CONNECTED PRODUCT LIFECYCLE MANAGEMENT MEETS (AND BEATS) PRODUCT COMPLEXITY

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ABERDEEN

To enable advancement to new areas such as the Internet of Things, augmented reality, and Industry 4.0, Best-in-Class companies are undergoing a product lifecycle management (PLM) digitalization process to provide a single view of product data across the enterprise, even extending this visibility to partners and customers. Their ultimate goal? To provide a connected, harmonious, collaborative PLM environment that makes product data consumable to all, while increasing engineering productivity and on-time delivery of high-quality products.

Complexity and Disparity Don't Discriminate

Large or small, every company today struggles with product complexity and disparity. These issues don't discriminate based on whether a firm launches a single product per year or hundreds (Figure 1).

Figure 1: Key Challenges of the Product Development Process
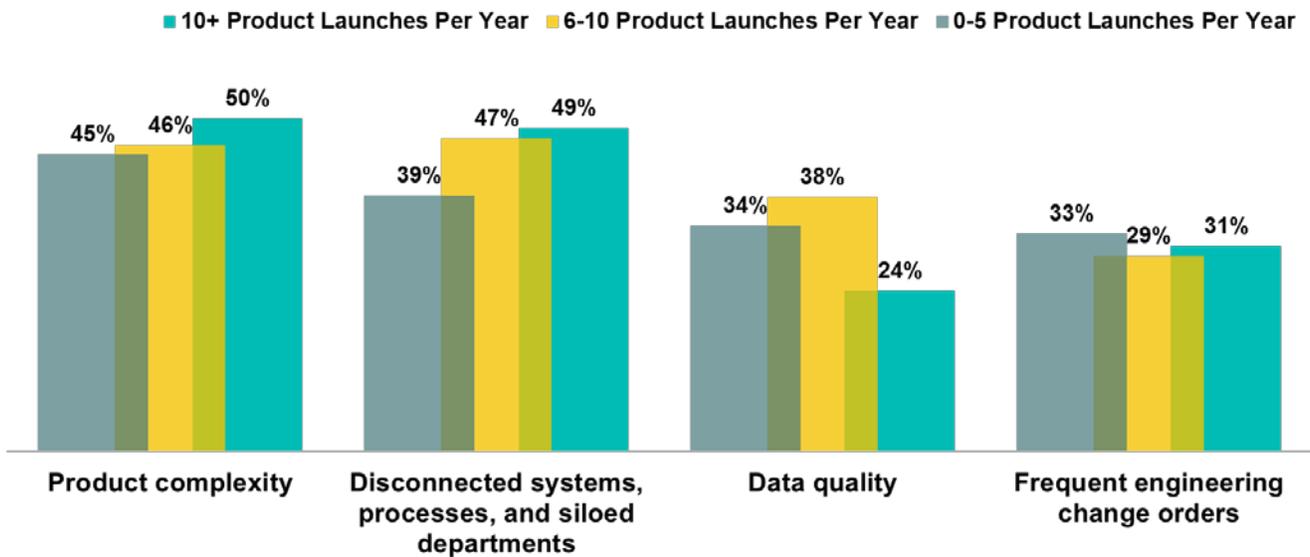
% of Respondents n = 393 Source: Aberdeen March 2018

The world is changing; smart, connected, electro-mechanical products now incorporate intricate software and embedded sensors. By their nature, these smart, connected products are complex and multi-disciplinary. As a result, the development process must be able to accommodate:

- ▶ higher volumes of product data, including sensor data;

- ▶ different types of parts (mechanical, electrical, electronic, software, sensor); and

- ▶ a broader range of product functionality and reliability

without compromising engineering productivity, product launch dates, or product quality.

The top challenges of developing such complex products are closely tied together: disconnected systems, processes, and siloed departments exacerbate product complexity, which leads to higher development costs. Product data can be scattered across many systems, including multiple instances of systems for PLM, computer-aided design (CAD), enterprise resource planning (ERP), and manufacturing execution systems (MES). Product data can also be secreted in home-grown systems, shared drives, and Excel files, and embedded in email communications.

These challenges make it critical to begin the process of PLM digitalization so firms can institute a single, clean "system of systems" view of product data across the enterprise, whether the underlying systems involved are PLM, ERP, CAD, or something else.

Obstacles to visibility into product data aren't the only reason PLM digitalization is no longer avoidable: industry compliance standards are changing, and companies are required to have digital data. No longer is it acceptable to simply submit drawings and PDF files to document a product design. Digitized product data is a prerequisite to move your company and products forward in a timely fashion.
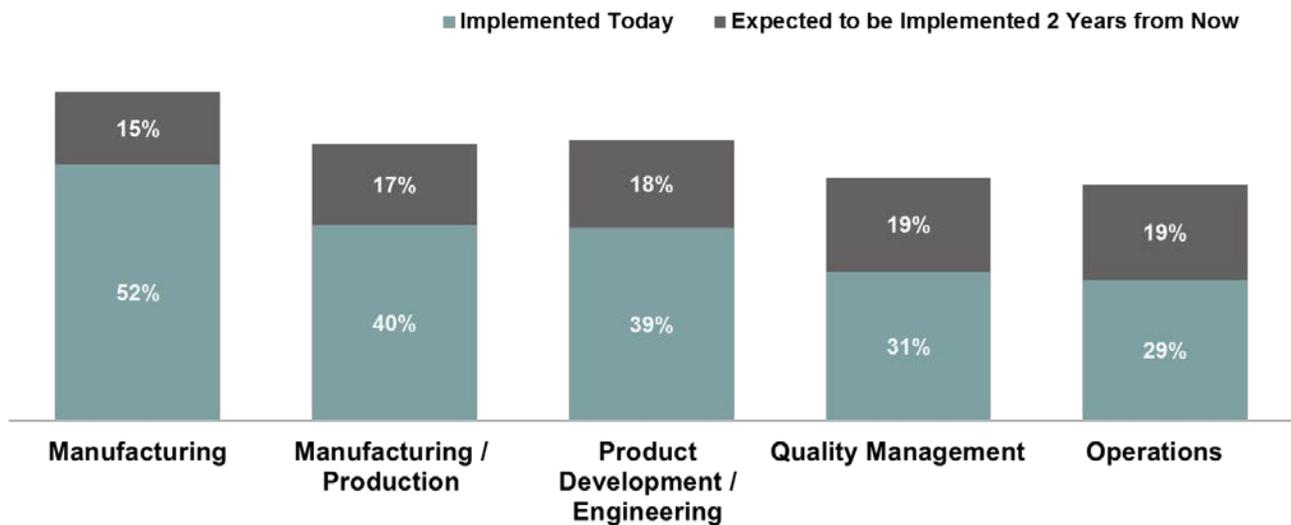
Disconnected systems and processes carry a host of risks, starting with disconnected product information, which increases design costs, delays schedules, and obstructs decisions made internally and by external partners and customers. Likewise, the persistence of siloed departments impedes the collaboration needed for effective product development. In addition, as connected products become more complex, frequent engineering changes and data quality issues become greater challenges.

Together, these challenges form a perfect storm of rapidly changing, complex product data. To truly thrive, companies need a single, connected view of product data across the enterprise, where data is easily consumable by stakeholders, partners, and customers. They also need effective internal and external collaboration with all product development stakeholders.

To Tame Complexity and Disparity, PLM Is Transforming into an Enterprise System

PLM is able to address product development challenges in an ever-changing market. Aberdeen finds that PLM's footprint is growing, and its role is evolving as it emerges in more business areas. What started out as an engineering-centric system is rapidly becoming an enterprise system that may just bring order to the chaos (Figure 2).

Figure 2: PLM Technology Continues to Push into More Areas

Implemented Today   **Expected to be Implemented 2 Years from Now**

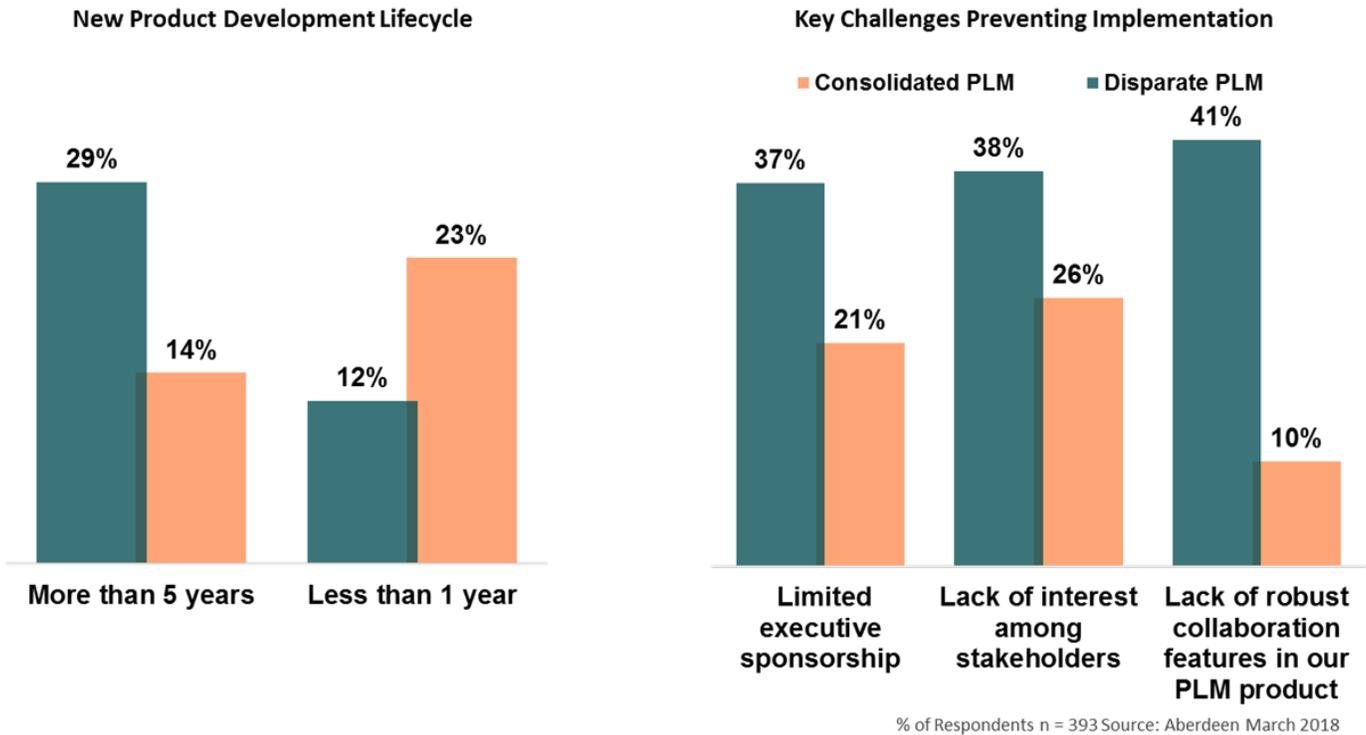|	Implemented Today	Expected to be Implemented 2 Years from Now
Manufacturing	52%	15%
Manufacturing / Production	40%	17%
Product Development / Engineering	39%	18%
Quality Management	31%	19%
Operations	29%	19%

% of Respondents n = 393 Source: Aberdeen March 2018

Projected PLM growth is strong in traditional areas such as manufacturing, production, and engineering (Figure 2). Notably, PLM is also expanding more rapidly in areas like quality management and operations. This reflects the fact that smart, connected products also require smart, connected manufacturing across different departments and across different areas of the organization.

The Perils of a Disconnected World

The cost for companies that fail to digitalize PLM is high. A lack of a consolidated ("connected") PLM strategy produces poor results (Figure 3).

Figure 3: A Lack of Strategy Produces Poor Results

New Product Development Lifecycle

	More than 5 years	Less than 1 year
	29%	12%
	14%	23%

Key Challenges Preventing Implementation

■ Consolidated PLM ■ Disparate PLM

	Limited executive sponsorship	Lack of interest among stakeholders	Lack of robust collaboration features in our PLM product
Disparate PLM	37%	38%	41%
Consolidated PLM	21%	26%	10%

% of Respondents n = 393 Source: Aberdeen March 2018

What we see are two sides of the same coin. Consolidated PLM users are much more likely to have a shorter development cycle, while disparate PLM users are more than twice as likely to have a product life cycle that extends beyond five years. This means **disparate PLM users languish, missing out on the ability to accelerate the product lifecycle.**

Key challenges that hinder the PLM process are much more intense for companies in a disparate environment. Disparate PLM leads to negative consequences, such as limited executive sponsorship, lack of stakeholder interest, and collaboration challenges.

▶ In a disparate PLM environment, executives don't want to get involved. It's hard to gain buy-in from executives when they're only

focused on their own department and their own PLM system in use in their department.
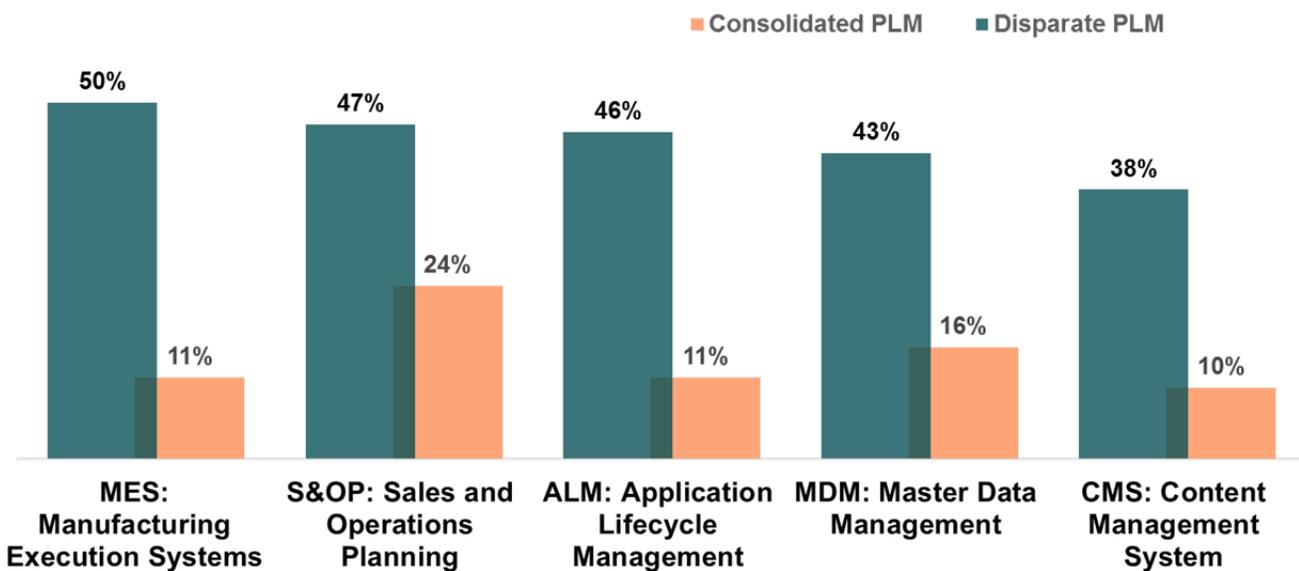
▶ Lack of stakeholder interest also plagues disparate PLM environments. In a disparate, disconnected environment, employees work in silos. These employees neither know nor care what other departments across the globe are doing, which leads to a lack of interest in collaboration.

▶ Moreover, the challenges of collaboration are exacerbated in a disparate PLM environment. Disparate teams across the organization working on different projects using disconnected PLM tools severely impede efforts to create a collaborative environment. Consequently, disparate users are four times more likely than consolidated PLM users to suffer a lack of robust collaboration features.

Users with consolidated PLM use a single system globally. Users with disparate PLM use five or more systems globally.

Consolidated vs. Disparate in Practice

How does consolidated ("connected") versus disparate ("disconnected") PLM play out in the real world? (Figure 4).

Figure 4: Disparate PLM Forces Ad-Hoc Application Use for PLM

Legend: ■ Consolidated PLM   ■ Disparate PLM

- MES: Manufacturing Execution Systems — 50% / 11%
- S&OP: Sales and Operations Planning — 47% / 24%
- ALM: Application Lifecycle Management — 46% / 11%
- MDM: Master Data Management — 43% / 16%
- CMS: Content Management System — 38% / 10%

% of Respondents n = 393 Source: Aberdeen March 2018

Figure 4 examines some of the other applications used to accomplish PLM processes and tasks. The disparities between connected PLM and non-connected PLM are stark.

While connected PLM ensures highly consumable, real-time data that's available enterprise-wide, disparate PLM forces ad hoc use of non-optimized applications for PLM processes.

Firms with a consolidated PLM strategy don't need to use an ad hoc "band-aid" approach for PLM processes. However, disparate PLM creates an environment of *product information chaos,* where people fall back on familiar – but not optimized – applications, rather than the best application for the job. The disparate PLM result is PLM processes and tasks get "shoe-horned" into non-PLM applications. This use of inappropriate applications for PLM tasks hinders the collaborative process and slows down product development cycles.

While the hazards of a disconnected world paint a cautionary tale, there *is* hope for the future. The Best-in-Class users have blazed a trail to success through PLM best practices that create a single, connected view of product data across the enterprise and its supply chain (both upstream and downstream), with effective internal and external collaboration between all product development stakeholders.

Best-in-Class Metrics for Connected PLM

Aberdeen selected three strategic metrics to define Best-in-Class companies. Together, these metrics strongly suggest a connected, harmonious PLM environment (Figure 5).

Figure 5: Who Are the Best-in-Class?

Best-in-Class Metric	Best-in-Class	Industry Average	Laggard
Product Launch Dates	78%	66%	52%
Engineering Productivity (YoY improvement)	22%	9%	-3%
First Pass Yield (YoY improvement)	21%	5%	-8%

Aberdeen draws from a very targeted and rich set of data: 136 senior engineers at large companies. All engineers had titles of manager or higher, and all worked at firms with revenues of $250 million or greater.

The Aberdeen maturity class framework is comprised of three groups of survey respondents. This data is used to determine overall company performance. Classified by their self-reported performance across several key metrics, each respondent falls into one of three categories:

▶ Best-in-Class: Top 20% of respondents based on performance

▶ Industry Average: Middle 50% of respondents based on performance

▶ Laggard: Bottom 30% of respondents based on performance

Sometimes we refer to a fourth category, All Others, which is Industry Average and Laggard combined.

The Best-in-Class perform much better across all three metrics:

- ▶ **Hitting Product Launch Date Targets**: Almost half of product launches are late for Laggards, while Best-in-Class excel. For the Best-in-Class, 78% of products meet launch date targets, which is a rate 58% higher than laggards.

- ▶ **Improving Engineering Productivity:** The Best-in-Class are much more likely to see an increase in engineering productivity while Laggards are likely to see a decrease. The Best-in-Class improved their engineering productivity an average of 22% over the past two years, which is 2.4x greater than the Industry Average.

- ▶ **Improving First Pass Yield (FPY):** Lastly, PLM best practices boost product quality. The Best-in-Class registered very strong two-year improvement, while Laggards experienced an 8% drop in quality. All in all, the Best-in-Class had a 21% improvement in FPY, which is 4x the industry average rate.

## Strong Organizational Maturity for the Best-in-Class

Not only are Best-in-Class companies moving almost 20% faster towards a connected PLM system, but they exhibit more comprehensive use of PLM capabilities, creating a single view of product data across the enterprise (Figure 6).

Figure 6: Best-in-Class Companies Have a Comprehensive Use of PLM

% of Respondents n = 136 Source: Aberdeen March 2018
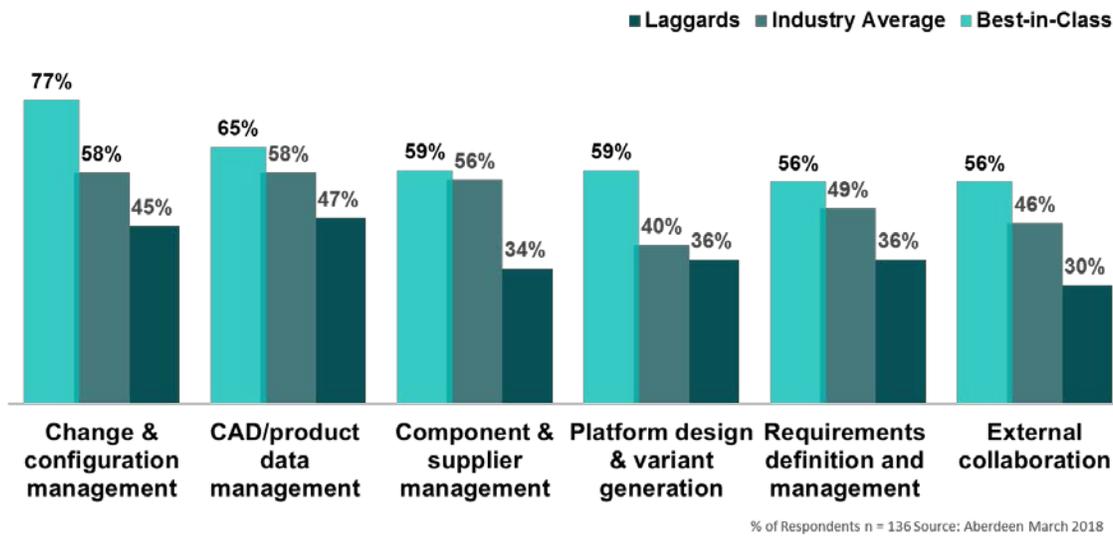
In addition, the Best-in-Class commitment to collaboration validates their strong dedication to producing and sharing consumable product data with internal stakeholders, external partners, and customers (Figure 7).

Figure 7: The Best-in-Class Have the Capabilities to Manage Collaboration

% of Respondents, n = 136, Source: Aberdeen March 2018
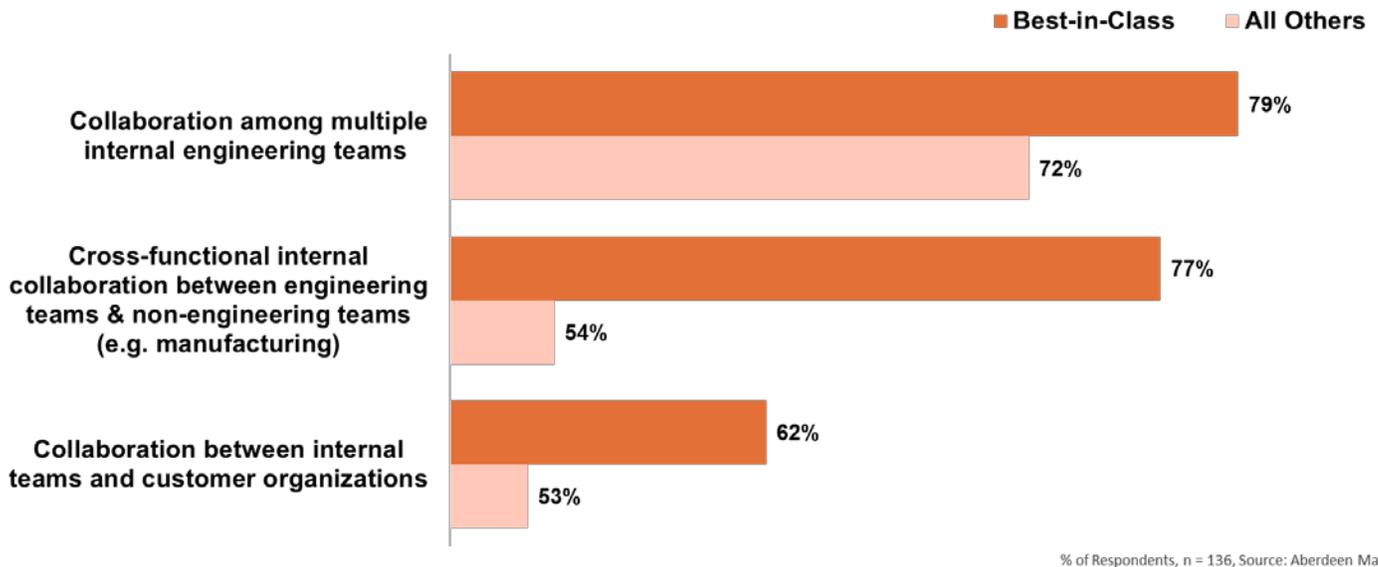
Finally, the Best-in-Class are carefully considering available PLM deployment options, making sure they not only have on-premise PLM solutions, but also cloud options. They are migrating PLM to the cloud at a faster rate, and are 14% more likely to describe their PLM software delivery model for their installed PLM systems as "*Software as a Service - Software architected for sharing application, infrastructure, and services; managed by a service provider.*"

The Best-in-Class also see many benefits of moving PLM to the cloud. They identify faster implementation speed, better efficiency in total lifecycle costs, and scalability as the top benefits pulling them to cloud-based PLM (see sidebar).

Results: Best-in-Class Meet Targets

As a result of these PLM best practices, Best-in-Class users execute against their targets for product development budgets and product quality at launch. Seventy-one percent of products shipped by the Best-in-Class meet product development budgets; this rate is 22% higher than that of Laggards.

In addition, 70% of products shipped by the Best-in-Class meet product quality targets at launch, which is 21% better than that of Laggards. The Best-in-Class' high use of PLM capabilities and broad emphasis on collaboration is creating a single, connected view of product data across the enterprise that improves engineering, manufacturing, production, and operations.

Conclusions and Recommendations

For complex product development in a changing world, firms need to establish a single, connected view of product data across underlying systems and across the enterprise.

The costs of not doing so are immense: Overall design costs are greater, which drags down engineering productivity, and engineers waste time depositing product data in disparate systems to share it outside of engineering, which introduces product launch date delays and delays due to quality issues.

While the perils of a disconnected world paint a cautionary tale, there is light at the end of the tunnel. The proven path of the Best-in-Class toward PLM digitalization suggests a threefold path to success:

Cloud PLM Benefits

Senior engineers at large companies ($250 million or greater) see distinct benefits of moving PLM to the cloud:

► Faster implementation speed- 61% of respondents

► Efficiency in total lifecycle costs- 59%of respondents

► Scalability- 44% of respondents

► Easier deployment- 38% of respondents

► Subscription pricing- 36% of respondents

► Automatic updates and upgrades- 29% of respondents

1. **Get Your Digital House in Order.** Digitalizing your PLM pays off. Aberdeen research confirms four major benefits of consolidated PLM: decreased costs, higher productivity, better product quality, and increased collaboration.

2. **Beware the Disconnected PLM Environment.** 20% of companies have more than five PLM solutions. Disconnected product information systems force a "band-aid" solution that creates a cascade of problems: increased design costs, schedule delays, and obstructed decisions. On the flip side, consolidated PLM helps drive collaboration and shortens the development life cycle.

3. **Maximize Performance with Consolidated PLM.** Not only are the Best-in-Class moving to a single PLM system at a faster pace than Laggards, they are extending and expanding their usage of PLM capabilities. They have a more comprehensive use of PLM processes and are more likely to be in a consolidated environment, which enables performance improvements such as timely product launches, improved engineering productivity, and improved product quality.

For the Laggards stuck in old ways of thinking, it is time to change. Fortunately, Best-in-Class firms are modeling the path forward on the journey to PLM digitalization. The Best-in-Class' extensive use of PLM capabilities, with special attention paid to collaboration, is leading to a single, connected view of product data that improves engineering, manufacturing, production, operations, and relationships with external partners and customers.

Related Research

Integrated Product Lifecycle Management in the Era of IoT; June 2017

Product Lifecycle Management Enables the Digital Thread; July 2017

Product Development and the Centrality of the Digital Twin; July 2017

Product Development in the Era of IoT: Tying the Digital Thread; June 2017

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