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The Mechatronics System Design Benchmark Report

Coordinating Engineering Disciplines

August 2006

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Executive Summary

The road to incorporating electronics and software into traditional mechanical products is fraught with peril. The mechanical engineer didn't tell the electrical engineering about the latest change. The electrical and software engineers have conflicting requirements and didn't even know it. And none of their bills of materials agree with one another. Worst of all, all of these engineers think these issues are someone else's problem and don't take corrective action. And while engineers are getting away with "throwing it over the wall," manufacturers are paying the price.

Yet some manufacturers are not only staying afloat, but making a killing with mechatronic products. They get to market on time at lower costs and sell like mad. What's the secret? Frighteningly enough, it's actually quite simple.

Key Business Value Findings

- Best in class manufacturers hit their revenue, cost, launch date, and quality targets for 84 % or more of their products.
- Four-out-of-five best in class manufacturers resolve integration issues in design. All resolve integration issues in verification and test.
- Seven-out-of-ten best in class companies are planning on integrated data management across disciplines. Only half of the rest plan the same.

Implications & Analysis

- More than half of best in class performers have separate discipline-specific organizations and design processes.
- Eight-out-of-ten best in class performers generate the bill of materials from design product structures.
- Eight-out-of-ten best in class performers measure design progress on a periodic or real-time basis.
- All best in class performers include some electronics and software in their products. Four out of ten do so for all of their products.

Recommendations for Action

- Add rigorous measurements to formal new product development (NPD) processes to catch integration issues.
- Balance frequent measurement of design progress between time and quality.
- Deploy or continue to use discipline-specific design processes.
- Keep or reorganize into discipline-specific teams.
- Coordinate discipline specific teams with integrated data management.

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Chapter One: Issue at Hand

Key Takeaways

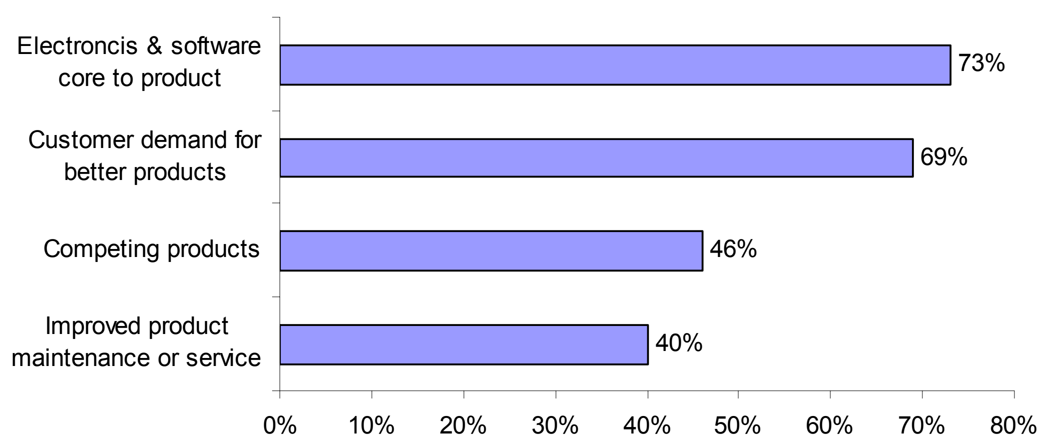
- Electronics and software features driven into products by customer (69%) or competitive (46%) pressures soon become commodities (73%). Manufacturers must be ready and committed to developing new mechatronic technologies.
- Challenges to mechatronic development such as design synchronization (68%), data management (36%), and diverse design processes (25%) mean manufacturers can't rely on product development "as usual." Fundamental changes must be made.

It's hard to find a product today that doesn't have a chip, electronics, or some software in it. In the past, the mechanical, electrical, and software features of the product were integrated through rounds of prototyping. But given today's time-to-market constraints, manufacturers have realized that this practice is a luxury they can no longer afford. Recent efforts have moved integration resolution upstream into design, where mechanical, electrical, and software engineers work together to avoid product prototype issues altogether. But resolving integration issues isn't that simple because mechanical, electrical, and software engineers have different design processes, organizations, and technology. However, despite these challenges, the number of mechatronic products is increasing in response to powerful business pressures.

Business Pressures Point to a Mechatronic Commitment

In one form or another, customers and the competition are driving manufacturers to incorporate electronics and software into their products (Figure 1).

Figure 1: Pressures Driving Electronics and Software into Products



Source: AberdeenGroup, August 2006

In fact, the top three pressures are interrelated. Manufacturers are incorporating more electronics and software to deliver new product capabilities, thereby responding to the pressures of *customer demand for better products* (46%) and *competing products* (40%). However, these capabilities soon either become core to the product or customers soon assume that they will be automatically included, leading to pressure to include or expand mechatronics capabilities because the *electronics and software are core to the product* (73%). Overall, this dynamic exhibits the natural evolution of any technology: what at first is unique and new soon proliferates and becomes a commodity.

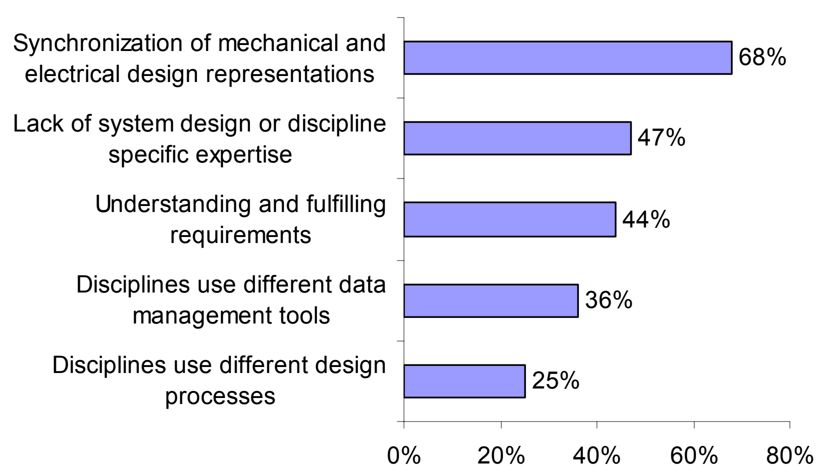
While electronics and software address customer and competitive pressures, electronics and software also offer a new avenue to *improved product maintenance and service* (40%) – and, just as important, to increase service revenue and lower product lifecycle costs. Electronics and software are being used to recognize when maintenance is required and inform the product owner or even the manufacturer of the fact. This product capability opens new opportunities for manufacturers to work with customers to deliver on-time preventative maintenance that will increase product longevity.

Overall, the message to manufacturers is clear. Incorporate electronics and software to gain a market advantage, but realize it is a short-term gain. As those product features become commodity in nature, be ready with new mechatronic technology to maintain that market edge. In short, mechatronics innovation better not be a one-time occurrence.

The Business of Product Development Must Change

While there are strong motivations to include electronics and software in products, there is also a powerful set of challenges with a common theme that consistently plagues manufacturers: getting engineering disciplines to work together (Figure 2).

Figure 2: Mechatronic Product Development Challenges



Source: AberdeenGroup, August 2006

In fact, three of the challenges listed -- *synchronization of mechanical and electrical design representations* (68%), *disciplines use different data management tools* (36%), and *disciplines use different design processes* (25%) -- are all symptoms of one problem: manufacturers' struggle to get mechanical, electrical, and software engineers to work together from technical and process perspectives.

Case Study – Danzco, Inc

Danzco, a small company that manufacturers automated equipment, certainly feels the pain of the challenge of *lack of system design or discipline-specific expertise.* It incorporates electronics and software into its products to "add intelligence to enable products to do what they would normally not be able to do." The company often designs and builds mechatronic subassemblies because the capabilities it needs are not commercially available. As a result, the company is left to cobble together something that works. "The people that can use the C++ programming language typically don't understand or can't relate to the mechanical requirements," says Danzer. In the end, it's up to Ed to make it work.

Ed Danzer, the Chief Technology Officer at Danzco, Inc.

The overall takeaway is that the way you used to run product development won't let you succeed in the future. To address these challenges, some fundamental changes must be made.

Chapter Two:
Key Business Value Findings

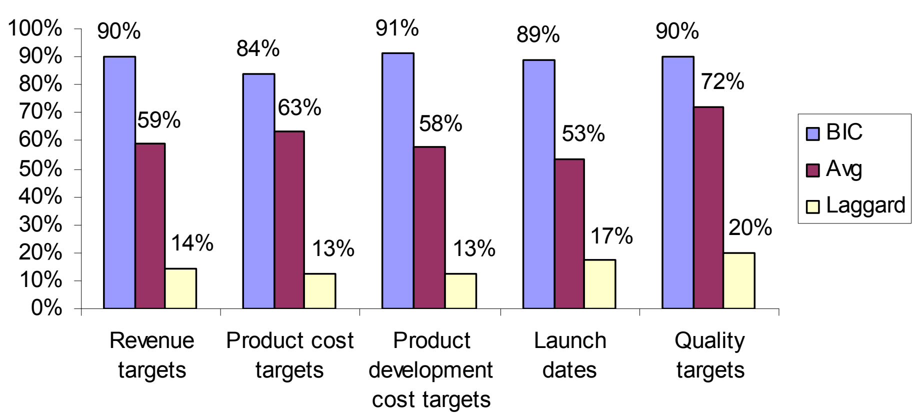
Key Takeaways

- Best in class manufacturers hit revenue, cost, launch date, and quality targets for 84 % or more of their products.
- Four-out-of-five best in class manufacturers resolve integration issues in design. All resolve integration issues in verification and test.
- Seven-out-of-ten best in class companies are planning on integrated data management across disciplines. Only half of the rest plan the same.

While current business drivers provide ample motivation for mechatronic development, Aberdeen research shows that getting engineering disciplines to work together is a formidable problem. However, the strategies and tactics manufacturers use to solve this problem are only as good as the results they deliver. To get a clear picture of which strategies and tactics are successful, Aberdeen categorized survey respondents by measuring five key performance indicators (KPIs) that provide *financial, process, and quality measures* (Figure 3). This subsequently enabled differentiation between the "best practices" of the top performers and practices of lower performing companies.

Based on aggregate scores incorporating all five metrics, those companies in the top 20% achieved "best in class" status; those in the middle 50% were "average"; and those in the bottom 30% were "laggard."

Figure 3: Best in Class Hit Targets on an 84% Average or Better



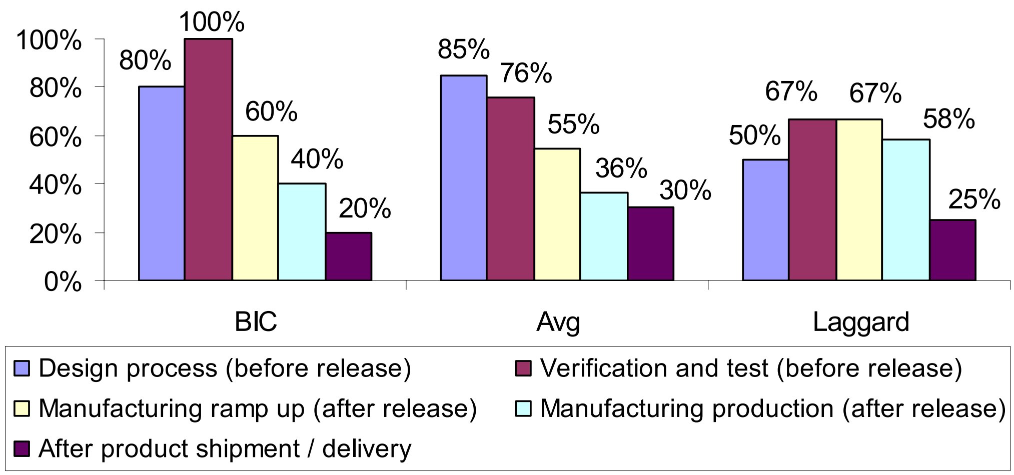
Source: AberdeenGroup, August 2006

As expected, companies in the different performance categories show marked differences – with best in class hitting all five marks at an 84% or better average. Additionally, Aberdeen found that the best in class performers averaged margins of 29% overall compared to 9% for other survey respondents. This should come as no surprise because companies that hit revenue, product cost, and development cost targets roughly 90% of the time are more likely to be profitable.

Cause and Effect: Resolving Integration in the Development Cycle

What attributes and activities produce these differences in performance among manufacturers? The product development phases in which integration issues are resolved provide one key answer (Figure 4).

Figure 4: Development Phase of Integration Issue Resolution



Source: AberdeenGroup, August 2006

Best in class performers start resolving integration issues early in design (80%) as well as during the verification and test phase (100%), before capital investments are committed to tooling in the manufacturing ramp-up and production phases. As a result, they mostly avoid the costs and time delays associated with resolving integration issues late. Among average performers, the commitment to resolving integration issues gets off to a strong start in design (85%), but drops off dramatically during the verification and test phases (76%). Finally, laggards are much less committed to resolving integration issues prior to design release, i.e., in the design (50%) and verification and test phases (67%). In fact, they use the manufacturing production phase (58%) to resolve many integration issues. This late resolution contributes greatly to high development costs and missed launch dates because investment capital is already committed to tooling, making change expensive and time-consuming.

Getting Strategic: Improving People, Oversight, and Technology

When ramping up for mechatronics development, manufacturers consider a number of strategies but, in fact, select a few with a high degree of frequency (Table 1).

Table 1: Top 5 Strategies for Mechatronic Development

Strategies	
Increase internal discipline-specific core competencies	89%
Implement or change your new product development process (NPD)	75%
Access partners with discipline expertise	52%
Improve engineering IT design environment	50%
Change your engineering organization	41%

Source: AberdeenGroup, Month 2006

From a human capital perspective, many manufacturers are facing a familiar decision: to develop internal design competencies or utilize external expertise. Results show that both are a popular – with 89% of companies developing internal competencies and 52% accessing external competencies. In reality, these strategies can be complementary as short-term and long-term approaches in which companies use partners' services while they ramp up internally.

While some companies think the solution lies in gaining internal engineering expertise, many others (75%) are focusing on changing their new product development process (NPD), especially by introducing more rigor in tracking and managing integration issues to resolution.

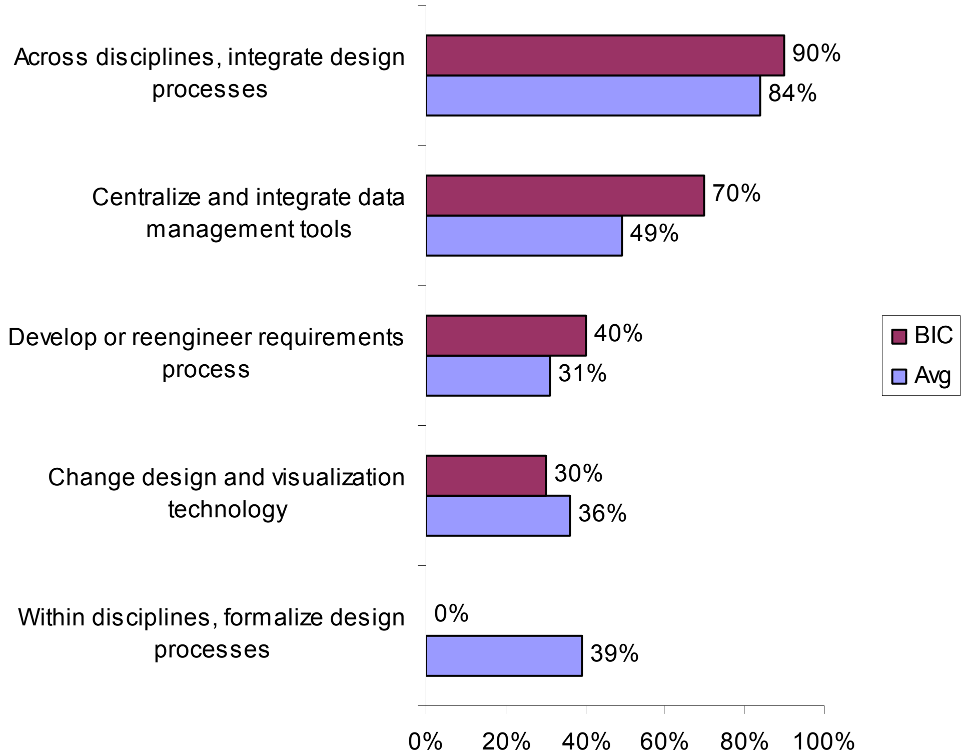
Getting Tactical: Addressing Process and Technology Specifics

In addition to pursuing a number of strategies for mechatronics development, manufacturers are also addressing the challenge of getting the engineering disciplines to work together with tactics focused on changing their processes and technology (Figure 5).

From a process perspective, best in class and average companies both strongly agree that they need to *integrate design processes across disciplines* (90% versus 84%) as well as *develop or reengineer the requirements process* (40% versus 31%). Because both of these tactics span engineering disciplines, they could help resolve integration issues.

However, there is a dramatic divergence of opinion on whether *to formalize design processes* within disciplines (0% versus 39%). This divergence in choice makes sense. Formalizing design processes will not assist manufacturers in resolving integration issues earlier in the process. In fact, this could actually amplify the problem if engineers are further constrained by activities within their own disciplines instead of working with engineers in other disciplines.

Figure 5: Tactics to Improve Mechatronic Development



Source: AberdeenGroup, August 2006

From a technology perspective, both best in class and average companies agree that *changing design and visualization technology* (30% versus 36%) is an effective tactic because the latest tools in these areas can directly address the challenge of *synchronizing mechanical and electrical design representations* (68%), as detailed earlier (Figure 2).

A marked difference in opinion emerges around data management. Best in class manufacturers clearly recognize *centralizing and integrating data management tools* as a tactical solution versus average performers (70% versus 49%). This approach promises to address concerns around *synchronizing mechanical and electrical design representations* (68% in Figure 2) as well as coordinating the *use of different data management tools by different disciplines*, another important challenge (36% in Figure 2).

Chapter Three:
Implications & Analysis

Key Takeaways

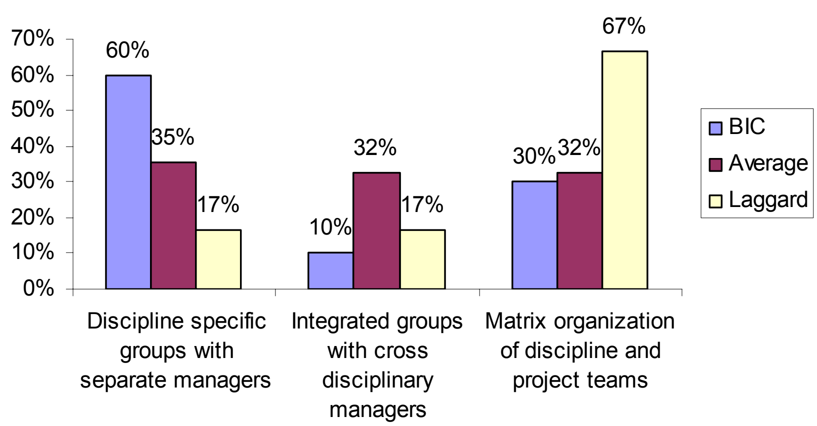
- More than half of best in class performers have separate discipline-specific organizations and design processes.
- Eight-out-of-ten best in class performers generate bills of material from design product structures.
- Eight-out-of-ten best in class performers measure design progress on a periodic or real-time basis.
- All best in class performers include electronics and software in their products. Four out of ten do so for all of their products.

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 characteristics and practices in four key categories – processes, organizational structures, technology usage, and performance management.

No Need to Integrate Discipline Organizations and Processes

When faced with fundamental problems such as resolving integration issues, popular strategies pursued by executives include formally changing organizational structures or processes. Because the goal is to resolve integration issues earlier in the process, one would expect an emphasis on integrated approaches in both of these areas; however, the findings showed the exact opposite response (Figures 6 and 7).

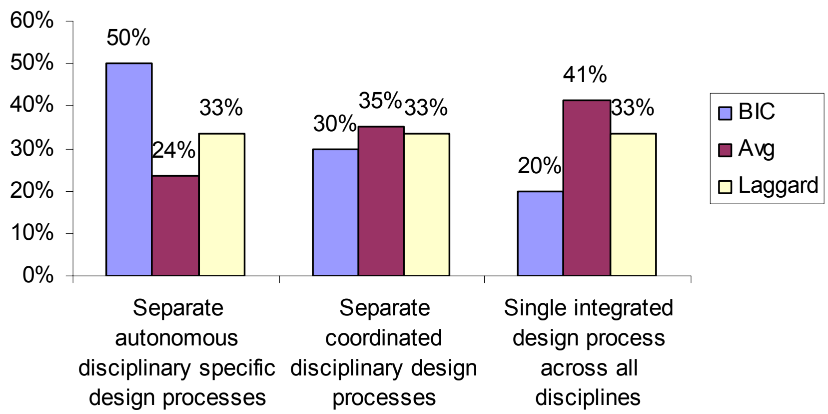
Figure 6: Engineering Organizations for Mechatronics Development



Source: AberdeenGroup, August 2006

In both cases, best in class performers clearly prefer discipline-specific groups with separate managers over integrated groups with cross-disciplinary managers (60% versus 10%) and separate, autonomous disciplinary-specific design processes over single, integrated design processes across all disciplines (50% versus 20%).

Figure 7: Design Processes for Mechatronics Development



Source: AberdeenGroup, August 2006

The conclusion here is clear: do not migrate from discipline-specific organizations and processes to integrated ones. Coordination between disciplines can be handled through other mechanisms. While the best in class did not choose these strategies to provide coordination across disciplines, many identified *the new product development process* as a strategy pursued to address mechatronic development (75% in Table 1). In fact, the majority of best in class companies utilize *formalized NPD activities* (70%) to ensure managers with top-level responsibility (rather than a discipline-specific level of responsibility) track and manage the development of the product.

From an organizational perspective, program managers, chief engineers, and system engineers are empowered to seek out and resolve integration issues. From a process perspective, they implement formal entry and exit criteria, especially in the verification and test phase, to help identify integration issues where the organization can then take corrective action. In contrast, average and laggard performers are split between pursuing a rigorous or an ad-hoc NPD process.

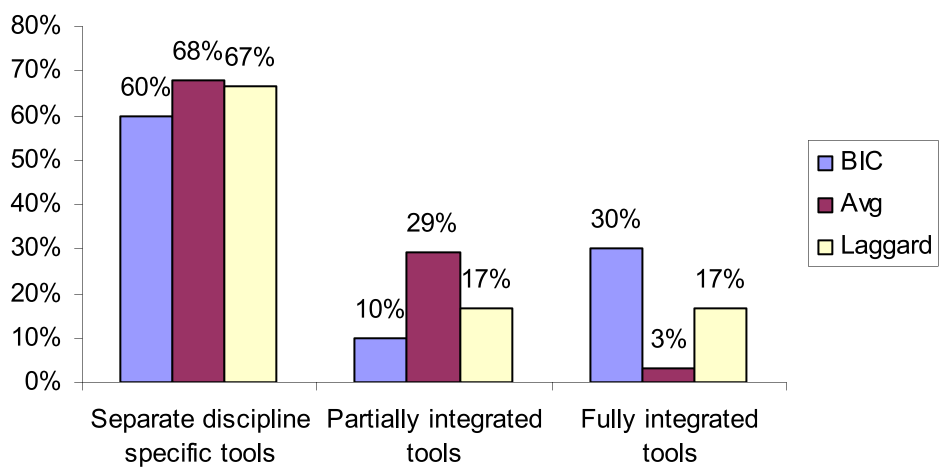
Case Study – Mid-Sized Automotive Supplier

A mid-sized automotive supplier strongly identified with many of the challenges exhibited in this benchmark report. Even though the company diligently fills out the APQP (Advanced Product Quality Planning) documentation that is commonly required by automotive OEMs, a mechanical engineer at the company admitted his group commonly just "throws it (designs) over the wall" to counterparts in other engineering disciplines.

Technology Enablers: Design Integration Approaches

Although some manufacturers plan on changing their organization and processes, it isn't easy. Challenges around technology abound. From a data management perspective, some companies recognize the fact that *disciplines use different data management tools* as a formidable problem (36% in Figure 2). In fact, Aberdeen's findings show that this problem is prevalent among manufacturers because most use *separate discipline-specific tools* (~65%) for data management (Figure 8).

Figure 8: Data Management Used for Mechatronic Development



Source: AberdeenGroup, August 2006

Another design deliverable that requires input from all disciplines is the bill of material (BOM). A mechatronic product has mechanical, electrical, and software items. While a variety of options exist for creating and managing this key deliverable, best in class performers use either a *design tool export* (20%) or a *data management product structure* (50%) to generate it (Figure 9). At a combined rate of 70%, a majority of the best in class clearly prefer to start from design representations that already exist in design tools, which saves time as a result.

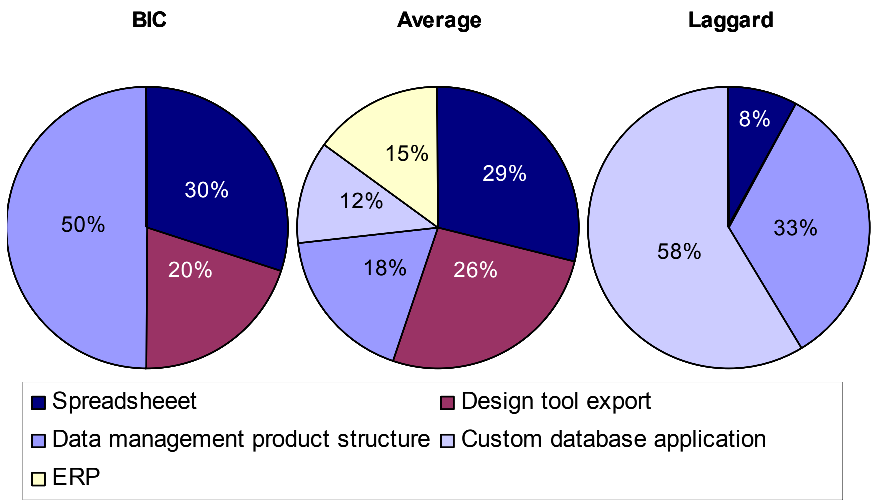
Case Study – NASA Jet Propulsion Laboratory

"Even if you're very good at data management within a discipline, closely coupled designs don't progress well. All of these systems live in the same lifecycle, and separate (discipline-specific) configuration tools don't bring them together well. The traditional 'divide and conquer' interface management approach doesn't work for these systems because they are so closely integrated. Once you get them in a common data management system, then you can take advantage of additional capabilities that lie on top of data management such as workflow and cross-disciplinary visualization."

Clark Briggs, NASA Jet Propulsion Laboratory

Figure 9: Technologies Used for

Bill-of-Material Development



Source: AberdeenGroup, August 2006

In contrast, laggard performers show a clear preference for generating the bill of material from a *custom database application* (58%). This, however, entails a couple disadvantages. First, time, resources, and money are required to maintain the custom application. Second, the BOM in the custom application must be manually synchronized with design product structures that could contain thousands of items. Overall, this approach results in higher development costs and added time, which affect profitability and launch dates.

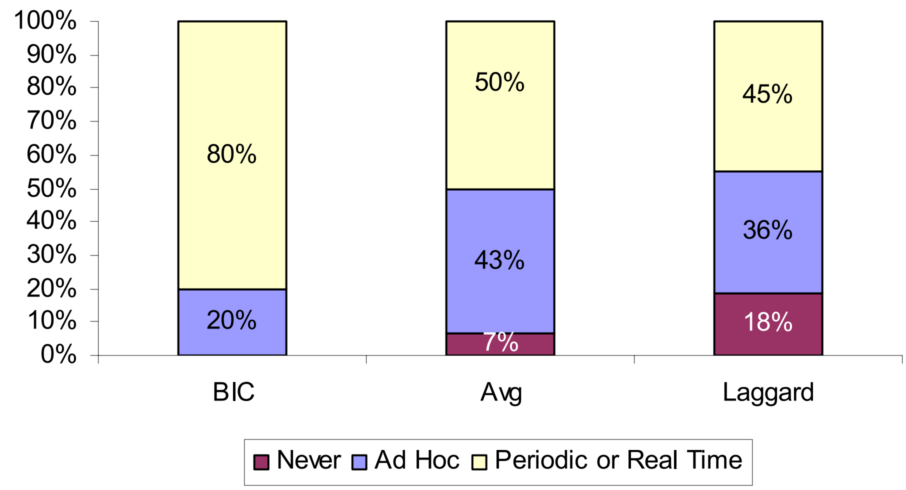
The conclusion is clear: the best practice is to utilize the design product structures in some way to generate the bill of material while avoiding custom applications.

Performance Measurement: Diligence Matters

Another key differentiator of mechatronic development performance is what is measured and how frequently it is measured. While several of these measures are favored equally by the best in class and average performers, such as *minimizing change orders* (23% by both) and *controlling product costs* (13% versus 14%), a more interesting difference emerged. Two measures were favored more by best in class performers than other companies: *hitting due dates* (47% versus 37%) and *hitting quality targets* (17% versus 37%). Through these two measures, best in class performers ensure they get to market on time while not sacrificing product quality.

In short, *what* measures are tracked is highly important – but *when* they are measured is equally important. Aberdeen findings show clearly that best in class companies are more diligent in measuring key performance indicators (KPIs) (Figure 10).

Figure 10: KPI Measurement Frequency



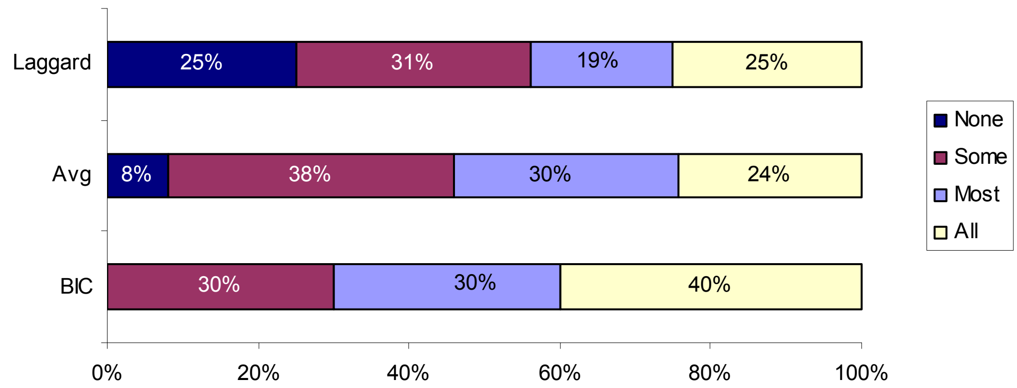
Source: AberdeenGroup, August 2006

Overall, the best in class measure KPIs on a periodic or real-time basis – far more frequently than the average and laggard performers (80% versus 50% versus 45%). In addition, the percentage of manufacturers that never measure indicators increases from the average to the laggards (7% versus 18%). The conclusion is clear: manufacturers that measure frequently perform better than those that do not.

A Matter of Focus: Dedicated Manufacturers Outperform

A final factor driving best in class performance is a manufacturer's dedication to mechatronics. Not surprisingly, there is a strong correlation between the proportion of a company's products that are mechatronic and its performance in developing mechatronic products (Figure 11).

Figure 11: Proportion of Products That Are Mechatronic



Source: AberdeenGroup, August 2006

Aberdeen findings show that best in class manufacturers quite simply are more dedicated to mechatronic products. In fact, 40% of the best in class incorporate electronics and software into every one of their products. Conversely, among manufacturers that include no electronics or software in their products, none performed at best in class levels. Obviously, the higher percentages of electronics and software in products will not make a manufacturer best in class. However, this finding shows there are efficiencies gained through the repetition of working through integration issues again and again. As they say, "practice makes perfect."

Chapter Four: Recommendations for Action

Key Takeaways

- Add rigorous measurements to formal NPD processes to catch integration issues.
- Balance frequent measurement of design progress between time and quality.
- Deploy discipline-specific design processes, not integrated ones.
- Reorganize into discipline-specific teams, not integrated or matrix ones.
- Implement fully integrated data management technologies.

Mechatronic development is a reality for manufacturers today. Whether they are driven by competitive or customer pressures to include electronics and software in their products, they must find ways to address the technical and process challenges in getting mechanical, electrical, and software engineers to work together. The following actions can help them address these challenges as well as enable them to improve their performance levels from "laggard" to "industry average," or from "industry average" to "best-in-class," or even from "best in class" to number one in their market.

Laggard Steps to Success

1. *Add rigorous measurements in the NPD process to catch integration issues.*

   Resolution of integration issues prior to design release dramatically reduces costs and time associated with change orders from manufacturing phases. Therefore, laggards should add rigorous measurements for integration checks into the stage gates of their new product development (NPD) processes to provide due diligence on integration issue resolution.

2. *Implement data management tools for bill-of-material development.*

   A tool of laggard performers, custom applications require software maintenance and manual synchronization of product structures between engineering disciplines, which affect development costs and launch dates. Use technology that generates the bill of material directly from design deliverables, especially data management solutions.

3. *Reorganize into discipline-specific engineering teams, not integrated or matrix ones.*

   Matrix organizations often lead to confusion when there are no clear authority lines drawn. Integration issues languish with skyrocketing costs and time delays. Reorganize to create discipline-specific organizational structures led by discipline-specific managers.

Industry Norm Steps to Success

1. *Implement integrated data management technologies.*

Mechanical, electrical and software engineers work on different representations of the same designs. Manually synchronizing their work-in-process changes across different data management tools incurs errors, costs, and delays in the product development process. Implement an integrated data management technology or set of technologies to eliminate this cost and risk.

2. *Deploy discipline-specific design processes, not integrated ones.*

   While a single integrated design process across all disciplines seems intuitive, the statistics show that all of the process reengineering effort goes to waste. Continue to use or deploy separate design processes across disciplines; just be diligent in coordinating engineering groups.

3. *Balance frequent measurement of progress between time to market and quality*

   Make a commitment to measuring progress on a periodic or real-time basis. While tracking product cost during work-in-process changes prior to design release as well as change orders after design release, track against due dates to meet time-to-market targets but balance it with product quality measures.

Best in Class Next Steps

1. *Add rigorous measurements in the design phase to catch integration issues.*

   While resolution of integration issues in the verification and test phases are good ways to catch issues prior to design release, cost could be removed with a greater emphasis on finding and resolving integration in the design phase. During periodic progress and status meetings, diligently review all interactions across disciplines and review virtual prototypes to ensure work-in-process changes are communicated.

2. *Implement integrated data management technologies.*

   Use this type of technology to address differences and assess changes in design representations, product structures, and bills of material between mechanical, electrical, and software engineers. Leverage other product lifecycle management and collaboration tools to enable these separate discipline-specific engineers to work together.

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The Telelogic Systems and Software Modeling Business Unit is the leading provider of Model-Driven Development (MDD) solutions for systems design through software development focused on real-time embedded applications. The Rhapsody MDD solution, based on the UML, SysML and DoDAF standards, allows engineers to graphically model the requirements, behavior, and functionality of embedded systems and software. The design is iteratively analyzed, validated, and tested throughout the development process and production quality code is automatically generated. Rhapsody is tightly integrated with the UGS Teamcenter PLM solution, enabling a bi-directional, seamless Mechatronics workflow between the mechanical and embedded software disciplines.

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With products increasing in technological complexity, manufacturers struggle with the best practices to efficiently operate, manage, and support design processes and organizations. Chad Jackson is researching the dynamic and evolving intersection of these issues in product development.

This ranges from understanding the impact of bringing dramatically different design cultures and communities into closer collaboration, to the changes and integration of cross-domain design processes as well as the use of technology throughout the product development process.

Chad has a strong product management background in the Enterprise Software industry. He worked previously at a leading MCAD and PLM vendor, PTC, for over ten years. There he investigated end user needs and developed releases and go-to-market plans for several different software product lines. He brings a combination of industry experience, analytical skills, and end user perspective to Aberdeen.

Appendix A: **Research Methodology**

Between June and August 2006, Aberdeen Group and *CADinfo.net* examined the manufacturing procedures, experiences, and intentions of more than 140 enterprises in aerospace and defense, automotive, consumer electronics, industrial equipment manufacturing, telecommunications and transportation.

Responding engineering, information technology, and manufacturing executives completed an online survey that included questions designed to determine the following:

- The degree to which mechatronics development impacts corporate strategies, operations, and financial results
- The structure and effectiveness of existing mechatronics development procedures
- Current and planned use of technology to aid these activities
- The benefits, if any, that have been derived from mechatronics development

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

The study aimed to identify emerging best practices for mechatronics development and provide a framework by which readers could assess their own product development capabilities.

Responding enterprises included the following:

- ***Job title/function:*** The research sample included respondents with the following job titles: engineering (64%), information technology (13%), logistics and supply chain (2%), manufacturing (4%), marketing (4%), and business process management (2%).
- ***Industry:*** The research sample included respondents predominantly from manufacturing industries. Industrial equipment manufacturers represented 25% of the sample, followed by aerospace and defense, which accounted for 15% of respondents. Automotive and manufacturers of metals and metal products (including industrial equipment) totaled 10% of respondents. Consumer electronics accounts for 8% of the sample. Other sectors responding included medical devices and transportation.
- ***Geography:*** Nearly all study respondents were from North America representing 75% of the sample. Europe, the Middle East and Africa account for 19% of respondents. Asia and the Pacific account for the last 6% of respondents.
- ***Company size:*** About 26% of respondents were from large enterprises (annual revenues above US$1 billion); 46% were from midsize enterprises (annual revenues between $50 million and $1 billion); and 24% of respondents were 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 the *Mechatronics System Design Benchmark Report*. Their sponsorship has made it possible for Aberdeen Group and *CAD-Info.net* to make these findings available to readers at no charge.

Table 2: 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: AberdeenGroup, August 2006

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: AberdeenGroup, August 2006

Table 3: 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: *Laggards (30%)* — FIELD SERVICES practices that are significantly behind the average of the industry, and result in below average performance *Industry norm (50%)* — FIELD SERVICES practices that represent the average or norm, and result in average industry performance. *Best in class (20%)* — FIELD SERVICES practices that are the best currently being employed and significantly superior to the industry norm, and result in the top industry performance.

Source: AberdeenGroup, August 2006

Appendix B: Related Aberdeen Research & Tools

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

- *The Product Innovation Agenda Benchmark Report* (September 2005)
- *Environmental Compliance in Electronics: Creating a Successful Strategy* (June 2006)

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

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Our Approach

Aberdeen delivers unbiased, primary research that helps enterprises derive tangible business value from technology-enabled solutions. Through continuous benchmarking and analysis of value chain practices, Aberdeen offers a unique mix of research, tools, and services to help Global Business Executives accomplish the following:

- IMPROVE the financial and competitive position of their business now
- PRIORITIZE operational improvement areas to drive immediate, tangible value to their business
- LEVERAGE information technology for tangible business value.

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- CREATE DEMAND, by reaching the right level of executives in companies where their solutions can deliver differentiated results
- ACCELERATE SALES, by accessing executive decision-makers who need a solution and arming the sales team with fact-based differentiation around business impact
- EXPAND CUSTOMERS, by fortifying their value proposition with independent fact-based research and demonstrating installed base proof points

Our History of Integrity

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Founded in 1988, Aberdeen*Group* is the technology-driven research destination of choice for the global business executive. Aberdeen*Group* has over 100,000 research members in over 36 countries around the world that both participate in and direct the most comprehensive technology-driven value chain research in the market. Through its continued fact-based research, benchmarking, and actionable analysis, Aberdeen*Group* offers global business and technology executives a unique mix of actionable research, KPIs, tools, and services.

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