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CONNECTED PLM MEETS (AND BEATS) PRODUCT COMPLEXITY

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ABERDEEN

Today's Best-in-Class companies are embracing a new era of digital transformation in product lifecycle management (PLM). As a result of their efforts to generate a collaborative and connected PLM environment, these companies enjoy superior results in cost reduction, quality improvement, and accelerated time-to-market. In this report, Aberdeen uncovers the benefits of leveraging enterprise PLM as a means to digital transformation and the perils of not doing so.

Navigating a World of Complex Products, Systems, and Data

As companies strive to meet and exceed customer expectations, they find themselves faced with an array of daunting challenges that hinder their product development efforts. While some of these challenges are heavily dependent upon the size and breadth of a company's product launch capabilities, others are nearly universal. Aberdeen's research shows that these organizations struggle significantly when it comes to managing the growing complexity of their product lines. Not only that, they grapple with controlling a disparate and disconnected environment of systems and processes. These issues don't discriminate based on whether a firm launches a single product or hundreds per year (Figure 1).

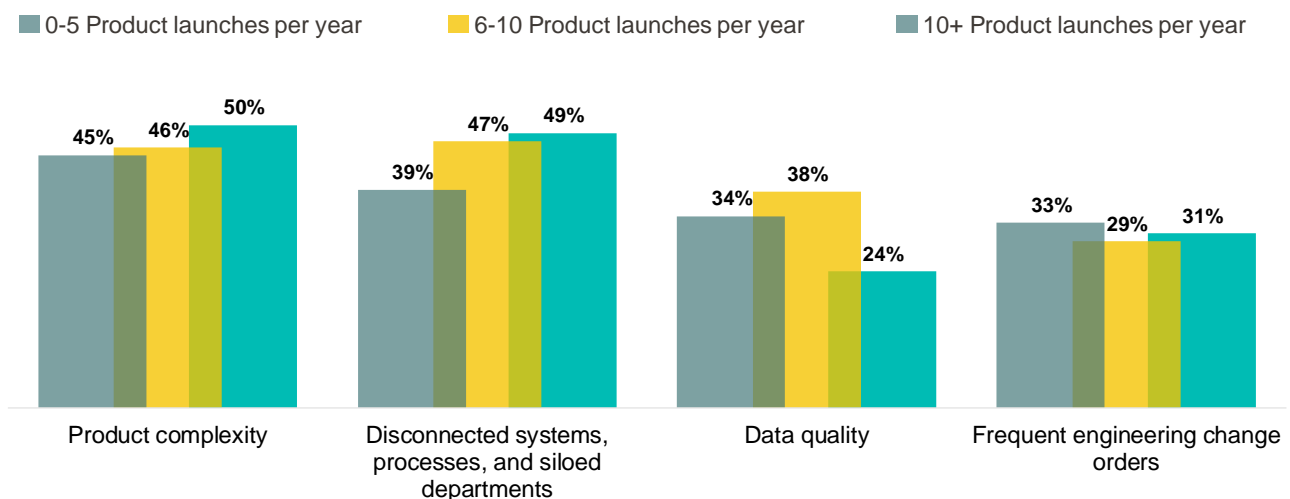
About the Study

In March 2018, Aberdeen conducted a survey of 393 organizations, exploring their experiences with product lifecycle management (PLM) technology.


The results of this report investigate several key concepts, including:

- Top challenges facing PLM users
- The changing PLM footprint within organizations today
- The perceived benefits of deploying PLM in a cloud-based architecture
- The relevance of PLM to today's emerging IoT use cases
- The risks associated with a broadly distributed and disconnected PLM environment

Figure 1: Key Challenges of the Product Development Process



% of Respondents n = 393 Source: Aberdeen, April 2018



The world is changing. Smart, connected, electro-mechanical products now incorporate intricate software and embedded Internet of Things (IoT) sensors. By their nature, these sophisticated products are complex and multi-disciplinary. As a result, the development process must be able to accommodate higher volumes of product data (such as IoT sensor data) as well as different types of parts (i.e., mechanical, electronic, software, sensor). Moreover, companies need to handle this type of complexity without compromising new product development cost, 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, Excel files, and embedded in email communications.

The Perils of a Disconnected World

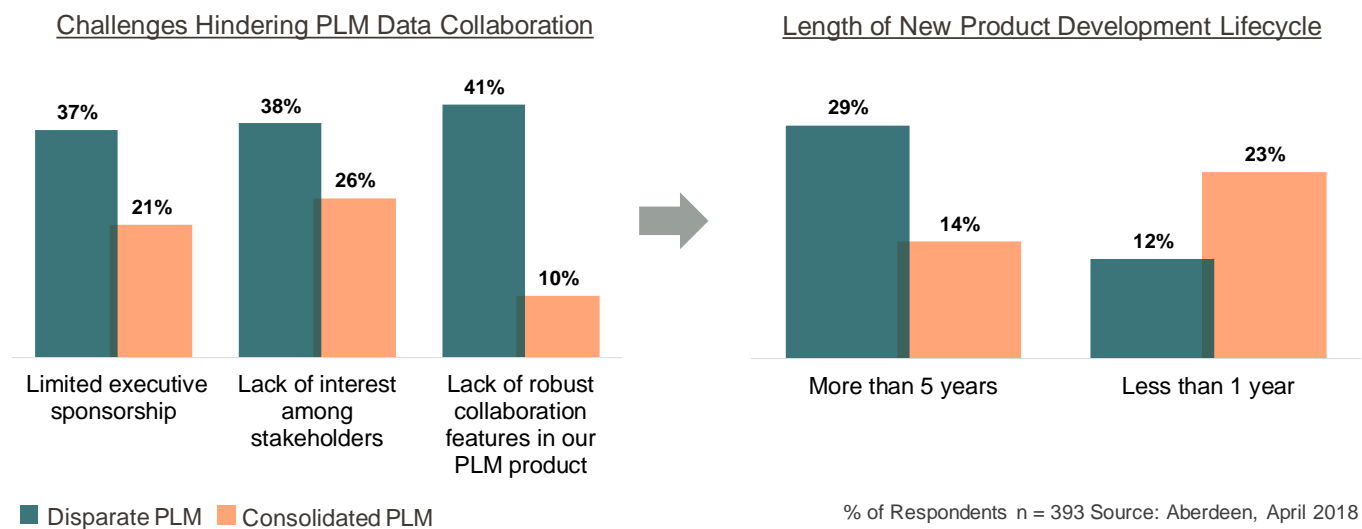
Technology disparity — in terms of applications, infrastructure, or just data — is an issue that plagues organizations across a multitude of industries. However, product companies managing a globally dispersed PLM environment seem particularly thwarted by this challenge. According to Aberdeen's research, 27% of companies are struggling to bring harmony to **5 or more PLM systems** across their global workforce. This type of disparity exacerbates several challenges that companies already struggle with, including:

- ▶ **Lack of executive oversight.** Today's executives are short on time and long on competing priorities and projects. With a PLM environment rife with disparity, senior managers have a hard time seeing the value of investing precious time and resources in supporting PLM systems and activities that fall outside their own department.
- ▶ **Lack of stakeholder interest.** In this type of disconnected PLM environment, employees work in silos, whether functionally or geographically. This presents a major challenge to collaboration in the product development process as employees have no way of engaging with other enterprise teams across these silos. Each department works on their piece of the product development

cycle, often with their own specific PLM system, preventing a bigger picture view of the process and hindering collaboration. A connected and consolidated PLM environment helps mitigate these challenges.

Aberdeen’s research consistently demonstrates that a collaborative internal environment can help drive continuity in the development process and bring about significant efficiencies. On the other hand, those struggling to manage disparity in their PLM environment experience elevated challenges to their collaborative efforts, ultimately leading to an extended product development lifecycle (Figure 2).

Figure 2: Poor Collaboration Frustrates the New Product Lifecycle



What we see are two sides of the same coin. Organizations with a consolidated PLM system are more likely to have a shorter development cycle, while disparate PLM users are more than twice as likely to have a product lifecycle that extends beyond five years. This means disparate PLM users languish as they face quality and time-to-market challenges, missing out on the ability to accelerate the product lifecycle.

While connected PLM ensures highly consumable, accurate, real-time data that’s available enterprise-wide, disparate PLM forces the 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

Definitions

Users with **disparate PLM** use five or more systems globally.

Users with **consolidated PLM** use a single system globally.

familiar — but not optimized — applications. This slows down product development cycles.

The key takeaway is to integrate all these systems of record to provide a single, connected view of product data across the enterprise and manage that process with connected PLM. The use of PLM in a connected environment adds value to an organization's existing architecture, even if it is distributed in nature. Not only that, a single, connected view of PLM product data as a lever brings a measure of community, clarity, correlation, and harmony across those different applications and achieves a level of consistency across the organization.

Best-in-Class Rise to the Top

For some companies, a connected and highly collaborative global PLM environment is purely aspirational. For others, it is a reality. With this disparity in mind, Aberdeen chose three relevant performance metrics to define top companies and underperformers (see sidebar). Discussed in more detail below, these metrics paint the picture of an elite product organization in a rapidly changing business environment.

- ▶ **Team productivity.** A consolidated and connected PLM environment results in a much higher level of team cohesion, as opposed to globally dispersed and “siloeed” engineering teams that struggle to produce results.

*Best-in-Class companies experienced an average **22% increase in engineering productivity** over the prior 12 months, compared with 9% for the Industry Average and 3% for Laggards.*

- ▶ **Quality of output.** With a Best-in-Class approach, the continuity and clarity across multiple systems of record can reduce process waste and improve quality. (Wrangling data from a multitude of applications and data sources can lead to inconsistencies in the flow of information and drive problems with quality.)

*Best-in-Class companies saw an average **21% improvement in first-pass yield** over the previous 24 months, compared with a 5% improvement for the Industry Average and an 8% decline for Laggards.*

- ▶ **Time-to-market efficiency.** Companies that have developed a more unified global PLM environment are able to marshal their resources (both data and human capital) in order to accelerate the

Best-in-Class Defined

In the context of this report, Best-in-Class companies were defined by their ability to create a connected and efficient PLM environment. Three relevant metrics were used to determine performance:

- ▶ Increase in engineering productivity
- ▶ Improvement in first-pass yield
- ▶ Product launch date targets met

From the total pool of respondents, 136 senior-level engineers were scored based on their responses to the above metrics and were subsequently placed into one of three categories:

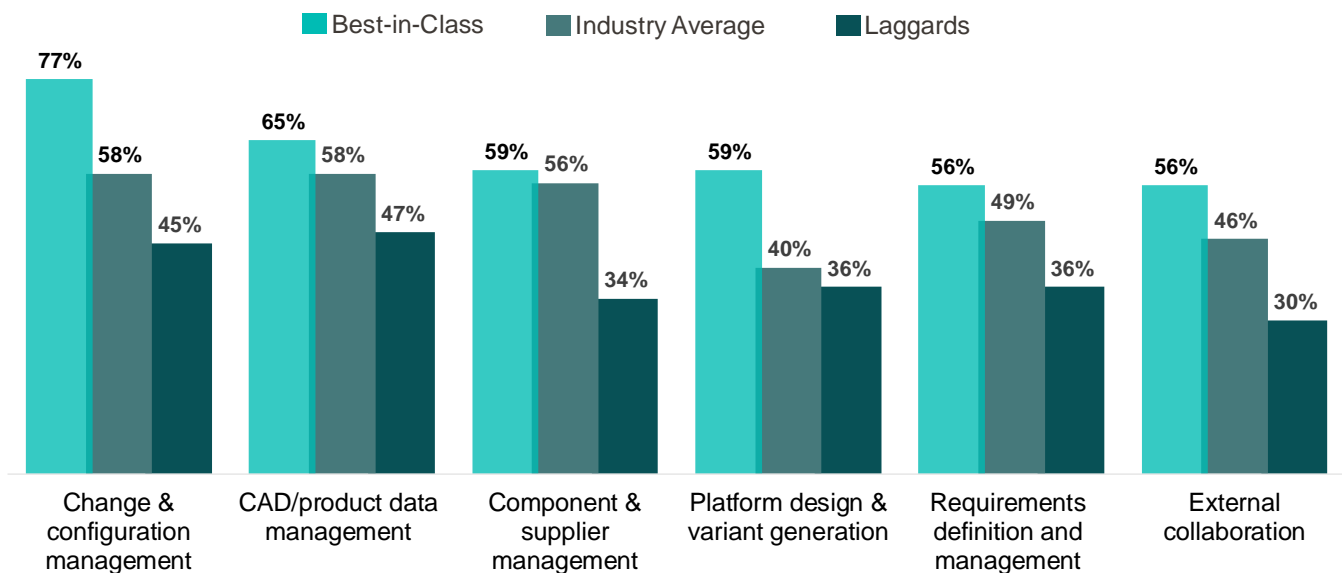
- ▶ **Best-in-Class:** Top 20% of respondents (*based on aggregate score*)
- ▶ **Industry Average:** Middle 50% of respondents
- ▶ **Laggard:** Bottom 30% of respondents

development process and bring products to market in a timely way.

*Best-in-Class companies, on average, achieve **78% of their product launch target dates**, compared with 66% for the Industry Average and 52% for Laggards.*

So, how is it that Best-in-Class companies deliver superior results? What are the things they do differently? Aberdeen's research uncovered some answers, as outlined in Figure 3. Outside of the connected and cohesive nature of their PLM environments, the Best-in-Class share several characteristics, including their propensity to use PLM more broadly across their organizations, applying it to more key processes. From internal processes like change management and variant generation to external collaboration and supplier management, Best-in-Class companies are applying PLM firepower to get the job done effectively.

Figure 3: Best-in-Class Companies Extend PLM Use More Broadly



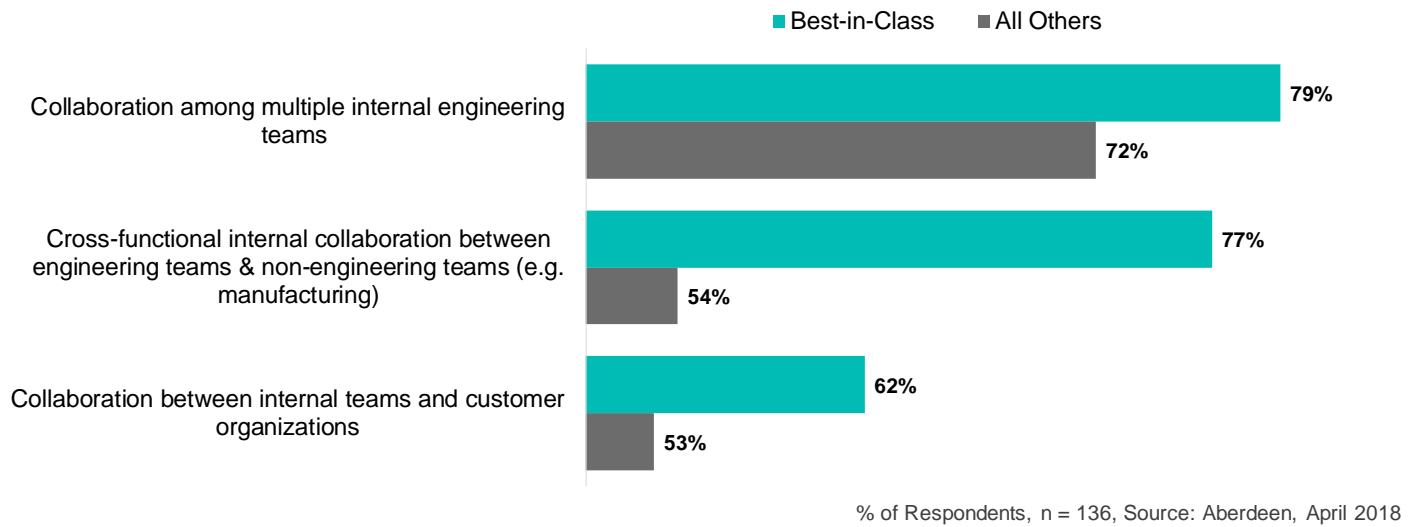
% of Respondents n = 136 Source: Aberdeen, April 2018

Another key characteristic of a Best-in-Class company is the way in which they structure their organization to support collaboration. This commitment to collaboration validates their strong dedication to producing

and sharing consumable product data with internal stakeholders, external partners, and customers.

These top companies are more likely than their peers to have these collaborative elements in place (Figure 4).

Figure 4: Best-in-Class Capabilities for Collaboration



Accelerating Digital Transformation and IoT / AR Adoption with PLM in the Cloud

As companies start to explore the potential of cutting-edge technologies and applications like augmented reality (AR) and Internet of Things (IoT), most understand that they need to think more strategically about digital transformation. The drivers of digital transformation — overly manual processes, supported by disjointed and antiquated technology — are nearly universal regardless of technical maturity or sophistication. However, top-performing companies understand the importance of the Cloud in supporting this critical journey. Cloud-based systems or hybrid (a combination of Cloud and on-premise) architectures, particularly in a geographically dispersed PLM environment, can have the effect of unifying disparate systems and teams, thus accelerating digital transformation.

The Best-in-Class are migrating PLM to the Cloud faster than All Others because they see many benefits. For example, they identify faster implementation speed, better efficiency in total lifecycle costs, and scalability as the top benefits pulling them to cloud-based PLM (see

Best-in-Class Benefits of Moving PLM to the Cloud

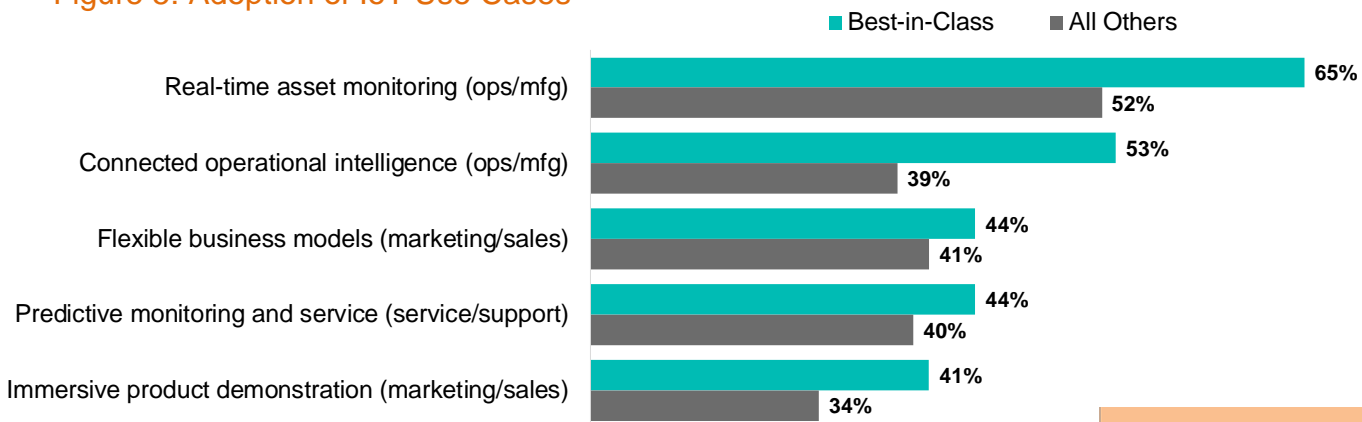
(% of respondents)

- ▶ Faster implementation speed: 61%
- ▶ Efficiency in total lifecycle costs: 59%
- ▶ Scalability: 44%
- ▶ Easier deployment: 38%
- ▶ Subscription pricing: 36%
- ▶ Automatic updates and upgrades: 29%

sidebar). In terms of how they outline their systems, the Best-in-Class are 40% more likely to describe their PLM software delivery model for their installed PLM systems as a “managed service” (software deployed and managed for a customer in a cloud environment administered by a service provider). They are 11% more likely to describe their PLM software delivery model for their installed PLM systems specifically as “software-as-a-service”, or SaaS (software architected for sharing applications, infrastructure, and services handled by a service provider). With SaaS or managed services, PLM vendors deploy capabilities faster than an organization could do so themselves, with updates and upgrades being implemented automatically.

By getting to value faster with capabilities and having greater maturity in PLM with cleaner, more consolidated product data, the Best-in-Class can capitalize on emerging IoT use cases. Because the Cloud accelerates this digital transformation process, the Best-in-Class are considering SaaS, managed services, etc. as a critical part of their business strategy towards adopting new, value-added technologies, such as IoT, AR, and the digital twin (Figure 5).

Figure 5: Adoption of IoT Use Cases



% of Respondents, n = 136, Source: Aberdeen, April 2018

The Best-in-Class are ahead of All Others in applying (or planning to apply) IoT use cases. Two of these use cases, immersive product demonstration and connected field service, also strongly suggest higher readiness to applying AR use cases. Significantly, the strongest reported benefit of IoT is improved product design, followed by improvements in customer satisfaction / product quality, reduced manufacturing lead times

IoT Benefits Realized by the Best-in-Class (% of respondents)

- ▶ Improved product design: 73%
- ▶ Improved customer satisfaction: 71%
- ▶ Improved product quality: 65%
- ▶ Improved manufacturing lead times: 62%
- ▶ Reduced service costs: 62%

/ service costs, and better visibility into product usage and performance (see sidebar).

The Drive toward PLM Digital Transformation

The seemingly ubiquitous challenges of data complexity and disparity highlight the need for PLM digital transformation – an endeavor that will enable firms to institute a single, clean “system of systems” view of product data across the enterprise, whether the underlying systems involved are PLM, ERP, CAD, or other applications. Additionally, 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. Digitalized product data is a prerequisite to move your company and its products forward in a timely fashion toward digital transformation.

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.

Reaping the Reward: Quality, Cost, and Growth

The Best-in-Class’s high use of PLM best practices and broad emphasis on collaboration is creating a single, connected view of product data across the enterprise that improves engineering, manufacturing, production, and operations. Not only that, these PLM users execute better against their targets for product development budgets, product quality at launch, and product revenue. Figure 6 shows that:

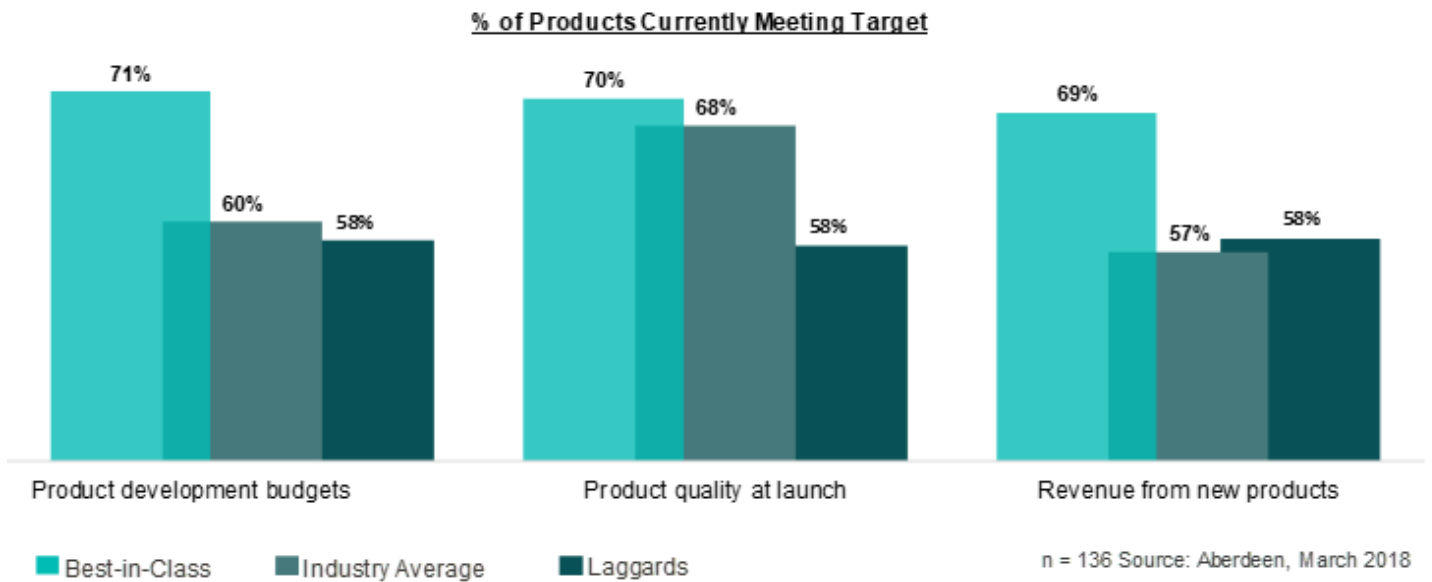
- ▶ **71%** of products shipped by the Best-in-Class meet product development budgets; a **22%** higher rate than that of Laggards.
- ▶ **70%** of the products shipped by the Best-in-Class meet product quality targets at launch, which is **21%** better than that of Laggards.

Best-in-Class PLM digital transformation

Using the Cloud as an enabler, Best-in-Class firms are effectively managing the hazards of a disconnected world. With effective internal and external collaboration between all product stakeholders, these companies are blazing a trail to success through PLM best practices.

Taking strides to shore up their digital environments, these firms create a single, connected view of product data across the enterprise and its supply chain. Often employing the Cloud as a business accelerator for PLM, they are well-positioned to take advantage of emerging use cases in IoT, AR, and the digital twin.


Figure 6: Best-in-Class Users Outperform on Critical Metrics



Recommended Actions

For complex product development in a changing world, Best-in-Class firms are undergoing a PLM digital transformation process to establish a single, connected view of product data across underlying systems and across the enterprise. The proven path of the Best-in-Class toward an effective PLM digital transformation suggests a threefold path to success:

- 1. Get your digital house in order.** Given the complexity of a typical data infrastructure today, achieving one single system of record across a geographically distributed organization may be a pipe dream. However, the most effective product organizations leverage PLM as a hub, of sorts, to not only drive continuity of data across multiple systems (i.e., MES, ERP), but drive toward greater digitalization of data as well. As companies move toward more of a parts-centric approach, PLM becomes a centralized force in driving superior quality and clarity of data, features that are critical in supporting emerging uses cases like IoT, AR, and digital twin. Best-in-Class companies leverage this more orderly data environment to drive an average 22% improvement in engineering productivity and a 17% reduction in cost of goods sold over the previous two years.



2. Make collaboration a strategic priority. Data quality, clarity, and continuity are vital components of a next generation PLM environment, but without a cohesive human element in the process those efforts are limited in value. Best-in-Class companies don't just pay lip service to the notion of collaboration, they build it into their strategic approach to the product lifecycle. The research shows that these companies are more likely than their peers to build collaborative ability across multiple engineering teams, disparate teams outside of engineering, as well as externally with customers and suppliers as well. A key component of a Best-in-Class strategy is combining this collaborative approach with effective PLM tools and capabilities. This method gives users access to the data they need, but more importantly the *context* they need. This broader and deeper collaborative effort is instrumental in their ability to bring products to market on-time, at a rate 50% higher than their peers.

3. Maximize performance with consolidated PLM. Using a consolidated PLM system enables top companies to simultaneously connect PLM to multiple disparate systems, leverage the existing software infrastructure, and maintain a centralized, clean, and consistent view of data. The Best-in-Class are extending and expanding their usage of PLM capabilities and moving to a single system at a faster pace than Laggards. With this elevated maturity and comprehensive use of PLM, Best-in-Class organizations are outperforming their peers by a significant margin: these companies saw a 22% year-over-year increase in engineering productivity while driving an average 17% reduction in cost-of-goods sold.

All in all, the costs of not pursuing connected PLM digital transformation are immense. Overall design costs are greater, which drags down engineering productivity. Engineers then waste time depositing product data in disparate systems to share it outside of engineering, which introduces product launch date delays and quality issues.

While the perils of a disconnected world paint a cautionary tale, there is light at the end of the tunnel. Companies will see it, if they follow the path of the Best-in-Class by maximizing PLM.

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

About Aberdeen Group

Since 1988, Aberdeen Group has published research that helps businesses worldwide to improve their performance. Our analysts derive fact-based, vendor-neutral insights from a proprietary analytical framework, which identifies Best-in-Class organizations from primary research conducted with industry practitioners. The resulting research content is used by hundreds of thousands of business professionals to drive smarter decision-making and improve business strategies. Aberdeen Group is headquartered in Waltham, Massachusetts, USA.

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