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## Lean Product Development for Industrial Equipment Manufacturers

While Lean is a familiar word for the manufacturing organizations of most manufacturers, it is a concept that is just beginning to make headway in product development circles. Organizations have found success 'Leaning out' manufacturing operations and supply chains, particularly in terms of cost reduction, but bringing Lean to engineering and design organizations is about removing redundancy and wasted effort from a product's critical path from concept to shipment. While this is the case among manufacturers in the industrial equipment sector as much as their peers, an unfocused approach to Lean can prevent these companies from seeing much benefit from Lean. This Sector Insight provides a roadmap for industrial equipment manufacturers seeking to both begin or simply fine tune Lean initiatives.

### The Emergence of Lean Product Development

Originally popularized by Toyota Motor Corporation, Lean principles have been present in the manufacturing organizations of many companies since the early 1980s. As manufacturers have seen success with Lean programs, the concepts have been applied to areas including new product development as well as supply chain management. Wherever it is applied, the basic tenets of Lean remain the same: the elimination of 'waste' and non-valued added tasks.

Lean is a relatively new concept for many engineering organizations, but as manufacturers have seen success with Lean programs, the concepts have begun to be applied to the new product development process. As applied to manufacturing, Lean is typically about cost reduction, but Aberdeen's [Lean Product Development Benchmark Report](#) found for product development, it's often about improving the speed of processes as often as it is about cost (Table I).

**Table I: Pressures Driving Lean PD**

	Industrial Equipment	All Other Industries
Market demand for rapid product introduction	40%	36%
Global markets / competition	36%	40%
Limited product development budgets	30%	34%
Customer demand for increased product quality	22%	18%
Demand for increased product performance	17%	16%

Source: Aberdeen Group, May 2007

### Sector Insight

Aberdeen's Sector Insights provide strategic perspective and analysis of primary research results by industry, market segment, or geography

### Sector Definition

For the purposes of this study, respondents who indicated that they operated within the industrial manufacturing space (including industrial equipment; consumer durable goods; construction, architecture, and engineering industries) were isolated and aggregated for comparison against peer manufacturers across industries in Aberdeen Group's performance framework.

Market demand for rapid product introduction is the top factor driving Lean product development for industrial equipment manufacturers (40%), but it is followed closely by cost pressures in the form of increased global competition (36%) and limited budgets (30%). This dual-focus on cost and quality is related to the needs of product development. Within manufacturing, improved performance is often about achieving the same results while reducing costs. Within product development, however, where the focus is on bringing new products to market faster, Lean is often about streamlining repetitive and redundant processes as often as it is about decreasing budgets. For industrial equipment manufacturers it can mean the opportunity to remove waste on the critical path from product concept to shipment.

“We have been pursuing a Lean product development for almost four years. Our initiative came about from a mix between grassroots movement and management; we have had a lot of meetings to discuss it. The main reason for applying it has been to get more market share in the semiconductor manufacturing equipment industry while decreasing costs at the same time.”

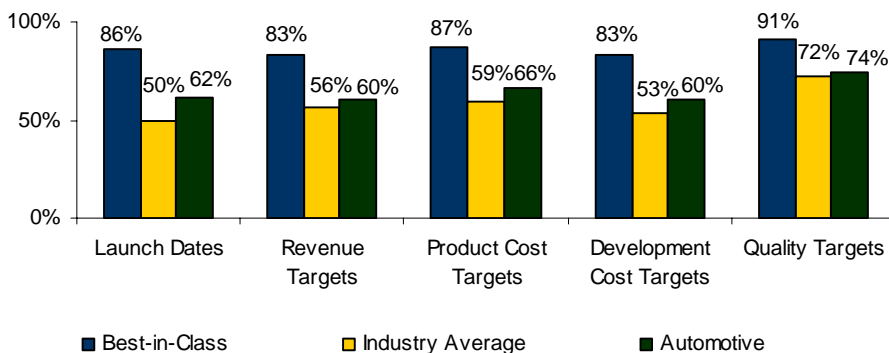
~ Engineer  
Industrial Equipment  
Manufacturer

## Aberdeen Analysis

How is Lean impacting the performance of these organizations? To find the answer, Aberdeen's May 2007 [Lean Product Development](#) benchmark study surveyed participating companies regarding the percent of their products that meet key product development metrics. Interestingly, Aberdeen found that industrial equipment manufacturers report performance that is roughly on par with that of the Industry Average (Figure 1).

In addition, these companies report that 46% of their time is spent on 'value-added' product development activities rather than on activities that they consider to be 'waste.' This is also on par with the Industry Average, which indicates 45% of time spent on 'value-added' product development activities.

**Figure 1: The Maturity Class Framework**



Source: Aberdeen Group, May 2007

Meeting these measures about as often as the Industry Average means that industrial equipment companies trail leading performers by 21% or more in all of the measures Aberdeen surveyed, leaving them with considerable opportunities for improvement. In addition to their enhanced performance, the Best-in-Class report that 69% of their product development time is

### 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 Average (50%)* — practices that represent the average or norm

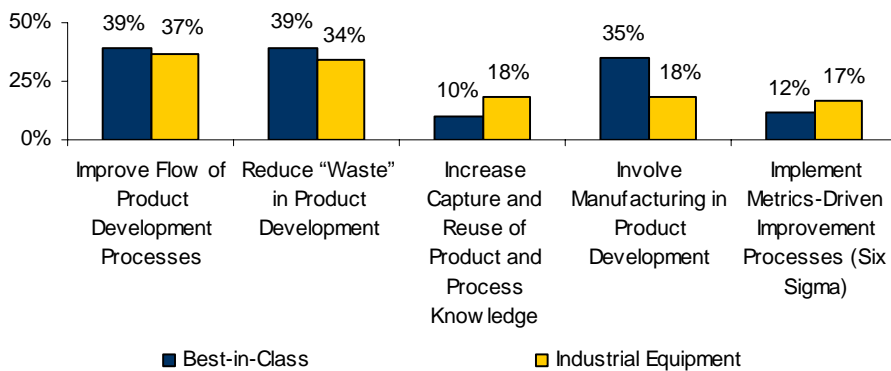
*Laggards (30%)* — practices that are significantly behind the average of the industry

devoted to value-added or productive design activities, 1.5-times that reported by industrial equipment manufacturers.

## Lean Strategies of Industrial Equipment Manufacturers

What are the Best-in-Class doing differently than industrial equipment companies? When it comes to the core tenets of Lean, such as reducing 'waste' and improving the flow of development processes, the answer is, 'not much' (Figure 2). However, the Best-in-Class report a particular focus on aligning manufacturing and product development that is lacking among industrial equipment manufacturers (Figure 2).

**Figure 2: Top Five Lean Strategies of Industrial Equipment Manufacturers**



Source: Aberdeen Group, May 2007

The relatively even performance reported across the industrial equipment sector is reflected in the close alignment to the Best-in-Class among the top two strategies. However, it appears that these companies are missing considerable opportunities by failing to involve manufacturing in product development. The Best-in-Class are nearly twice as likely as these companies to make this part of their Lean product development programs. Lean product development processes can make little difference if manufacturing organizations can't produce the product. For industrial equipment companies, involving manufacturing in product development can mean avoiding fixing problems when designs can't be manufactured on the shop floor. The delays and scrap caused when these organizations have to find fixes that could have been resolved by earlier collaboration can negate the benefits a Lean product development organization can provide.

Further, by involving manufacturing in product development, the Best-in-Class also allow these organizations to complete manufacturing planning processes soon as well, further improving efficiency.

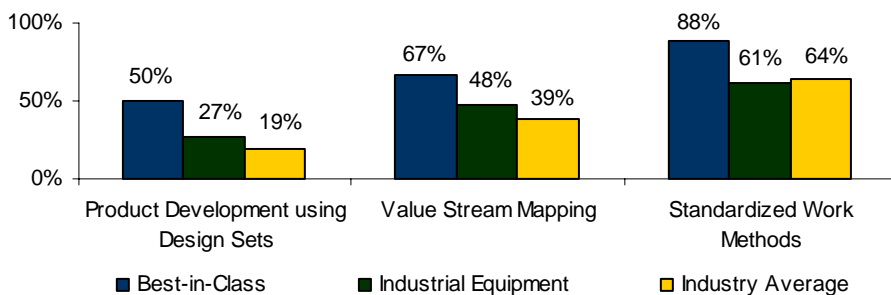
## Making Lean Work for Product Development

The area where Aberdeen found that industrial equipment manufacturers are failing to make the most of their Lean programs isn't in strategy themselves, but in execution. To improve the effectiveness of their Lean product development programs, industrial equipment manufacturers can look to the steps taken by these leaders.

### Streamlining Product Development Processes

While industrial equipment manufacturers indicate roughly the same focus on improving the efficiency of product development process on a strategic level, they fall behind when it comes to the process capabilities of the Best-in-Class (Figure 3).

**Figure 3: Process Capabilities of the Best-in-Class**



Source: Aberdeen Group, May 2007

Value stream mapping and standardized work methods are two hallmarks of Lean process. Value stream mapping is often an initial step of Lean, by which the steps of a process are scrutinized for inefficiencies and wasted effort. Activities that do not contribute to achieving customer value are redefined or removed in order to streamline the overall product development process. Once efficiency is removed, the next step is often to standardize these processes across an organization. Industrial equipment manufacturers report high adoption in both areas, but remain well behind the Best-in-Class.

However, the area that stands out as a significant opportunity for improvement for industrial equipment manufacturers is the adoption of design sets in product development. This is an approach that breaks a design into a series of functional 'modules' with standardized interfaces that buffer each area from dramatic changes that may be made to others. This enables engineers to explore a wide variety of new options in parallel with minimal impact to one another. Modularity also enables increased reuse across designs through common modules, while increasing the variability of designs through combinations of different modules. The Best-in-Class are 85% more likely than industrial equipment manufacturers to adopt this approach, effectively enabling innovation without introducing risk.

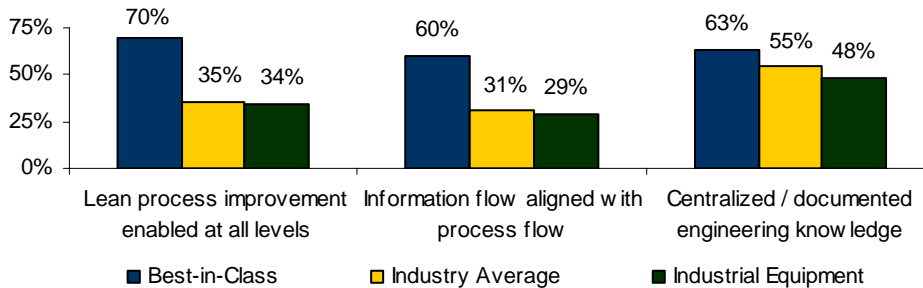
"We are pursuing Lean company-wide. Basically, each sector (R&D, service, etc.) of our company established some targets and, on average, we are getting there. My personal opinion is that taking each different approach (streamline processes, reducing waste, etc.) at the same time will not only improve things, but also it will speed our product development in a smoother way. For example, our service costs decreased while the technology of our most current products was improved a lot."

~ Wilson Pardi Junior  
Software / Hardware Engineer  
NuFlare Technology, Inc.

## Supporting Lean Development

Truly 'Leaning out' the product development, however, requires more than attention to processes. The Best-in-Class adapt their organizations in a way that supports the implementation and effectiveness of Lean concepts (Figure 4).

**Figure 4: Support Capabilities of the Best-in-Class**



Source: Aberdeen Group, May 2007

In particular, the Best-in-Class are 2.2-times as likely as industrial equipment manufacturers to authorize individual process owners to make the changes they deem necessary to streamline those processes. By doing so, the Best-in-Class recognize that it is the individuals performing a task who best understand it, and thus how to best improve it. Further by placing responsibility for Lean directly in the hands of engineering staff, the Best-in-Class increase employee buy-in, which can improve the efficacy of a Lean program.

However, aligning information flow with process flow may be a more critical step. Streamlining processes without similarly adapting the flow of information through their organization to match it, they are creating roadblocks for themselves. The Best-in-Class are twice as likely as industrial equipment manufacturers to align information flow to process flow. Ensuring that individuals at all steps of the process have the right information to do their jobs without waiting, excessive searching, or rework of data has the potential to reduce cycle times and improve overall product development efficiency.

Documenting and centralizing engineering knowledge is a related area of concern, but one where industrial equipment manufacturers don't lag the Best-in-Class as dramatically. Central access to information is a critical step to removing waste from product development. Engineers who are seeking out information, or who are not aware that the information exists, are not focused on productive design tasks, and may even be repeating steps that have already been taken. A central location that is accessible by all design stakeholders can significantly improve the efficiency of product development processes.

### **The Role of Technology**

Further, the Best-in-Class are taking advantage of technology tools as part of their Lean programs. The solutions they are using range from specialty tools for lean to Product Data Management (PDM), and product portfolio management (Table 2).

**Table 2: Technology Enablers Supporting Lean**

	<b>Best-in-Class</b>	<b>Industry Average</b>	<b>Industrial Equipment</b>
Digital Manufacturing (DM) / manufacturing process planning	53%	34%	29%
Advanced search technologies	53%	23%	15%
Specialty tools for lean	61%	21%	38%
Product Data Management (PDM)	67%	48%	48%
Product portfolio management	72%	53%	35%

Source: Aberdeen Group, May 2007

Specialty tools for Lean are business approaches that have been automated by many companies to execute process improvement, communicate standardized work processes, or promote consistent execution of Lean activities. The Best-in-Class are 1.6-times as likely as industrial equipment manufacturers to take advantage of these kinds of specialized solutions. However, these tools are only the most obvious technology enablers of Lean product development the Best-in-Class use.

In many cases, the tools that the Best-in-Class leverage have not been designed with Lean in mind, but have significant Lean applications. Advanced search technologies that search by parameters or part characteristics (which the Best-in-Class are 3.5-times as likely as industrial equipment manufacturers to use) reduce time wasted waiting for information from others or with struggling with the limitations of less sophisticated searches. Additionally, the use of Product Data Management (PDM), which is by no means a Lean-specific tool, can help eliminate non-valued added tasks in product development, particularly in a design environment that can be as complex as industrial equipment manufacturing.

Further, digital manufacturing solutions, which aren't necessarily associated with Lean either, can help industrial equipment companies to involve manufacturing organizations in product development by allowing companies to simulate manufacturing processes along side designs as they are developed. In this way, they improve the efficiency of design processes, enhance the manufacturability of designs, and allow manufacturing planning processes to begin earlier as well as avoid errors and rework, effectively reducing the overall time to market cycles.

Finally, the Best-in-Class are twice as likely as industrial equipment manufacturers to leverage Product Portfolio Management (PPM) solutions.

These tools allow the Best-in-Class to apply Lean to product development from a planning perspective. PPM tools are used to target resources and efforts on products that are best aligned to customer needs and business value, effectively 'Leaning out' the portfolio to allow these organizations to focus on projects that will provide the greatest value.

## Recommendations

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Lean is largely a new concept for product development organizations in general, but industrial equipment manufacturers report relatively wide adoption of Lean strategies. For those companies looking to either begin to go Lean or expand on their current programs, they will benefit from adopting the following steps of the Best-in-Class:

- **Streamline product development with design sets.** The Best-in-Class are 2.6 times as likely as industrial equipment companies to take advantage of design sets to develop products in a platform fashion, which can help increase variation in design with minimal rework as well as consolidating and reusing parts.
- **Empower Lean decision makers at all levels of the organization.** Often the individual with the best insight into how to improve a process is the one who performs it. The Best-in-Class take advantage of the experience of their staff and enable the engineers who are responsible for a process to determine how it can be best improved. Additionally, by locating ownership of Lean programs at all levels of the product development organization, the Best-in-Class stimulate greater enthusiasm for Lean, which is a concept that engineers often can find distasteful.
- **Involve manufacturing in the product development process.** This is an area where industrial equipment manufacturers have considerable opportunity for improvement. The Best-in-Class are 2.2 times as likely as these companies to involve the manufacturing organization in product development as part of a specific Lean initiative. In addition, these leading performers are 1.8 times as likely to use digital manufacturing tools to support this effort. By doing so, the Best-in-Class are able to streamline the handoffs between engineering and manufacturing as well as head off incompatibilities between designs and manufacturing environments.

For more information on this or other research topics, please visit [www.aberdeen.com](http://www.aberdeen.com).

### Related Research

[The Engineering Executive's Strategic Agenda: June 2008](#)

[The Lean Product Development Benchmark Report: May 2007](#)

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