almost 40% more likely to be using high-level verification software than other companies.
- Best in class companies are more than three times more likely than laggards to integrate design processes and more than six times more likely than laggards to have fully integrated their design process into their new product development (NPD) process. Aberdeen findings also revealed that best in class companies are nearly 50% more likely than other companies to be using product data management (PDM) and product lifecycle management (PLM) solutions to better integrate people, processes, and design information.

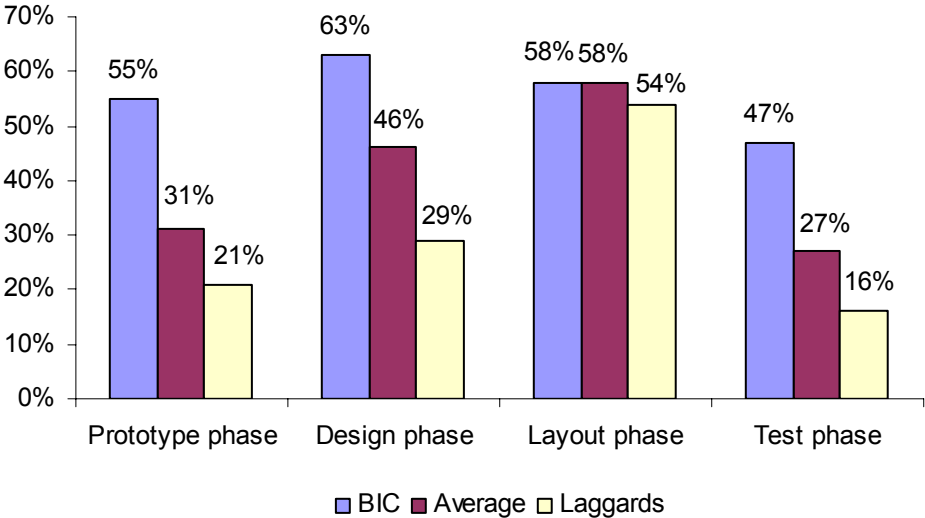
As described in Chapter 2, Aberdeen research shows that companies that are best in class at product design hit their performance, revenue, cost, deadline, and quality targets more frequently than other manufacturers – and require fewer re-spins. It also shows that they use a number of common tools and processes that differentiate them from other manufacturers. Here’s a closer look at these distinctive best practices for product development and design.

Design for Manufacturability: Getting It Right the First Time

Achieving a high-yielding product in manufacturing is no simple task. Because of the challenges engineers are facing with rising complexity, they are now incorporating manufacturing methodologies into their designs that will enable them to discover manufacturing issues while the product is still in design. One major factor contributing to best in class companies hitting their performance targets and requiring fewer re-spins is their adoption of design for manufacturability (DFM) processes and technology. Best in class companies are incorporating the use of DFM in all phases of development before release to manufacturing, particularly in the early stages of design (Figure 6).

Dell
“Shifting discovery to the left helps shorten overall cycle time.”
<i>Product Manager</i>

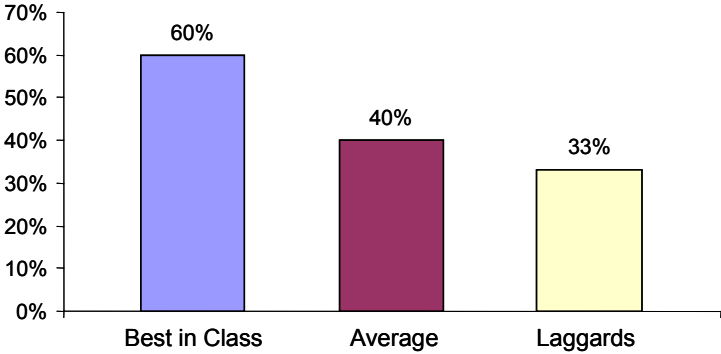
Figure 6: Use of Design for Manufacturability by Design Phase



Source: Aberdeen Group, January 2007

In particular, these top performers are implementing DFM tools and methodologies 50% more frequently than average companies (60% versus 40%) and almost twice as much as laggards (60% versus 33%) (Figure 7).

Figure 7: DFM Software Implementation



Source: Aberdeen Group, January 2007

Designing products for manufacturability – getting it right the first time – minimizes engineering change orders after product release to manufacturing. These late changes not only require additional time spent in re-designing, re-verifying, and re-releasing the design to manufacturing, but also may result in changes to design that negatively affect per-



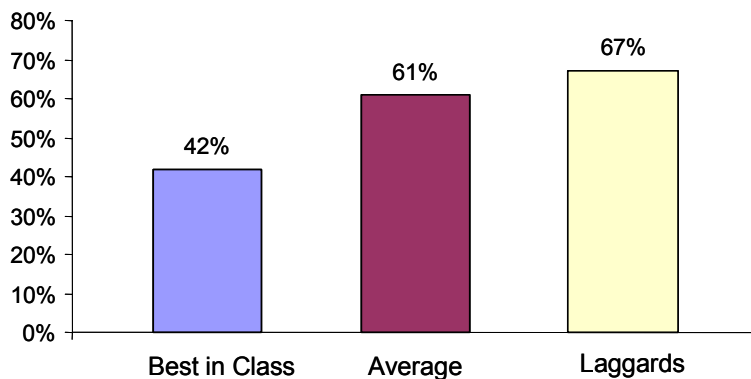
formance. As a result, DFM directly helps companies to transfer designs cleanly to manufacturing, which enables them to meet design deadlines and development cost targets, while assisting them to meet product performance targets as well.

Verification: Ensuring the Design is Right

More than two-thirds of the manufacturers surveyed by Aberdeen report that products fail to meet engineering release dates because engineering verification times are too long. In fact, due to product complexity, verification times have increased, with many companies now spending more time on validation than on design (Figure 8).

EMC Corporation
<p>“With electronic components becoming more complicated, verification is the number one concern. If they are not designed correctly or escape with hidden bugs, they can render the product unusable. Verification should be implemented upfront and followed through until release.”</p> <p><i>Mike Gnieski</i> Senior Designer</p>

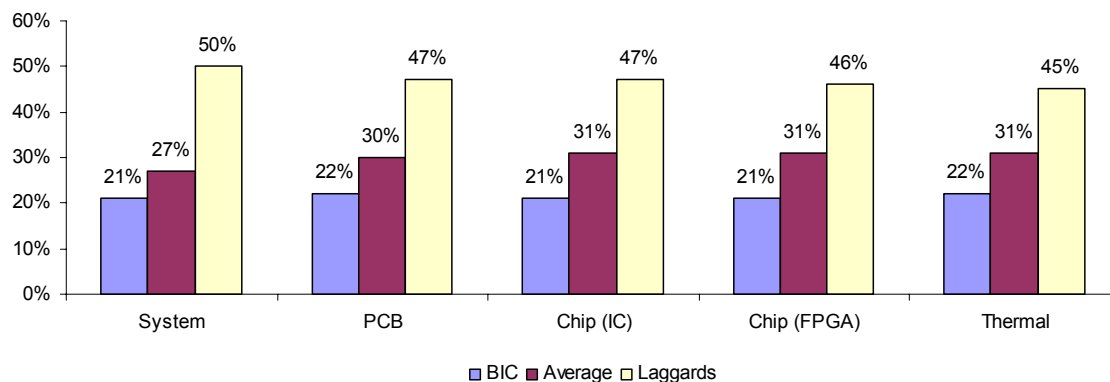
Figure 8: Percent of Time Spent by Engineers in Verification



Source: Aberdeen Group, January 2007

Interestingly, across the electronics industry, best in class companies spend less time than other companies on verification (Figure 9). This may seem counterintuitive. Time spent in verification might seem beneficial – to get the product right the first time. However, spending less time in validation, due to modern verification tools, allows more time to be spent on actual designs, including innovation.

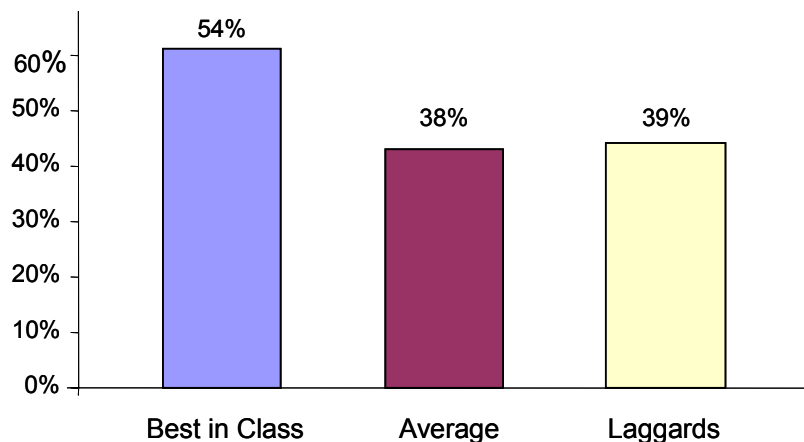
Figure 9: Percent of Time Spent in Verification



Source: Aberdeen Group, January 2007

The key to their success at meeting deadlines for release and for quality is verification software. Best in class companies are more likely to be using highly sophisticated verification technologies (Figure 10).

Figure 10: Use of Verification Technologies



Source: Aberdeen Group, January 2007

In short, the focus is on improving designs to get them ready for manufacturing and on using verification tools to ensure product performance by increasing design integrity. These approaches help electronics companies develop the product “first time right” and clearly contribute to the enhanced performance of best in class companies compared to lower-performing competitors.



Tying It All Together

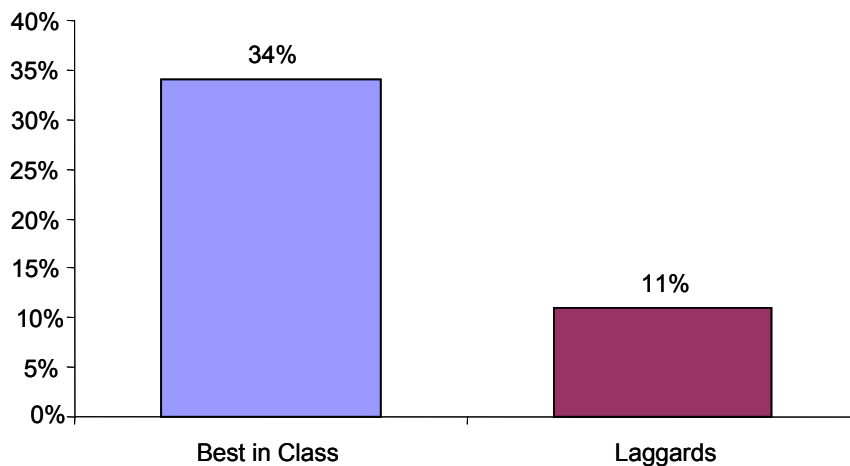
Another differentiator of best in class companies is their focus on integrating their engineering processes across departments, including those outside of engineering. This reduces process time and costs while improving design collaboration and quality.

Process Integration

Best in class companies are over three times more likely than laggards to integrate their design engineering process across all departments (Figure 11). Too frequently, electrical engineers are isolated from the overall product development process and the other company disciplines that are required to bring a successful commercial product to market. With process integration, procurement, manufacturing, and quality departments, as well as other engineering disciplines, can have timely input into design. This collaboration prevents miscommunication and decisions that negatively impact downstream parties, adding additional time and cost to the process.

Waiglobal
<p><i>“Having an integrated design process ensures that engineering data gets updated wherever it’s used. Design process automation tools speed up the publication and advertisement of that data, by reducing the time in which your business operations are disconnected from your design.”</i></p> <p style="text-align: right;"><i>John Burrill</i> <i>Automotive Engineering</i></p>

Figure 11: Companies with a Fully Integrated Process across All Departments

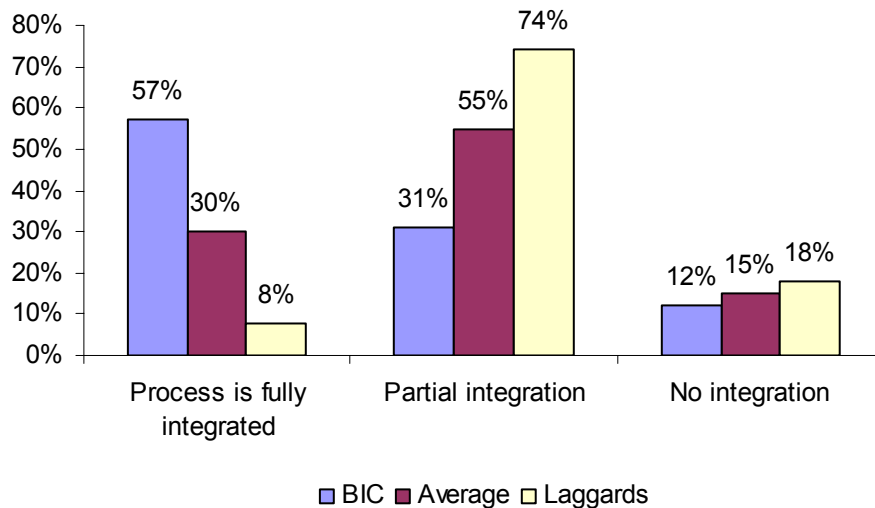


Source: Aberdeen Group, January 2007

These leading companies also are integrating their design processes into the overall new product development process (NPD). In particular, they are over six times more likely to have fully integrated their electrical design process into their NPD flow than industry laggards (Figure 12). This integration creates efficiencies beyond design. For example, with early, accurate design information procurement professionals can begin sourcing to

get the best price in less time and, as a result, reduce both development time and product cost. NPD process integration also allows for more coordinated scheduling in which cross-departmental dependencies can be tracked and managed. By viewing engineering in the context of the full process of conceptualizing, developing, and commercializing a product, best in class companies have much better ability to hit the product development targets that drive profitability.

Figure 12: Integration of the Design Process into the NPD Process



Source: Aberdeen Group, January 2007

Product Data Management, Product Lifecycle Management

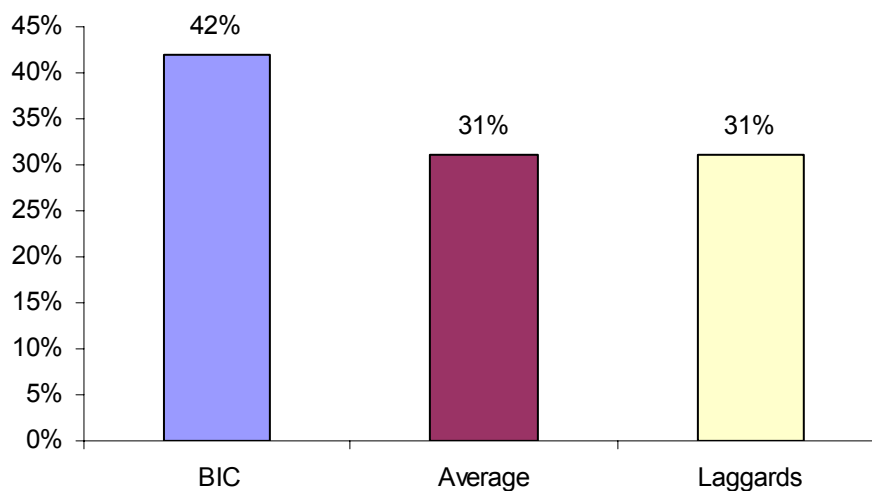
To support better integrating and managing design and new product development (NPD) processes, these leading companies are investing in product data management (PDM) and product lifecycle management (PLM) solutions (Figure 13). Product data management – with capabilities such as authorization and version control – enables appropriate people across departments to readily access the latest versions of designs securely. PDM also enables design professionals to avoid working on the wrong design version (thus, eliminating rework), promotes reuse, and expedites collaboration (to support innovation). These solutions greatly enhance control over product data and provide a platform for product collaboration.

Kollmorgan
<p>“PLM provides a uniform procedure to integrate multi-disciplines. A properly designed process would involve all stakeholders in the design to participate in an orchestrated manner. In an orchestra the music plays wonderfully when all the individuals play the process of the music. But if you take out the conductor and sheet music, with everyone playing to their own beat, then the music doesn't sound as good.”</p> <p style="text-align: right;"><i>George Bishop</i> <i>Electro-Optical Division</i></p>



Product lifecycle management extends PDM with process capabilities and promotes sharing product development information inside and outside of the enterprise. PLM supports cross-departmental processes and integrated new product development and design processes, allowing leading companies to better meet their product development targets. These solutions greatly enhance control over processes and projects and provide collaborative capabilities that help companies improve communication – enabling them to find errors earlier in the process and prepare downstream departments to play their roles in delivering a profitable product.

Figure 13: Use of PDM and PLM Solutions



Source: Aberdeen Group, Month 2007

In fact, best in class companies are nearly 50% more likely than other companies (42% versus 31%) to be using PDM and PLM solutions to better integrate people, processes, and design information. This supports earlier findings from Aberdeen Group’s [Product Innovation Agenda Benchmark Report](#), which indicated that companies that are best in class at hitting their product development targets are four times more likely to have centralized PDM and four times more likely to have integrated business processes and collaboration capabilities.

In conclusion, with best in class companies adopting the strategic processes, tools, and methodologies discussed here at much greater rates than other companies, it is apparent why they are meeting their corporate targets.

Chapter Four: Recommendations for Action

Key Takeaways

- Understand and address potential manufacturing issues while designing by implementing design for manufacturability (DFM) tools earlier in the design cycle, to reduce the need for costly and time-consuming re-spins.
- Utilize high-level verification technologies to reduce engineering time spent on verification, to shorten design cycles and enhance time for innovation while still delivering a reliable, highly functional design.
- Incorporate a structured product lifecycle management (PLM)/product data management (PDM) process across all product development disciplines to streamline processes and coordinate engineering with the overall new product development process, to increase efficiency and avoid disconnects that lead to rework and lost time.

Businesses are fully aware of the window of opportunity for market deliverables. They know they have products to deliver and must find ways to bring them to market reliably and on time. Faced with these mounting pressures they are looking to better business processes and technology to help them reach their targets. The following actions can assist them in addressing these challenges while enabling them to improve their performance from “laggard” to “industry average,” or from “industry average” to “best in class,” with the potential to go from “best in class” to “market leader” by improving the ability to deliver designs “first time right.”

Laggard Steps to Success

1. *Incorporate the use of design for manufacturability (DFM) technologies across the entire design cycle.*

Involve manufacturing early in the design process by implementing DFM across product development. This can be accomplished by implementing DFM tools that will assist the engineer in knowing manufacturing capabilities and adjusting designs to meet manufacturing requirements – earlier in the process.

2. *Reduce engineering verification times without compromising design integrity and product reliability.*

Implement high-level verification tools to allow engineers to spend less time verifying designs by improving error detection. This will result in faster design delivery, better reliability, and an increased percentage of design time spent on innovation as opposed to verification.

3. *Involve more departments in the engineering process, and coordinate with the overall new product development (NPD) flow.*

Integrate downstream parties and departments into the engineering processes to increase communication and to enhance the ability to both identify and correct design issues earlier in the design process.



4. *Incorporate a formal product lifecycle management (PLM)/product data management (PDM) process.*

Implement product data management techniques and solutions, at a minimum, to allow for better collaboration and control of the design process. Enhance access to data, ensuring that all design participants are working on current revisions and up-to-date requirements. This allows product development targets to be more easily attained by reducing miscommunication and associated rework.

Industry Norm Steps to Success

1. *Improve the use of DFM.*

Continue to move the DFM process both upstream and downstream in the design cycle. Implement more use of DFM technology capabilities into engineering processes to align designs with manufacturing capabilities in advance of first production.

2. *Implement the use of more high-level verification software.*

Utilize high-level verification tools to decrease the time spent ensuring that products meet product specifications in order to reduce costly re-spins. Implementing these tools and processes allows engineers to spend more time on innovating new products while maintaining product reliability.

3. *Fully integrate new product development and the design processes.*

Integrate design processes into the NPD process in order to fully align engineering tasks and resources with the ultimate objective – bringing a profitable product to market. Integrate downstream parties and departments to increase communication and to enhance the ability to both identify and correct design issues earlier in the design process.

4. *Adopt and expand the use of PDM/PLM solutions.*

Solidify product data management techniques and solutions to allow for better collaboration and control of the design process. Enhance access to data, ensuring that all design participants are working on current revisions and up-to-date requirements. This allows product development targets to be more easily attained by reducing miscommunication and associated rework. Extend data management with product lifecycle capabilities that coordinate cross-departmental and cross-enterprise workflows in order to coordinate resources and project schedules and to enable teams to improve communication, collaboration, and control – ultimately leading to more profitable products.

Best in Class Next Steps

1. *Continue to improve the DFM methodology.*

Don't be complacent. Designs are becoming more complex everyday. Continue to adapt by finding better ways to detect potential manufacturing errors within

the design in advance to continue to reduce costly and time-consuming re-spins, thus raising the bar for the competition and retaining an advantage in cost and time to market.

2. *Continue to focus on reducing verification times while maintaining reliability.*

Adopt and extend high-level verification processes and tools in order to continually reduce the amount of time engineers must spend on verification as opposed to innovation, looking for new ways to validate designs and catch errors early in the process.

5. *Expand the use of PDM/PLM solutions.*

Expand the use of product data management and extend data management with product lifecycle capabilities that coordinate cross-departmental and cross-enterprise workflows. Continue to integrate processes and people – both internal and external to the organization – into the new product development process in order to coordinate resources and project schedules and enable teams to improve communication, collaboration, and control – ultimately leading to more profitable products.

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Appendix A: Research Methodology

Between December 2006 and January 2007, Aberdeen Group examined the electronic design procedures, experiences, and intentions of about 170 electronics companies.

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

- The current challenges of increasingly shorter windows of opportunity
- The effectiveness of existing electronic design procedures and infrastructures
- The use of automation to improve and accelerate design
- The results and benefits, if any, of key technologies and organizational and process approaches in managing complexity in electronic design and improving engineering processes

Aberdeen supplemented this online survey effort with telephone interviews with select survey respondents, gathering additional information on their design strategies, experiences, and results.

The study aimed to identify emerging best practices for getting electronic designs “right the first time” and provide a framework by which readers could assess their own electronic design capabilities.

Responding enterprises included the following:

- **Job title/function:** The research sample included respondents with the following job titles: engineer (43%), manager (20%), director (13%), executive management (CEO, CFO, COO, CTO) (12%), staff (4%), consultant (4%), senior vice president (2%), and divisional vice president (2%).
- **Industry:** The research sample included participants predominantly from the electronics industries. Responding companies compete in industrial electronics (41%), followed by wireless communications (29%), design services (25%), computer peripherals (19%), data storage (15%), and medical devices (14%). Desktop PCs accounted for 7% and optical devices 4%. A number of companies indicated that they compete in multiple lines of business.
- **Geography:** Nearly all study respondents (85%) were from North America. Remaining respondents were from EMEA (Europe, Middle East, Africa) (11%), and the Asia-Pacific region (4%).
- **Company size:** About 23% of respondents were from large enterprises (annual revenues above US\$1 billion); 32% from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 45% from small businesses (annual revenues of \$50 million or less).

Solution providers recognized as sponsors of this report were solicited after the fact and had no substantive influence on the direction of *Electronics – Correct by Design*. Their

sponsorship has made it possible for Aberdeen Group to make these findings available to readers at no charge.

Table 1: PACE Framework

PACE Key
<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><i>Pressures</i> — 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><i>Actions</i> — 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><i>Capabilities</i> — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products/services, ecosystem partners, financing)</p>
<p><i>Enablers</i> — 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, January 2007



Table 2: Relationship between PACE and Competitive Framework

PACE and Competitive Framework How They Interact

Aberdeen research indicates that companies that identify the most impactful 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.

Source: Aberdeen Group, January 2007

Table 3: Competitive Framework

Competitive Framework Key

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

Laggards (30%) — Electronics design practices that are significantly behind the average of the industry, and result in below average performance

Industry norm (50%) — Electronics design practices that represent the average or norm, and result in average industry performance.

Best in class (20%) — Electronics design practices that are the best currently being employed and significantly superior to the industry norm, and result in the top industry performance.

Source: Aberdeen Group, January 2007

Appendix B: **Related Aberdeen Research & Tools**

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

- [*The Mechatronics System Design Benchmark Report: Coordinating Engineering Disciplines*](#) (August 2006)
- [*The Product Innovation Agenda Benchmark Report*](#) (September 2005)
- [*Environmental Compliance in Electronics: Creating a Successful Strategy*](#) (June 2005)

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