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The 21st Century Mold and Die Shop

April 2007

~ Underwritten, in Part, by ~

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Executive Summary

Despite today's brutal demands on the mold and die industry, best in class performers hit their business goals 96% of the time. This report serves as a guide for those in the mold and die community who desire to achieve similar business performance.

Best in Class Performance

Five key performance criteria were used to identify the best in class mold and die shops. While delivering tooling three weeks earlier than laggards, the best in class hit the following targets.

- Accurately and timely development of job quotations (96%)
- Hit cost targets for manufacturing costs (97%)
- Deliver tooling with acceptable quality on every job (100%)
- Deliver tooling to customer on time (99%)

Competitive Maturity Assessment

Survey results show that the firms enjoying best-in-class performance shared several common characteristics with respect to tooling quotation, design and machining such as:

- Best in class performers standardize their quotation and design process (56% and 69%). Also, they are 61% more likely to have specialized tool design roles.
- Best in class performers are 2x as likely to capture tooling design knowledge, 56% more likely to adopt CAD with automated capabilities, 30% more likely to simulate the tooling in its manufacturing environment and 45% more likely to manage tool designs with PDM.

Required Actions

In addition to the specific recommendations in chapter 3, to achieve best-in-class performance, mold and die shops must:

- Standardize quotation and design processes
- Formalize specialized roles for quotation and design
- Accelerate tool design with CAD tooling automation
- Assess product manufacturability with simulation
- Manage tooling designs with product data management
- Leverage high speed machining technologies

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Cresent Industries

We have cut about 30% on our average delivery times from where we were 5 years ago, and again I would have to point to high speed machining and compressed design cycles as the two driving factors behind that.

Eric Paules, VP Operations

Mold-Tech, Inc.

We have embraced technology and spent the R&D time required to make it work for us.

Chuck Sand, President

Millennium Mold Design

We are using a high-end CAD package with a Mold wizard package, as well as custom libraries. We try to find customers that we can develop a relationship with, and once we have that relationship established we aren't afraid to invest in designating custom designs to this customer. A good example of this is when we do rubber molds for an automotive supplier, we have a pre-designed mold that we can drop a gasket in to and by doing that we have taken a typical design lead time from a week to a few days. Then we are ready to cut steel.

David Quinn, President

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Chapter One: Benchmarking the Best in Class

Price Competition / Top Industry Pressures

I want it cheap. That's what customers keep saying to mold and die shops despite the fact that the products and the corresponding tooling is only getting more complex (Table 1).

Table 1: Top 5 Pressures on Mold and Die Shops

Pressures	Response
Price Competition	66%
Foreign competition for tooling jobs	35%
Off-shoring of product manufacturing	35%
Customer requirements increasingly demanding	28%
Product design geometry is increasing in complexity	20%

Source: Aberdeen Group, 2007

With today's OEMs driving more and more cost out of their supply chains, it's not surprise that the top pressure is price competition. The effect? Unfortunately, shops are quoting more aggressive in order to win jobs. In a business already operating on razor thin profits, quoting a job too aggressively can result in a large loss. Owners are left wondering if the job they just won will keep them afloat or take the business under.

Maturity Class Framework

Given today's difficult business environment, mold and die shops are trying a wide variety of strategies and tactics to make a difference. However, a shop's strategies and tactics are only as good as the results they deliver. To clearly understand which ones impact business performance, Aberdeen categorized survey respondents by measuring five key performance indicators (KPIs):

- Quotation accuracy
- On-time delivery of quotations
- Achieving tooling manufacturing scrap cost targets
- On-time delivery of tooling to customer
- Achieving tooling quality requirements

Figure 1 summarizes the average performance of the best in class, industry average and laggards.

Fast Facts

√ Mold and die shops identified price competition as their top business pressure (66%).

√ Best in class shops hit their quotation, costs and quality targets on a 96% or better average. As a result, they deliver tooling to customers 3 weeks earlier than laggards.

√ Best in class shops have already addressed design efficiency as a means to decrease job turnaround times. They now focus on services and niche markets for differentiation

Competitive Framework Key

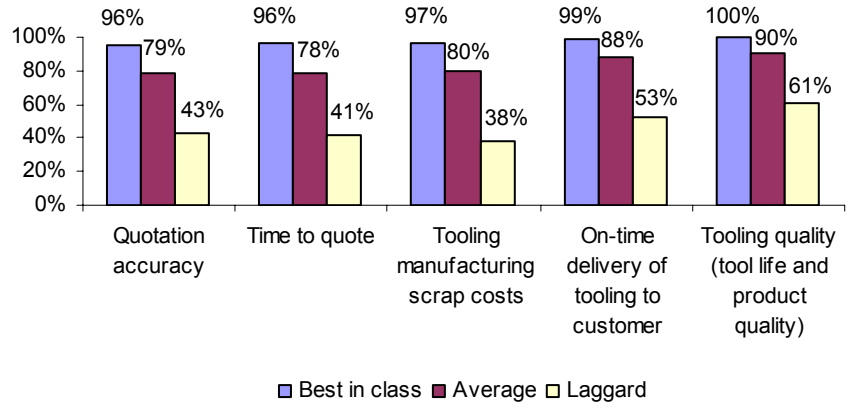
The Aberdeen Competitive Framework defines enterprises as falling into one of the three following levels of practices and performance:

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

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

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

Figure 1: Best in Class Hit Targets on an 96% Average or Better



Source: Aberdeen Group, 2007

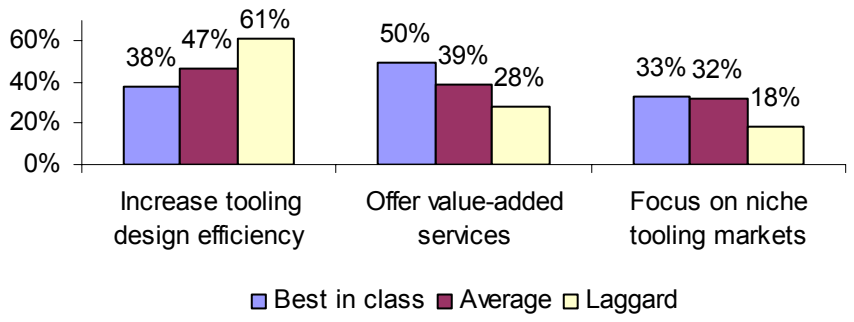
In addition to these relative performance differences, the best in class are not only delivering their tooling to the customer on time but more quickly too. In fact, the best in class deliver their tooling on average a full three weeks ahead of laggards (8.7 weeks vs. 11.6 weeks). The impact is twofold.

- **Increased job profitability** – As a job gets delayed, the shop still has to pay its employees, increasing the cost to complete the job. As a result, on-time job completion equates to the job profitability.
- **Increased shop revenue** – By completing jobs earlier, the shop can take the next job earlier. Over the course of the year, it means more jobs overall for the shop. More jobs equates to increased revenue.

From Design Efficiency to Service Differentiation

Given the wide gap in performance within the competitive framework, what strategies are truly successful employed by the best in class? There is a clear progression from one set of strategies to another (Figure 2).

Figure 2: Top Strategies across Competitive Framework



Source: Aberdeen Group, 2007

Crescent Industries

Like most of us we are being pressured to offer a better value for the dollar. So we need to continually make sure that we are competitive in the methods that we are doing to deal with the molds, and I think that that's a good thing. It may be painful, but I think it's good for the industry. I think it's probably driven by foreign competition and Canada to a lesser extent now. We have had to look at the methods that we were using to build molds and change some of the ways we have been operating to remain competitive.

Eric Paules, VP Operations

Mold-Tech, Inc.

We sell on value, not price. When we deal with purchasing people, they are looking mostly at price, not value. We are not selling a commodity. Most people who purchase tooling off shore do not understand the value of tooling and working with vendors in this country. They are unable to track the real cost of doing business overseas. They do not consider the life of the tooling, to cost to maintain it when built off shore and in a lot of cases, the poor quality.

Chuck Sand, President

Many shops, most notably the laggards, are currently focused on increasing their design efficiency. Why? First, it enables the compression of the tooling design cycle. Second, designing tooling right the first time allows shops to avoid manufacturability and tooling operation issues.

But why are the best in class not focused on this area? Given their performance in the five key performance indicators, they have already addressed this need. Interestingly, with this strategy addressed, they have turned too value added services and niche tooling markets as a means for differentiation. As a result, they can avoid winning jobs purely on lowest price, a dangerous game, and start to win through services.

The message? Get tooling design efficient as possible to decrease tooling turnaround times. Then you can differentiate yourself with services.

Best in Class PACE Model

Any strategy, such as increased tooling design efficiency, can be pursued with a number of tactics each with a varying effect on the key performance metrics cited above. By understanding the practices of the best in class mold and die shops, one can adopt tactics that have already been successfully used to impact business performance. Successful application of these tactics requires a combination of organization capabilities, processes and enabling technologies that can be summarized as follows:

Table 2: Best-in-Class PACE Framework

Pressures	Actions	Capabilities	Enablers
• Price competition	• Offer value-added services • Increase efficiency of tooling design • Focus services on niche tooling markets	• Strong project management expertise • Standardized quotation process • Formalized design process • Automate common tool design tasks • Employ specialized tool designers roles • Virtually prototype functional operation of tooling • Capture tooling design knowledge • Centralize and control design information	• CAD with tooling specialized user interface • CAD with automated tool design capabilities • Libraries of commonly used tooling components • Applications to exchange data between CAD formats • Simulation of tooling in its manufacturing environment • Fast machining capabilities • Centralized data management (PDM)

TJAR Innovations LLC

I am finding that offshore quoting is easer then ever because of the internet and for someone who is price shopping this becomes very tempting. Second challenge is there are allot of small shops starting up and hard to compete with a 1 man shop that has 15- 20 yrs. experience.

How do we differentiate ourselves? We are a complete one stop product development. From your idea to being store shelf ready.

Tony Arsenault, President

Millennium Mold Design

One of the niches that we are dropping into is color to component type molding. There are not a lot of companies that are focusing on this niche so it helps us remain competitive."

David Quinn, President

Source: Aberdeen Group, 2007

Aberdeen Insights – Part 1

The last decade brought a sea-change to the mold and die industry. As more and more jobs were outsourced to Asia, more and more shops in the United States went out of business. In this post-apocalyptic age, the simple jobs all go overseas. While the complex tooling jobs are the ones that are up for competition between the domestics shops, the primary pressure is on price. How cheap can you make this for me?

Given the new landscape, just about every surviving mold and die shop knew changes had to be made. The best in class quickly moved to increase design efficiency. As a result, they reduced their job turnaround times. They then adopted strategies to offer value added services and niche market focus to differentiate them so they didn't have to compete on price only.

As a result, big performance gaps exist between best in class and laggard shops. The best in class quote accurately and on timely on a 96% or better average. They also deliver the tooling on-time under scrap cost targets with high quality on a 97% or better average. The laggards? The hit all of these exact same targets on a 61% or worse average. Overall, this translates to a 3 week gap in delivery between the best in class and laggards.

What's it mean? It's the difference is between staying afloat and running a profitable and growing business.

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Chapter Two: Benchmarking Requirements for Success

As noted earlier, the aggregated performance of surveyed companies determined whether they ranked as best in class, industry average or laggard. In addition to having common performance levels, each class also shares process, organizational, knowledge management and technology characteristics (Table 2).

Table 3: Competitive Framework

	Characteristics	Best in class	Industry average	Laggard
Process	Standardized quotation process	69%	54%	44%
	Formalized design process	76%	59%	45%
Organization	Specialization of tool design roles	61%	45%	38%
	Strong project management skills	74%	66%	58%
	Tool designer shop floor experience	17 years	16 years	15 years
Knowledge Management	Capture of tooling design knowledge	67%	57%	33%
	Centralized control of design data	83%	67%	46%
Technology	**Design:** Specialized tool design GUI	74%	60%	65%
	Design: Automated tooling capabilities	64%	54%	41%
	Design: Libraries of tooling parts	79%	61%	61%
	Design: Data exchange tools	83%	79%	61%
	Production: Manufacturability analysis	70%	60%	54%
	Production: High speed machining	63%	54%	42%
	PDM / PLM: PDM applications	58%	43%	40%

Source: Aberdeen Group, 2007

Fast Facts

- √ Best in class performers are more likely to standardize their quotation and design process (56% and 69%).
- √ Furthermore, they are 61% more likely to have specialized tool design roles.
- √ Best in class performers are 2x as likely to capture tooling design knowledge.
- √ They are 56% more likely to adopt CAD with automated capabilities,
- √ They are 30% more likely to simulate the tooling in its manufacturing environment
- √ They are 45% more likely to manage tool designs with PDM.

Organizational Capabilities and Technology Enablers

These process, organizational, knowledge management characteristics and technology enablers come together to form a working solution that translates to competitive advantage.

- **Process: Discipline delivers** – Because on-time quotation and tooling delivery is essential with tooling jobs, knowing what to do next in the quotation or design process is critical. The best in class are 56% more like than laggards to have turned their quotation processes into turnkey sequences of activities (69% vs. 44%). Additionally, they are 69% more likely to do the same with their design process (76% vs. 45%). As a

result, processes are highly repeatable. That translates into accurate quotes completed on time as well as tooling delivered on time with the appropriate level of quality.

- **Organization: Specialization pays off, not experience** – A long held belief in the mold and die industry is that shop floor experience for tooling design matters. It's true; shop floor experience matters. It simply doesn't differentiate. Tool designers of best in class shops average 17 years of shop floor experience compared to 15 years for laggards. On the other hand, role specialization has an impact on business performance. Best in class performers are 61% more likely to have specialized roles. While specialized employees are less flexible in the big picture, they are much more efficient in their expertise than generalized ones.
- **Knowledge Management: Mitigating knowledge risk**– With shop floor and tooling operation experience an important yet non-differentiating asset, many mold and die shops are looking to mitigate the risk of losing that knowledge. The best in class are twice as likely as laggards to capture this knowledge electronically for future use (67% vs. 33). In addition, the best in class are almost twice as likely as laggards to centralize design and manufacturing tooling data so it can be easily found during hectic quotation, design or machining times (83% vs. 46%).
- **Technology: Specialized CAD eases learning curve** – With a range of specific terminology to describe different aspects of a tool, the mold and die industry has created a language all their own. As a result, the names of the capabilities available within generic Computer Aided Design (CAD) applications don't quite fit. As a result, it can take CAD users longer to get up to speed. Conversely, the best in class are more likely to adopt CAD that has tooling terminology build right in (74% vs. 65%). In turn, their users get productive fast.
- **Technology: Automated CAD eases saves time** – Tooling design tasks often are repetitive and affect multiple components. While using common capabilities of CAD applications can get the job done, it gets it done very slowly. Some CAD applications have automated these repetitive tasks in addition to embedding knowledge so they appropriately affect multiple components. Furthermore, they know how to react intelligently to change so the user can avoid manually propagating changes through many components. The best in class are 56% more likely to adopt these technologies (64% vs. 41%).
- **Technology: Reuse cuts down on design time** – Another way to shorten time to cutting metal is reuse. The standard tooling components around tooling can be simply reused. This is, in fact, exactly what the best in class are doing to save time (79% vs. 61%).
- **Technology: Design for manufacturability through simulation** – Just as the performance of a product in the customer's hands is critical to understand, the performance of tooling in the manufacturing environment is just as important. This allows the tooling to be designed

Mold-Tech, Inc.

Most of our designers and programmers were trained for the design process after working in the shop for many years so they understand what they are designing. It helps us to more easily maintain our reputation for the highest quality molds and consistency from mold to mold.

Chuck Sand, President

TJAR Innovations LLC

Does significant shop floor experience count? Yes. Because the text book will only get you so far and you need to have the floor experience to maximize progress.

Tony Arsenault, President

Millennium Mold Design

We will go to the extent where we will design a particular type of mold, but we will also leverage a slide assembly or sub-assembly from another customer because it makes sense for the new design. We have put designs back on disk so they are available, and with these designs at hand we can leverage designs from the past for use today.

David Quinn, President

for optimal operation instead of adjusting the operating parameters after the fact or rebuilding the tool. The best in class are 30% more likely to simulate tooling operation in its environment (70% vs. 54%)

- **Technology: High speed machining delivers** – Once a tool design is complete; it's a race to finish cutting metal. Best in class performers use high speed machining Computer Aided Manufacturing (CAM) applications and new milling machines to cut metal faster (63% vs. 42%).
- **Technology: Tooling data management reduces delays** – Another cause for delays in the tooling design process is trying to find the right data. When it is not centrally controlled, tool designers can spend hours trying to find the right part or the last version of their design. Best in class are 45% more likely than laggards to address this problem with Product Data Management (PDM) solutions (58% vs. 40%).

Aberdeen Insights – Part 2

If there's one overall lesson from the findings, it's that mold and die shops hoping to plug in a technology to solve all of their problems will be sorely disappointed. To make a meaningful change to their business, mold and die shops must look at a combination of people, process, knowledge and technology change.

When responding to a request for quote, the key is to generate a quote that is accurate, so you can mitigate the risk of taking a job at a loss, and also timely, so you can win the job. This means having a standardized process with specialized roles that can be executed efficiently. It means using simulation to assess the manufacturability of the part or tooling. It means using design automation to conceptually design the mold quickly with minimal investment.

Once the job is won, it turns into a race to start cutting metal that's tempered with the fear of making a mistake with expensive tool steel. Like the quotation phase, it's critical to have a formalized design process with specialized roles that can perform their tasks efficiently. Design automation should be used to eliminate manual and mundane tasks. Simulation should be used to optimize the manufacturability of the part and tooling.

Cresent Industries

We want to get to a production ready tool faster. Less trial and error during the tryout process. We have been using plastic injection filling analyses and cooling analyses to get gate design and cooling channels optimized on the drilling board before it gets into press.

We looked into this (CAM from 3D models) to build more tools faster and to reduce the dependency on EDM and grinding as a secondary operation.

Eric Paules, VP Operations

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Chapter Three: Required Actions

Despite the fact that almost all mold and die shops are responding to price competition pressures with a focus on increasing tooling design efficiency, many are finding that the devil is in the details. The best in class performers are employing specific tactics for competitive gains. Whether a mold and die shop is trying to move its performance from "Laggard" to "Industry Average," or "Industry Average" to "Best in Class," the following actions will help spur the necessary performance improvements:

1. ***Standardize quotation and design processes***

   Process flow more efficiently when everyone knows exactly what they need to do. Best in class performers have standardized and formalized their quotation and design processes to reduce time delays and increase efficiency. Avoid the mentality that every tooling quotation or tooling job is special and unique.

2. ***Formalize specialized roles for quotation and design***

   While generally skilled employees can be helpful in a pinch, overall productivity slips when expertise is not deep. Best in class performers employ specialized roles in their processes. Let employees specialize so they can work more efficiently.

3. ***Accelerate tool design with CAD tool automation technologies***

   Tool design often includes a number of repetitive and mundane design tasks. The best in class are accelerating these activities by using CAD technologies with specific tool design automation capabilities. Leverage these technologies to shorten your quotation and design times.

4. ***Assess part and tooling manufacturability with simulation technologies***

   A wide number of design characteristics and manufacturing conditions can dramatically affect the quality of resulting parts. Best in class performers use simulation technologies to virtually prototype and assess the manufacturability of parts and their tooling. Deploy this technology to "get it right the first time."

5. ***Manage tooling designs with PDM technologies***

   When working on tight timelines, it's critically important to be able to easily find design data to continue work uninterrupted. The best in class implement PDM technologies to manage design and manufacturing data centrally. Implement this technology to ease the burden on your tool designers.

6. ***Capture tool design expertise with knowledge management technologies***

   Because tool design expertise is one of the most important assets of a mold and die shop, ensure that you lose it. The best in class are

Fast Facts

- √ Standardize quotation and design processes
- √ Formalize specialized roles for quotation and design
- √ Accelerate tool design with CAD tool automation technologies
- √ Assess part and tooling manufacturability with simulation technologies
- √ Manage tooling designs with PDM technologies
- √ Capture tool design expertise with knowledge management technologies
- √ Leverage high speed machining technologies

Cresent Industries

We've achieved success by using high speed machining, compressing the design cycle, make it all run in conjunction as well as in parallel with some of the machining operations. Not waiting for a complete, paper mold design to be done before we start cutting steel and making the project happen.

Eric Paules, VP Operations

mitigating this risk by capturing tool design expertise electronically for reuse. Follow their lead to protect one of your most important assets.

7. *Leverage high speed machining technologies*

With on-time delivery the driving force in customer satisfaction, leverage CAM with high speed machining algorithms and cutting machines supporting high speed machining to cut metal faster and shorten time to delivery.

Aberdeen Insights – Part 3

How can mold and die shops, already under time and costs business pressures, find time and budget to adopt people, process, knowledge management and technology changes?

While adoption of some changes, such as point technology solutions, may offer some immediate benefits, the fundamental way to change business performance must start with process. It frames all activities (formalized or not) performed by employees (specialized or generalized) and supported by technologies (design, simulation, data management, knowledge management or otherwise).

For true benefit, the quotation and design processes must be first understood before they can be formalized. Once understood, two approaches can be considered regarding process change. You can proactively look for ways to improve your process or opportunistically remove inefficiencies that are obvious.

Once the process is understood, then the need for skilled expertise and specialization will be clearer. And finally, the needs and fit of design, simulation, data management and knowledge management technologies within the context of the quotation and design processes can be understood.

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Millennium Mold Design

It's all about what you can do that can add value to the process. There are a lot of guys out there that can build a pretty nice mold, but they expect the customer to deliver them a finished model in a print. That's just not how it works. Whatever you can do to add value to the customer will be what brings the customer back later on.

David Quinn, President

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With more than 20,000 installations worldwide, Cimatron is a leading provider of integrated, CAD/CAM solutions for mold, tool and die makers as well as manufacturers of discrete parts. Cimatron is committed to providing comprehensive, cost-effective solutions that streamline manufacturing cycles, enable collaboration with outside vendors, and ultimately shorten product delivery time. Cimatron's cutting-edge CAD/CAM solutions are widely used in the automotive, medical, consumer plastics, electronics, and other industries.

Founded in 1982, Cimatron is publicly traded on the NASDAQ exchange under the symbol CIMT. Cimatron's subsidiaries and extensive distributor network are located in over 35 countries to serve customers worldwide with complete pre- and post-sales support.

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Moldflow develops, markets and supports a broad range of Computer Aided Engineering ("CAE") software applications and Collaborative Production Management ("CPM") solutions. Our products help manufacturers improve their design-to-manufacture process by allowing them to speed their products to market, decrease manufacturing costs, improve production through greater reliability and quality, and reduce costly design and manufacturing errors. We have the widest and most advanced range of software solutions and proprietary technology to address the challenges that arise in each phase of the process of designing and manufacturing injection molded plastic parts. Our products are complemented by our experienced service and technical support organizations, as well as resellers, manufacturers' representatives and other strategic partners who provide consulting and ancillary product offerings to customers worldwide.

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Appendix A: Research Methodology

Between March and April 2007, Aberdeen Group examined the mold and die industry and the experiences, intentions, and internal processes of more than 350 enterprises.

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

Responding enterprises included the following:

- ***Job title/function:*** The research sample included respondents with the following job titles: 34% Manager, and 20% in Senior Management. In addition, 18% were Staff, with the remaining sample falling into VP, Director or Consultants.
- ***Industry:*** The research sample included respondents exclusively from mold and die industries and the industries they service. Full 48% fell into Automotive, 36% in Medical Devices. Another 27% accounted for Industrial Equipment Manufacturing, followed by Aerospace/Defense at 20%. The remaining sample included High Tech, Electronics, etc.
- ***Geography:*** The majority of respondents (87%) were from North America. Remaining respondents were from the Asia-Pacific region (4%), and Europe (5%).
- ***Company size:*** About 65% of respondents were from small businesses (annual revenues of $50 million or less). Another 24% were from midsize enterprises (annual revenues between $50 million and $1 billion); 8% of respondents were from large enterprises (annual revenues above US$1 billion);

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Table 4: PACE Framework

PACE Key

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 (e.g., economic, political and regulatory, technology, changing customer preferences, competitive)

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)

Capabilities — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products/services, ecosystem partners, financing)

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)

Source: Aberdeen Group, 2007

Table 5: Competitive Framework

Competitive Framework Key
The Aberdeen Competitive Framework defines enterprises as falling into one of the three following levels of FIELD SERVICES practices and performance: *Best in class (20%)* — Retail RFID practices that are the best currently being employed and significantly superior to the industry norm, and result in the top industry performance. *Industry norm (50%)* — Retail RFID practices that represent the average or norm, and result in average industry performance. *Laggards (30%)* — Retail RFID practices that are significantly behind the average of the industry, and result in below average performance

Source: Aberdeen Group, 2007

Table 6: 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, 2007

Appendix B: Related Aberdeen Research

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

- *Profitable Product Development for SME's Benchmark Report*, March 2007
- *The Design Reuse Benchmark Report*, March 2007
- *The Simulation-Driven Design Benchmark Report*, October 2006
- *The Multi-CAD Design Chain Benchmark Report*, December 2006

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

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