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WEAVING QUALITY INTO THE DIGITAL THREAD

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Across the bulk of the evolving manufacturing landscape, the need for automated quality processes tops the list as the most sought-after capability of today's product lifecycle management (PLM) technology platforms. Companies looking to enhance and extend governance and traceability initiatives while driving tangible business results also seek to sustain a Best-in-Class level of quality management regardless of its challenges. By placing quality at the forefront of a digital thread implementation, manufacturers can reduce complexity while advancing further on their journey of digital transformation.

Digital Thread Is Critical in Manufacturing

As manufacturers continue down the path of digital transformation, building a digital thread of product related data has become the key enabler of cross-domain speed and agility. In this context, digital thread can be defined as the connection of related upstream and downstream product and process information from heterogenous systems across the enterprise. The foundation of the digital thread is Product Lifecycle Management (PLM).

PLM creates the part centric governance and data associativity necessary to bring together the tools, processes, and methodologies for 24X7 global collaboration. The outcomes resulting from a holistic digital thread are vast and cut across smart connected products, operations and service initiatives. Quality programs implemented across the entire enterprise tend to be the first to benefit. Manufacturers witness these results clearly during verification and testing, but the impact of quality reaches far beyond one step in the course of production — quality is connected to time to market, product cost, capital and operating expenses, and overall customer satisfaction.

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

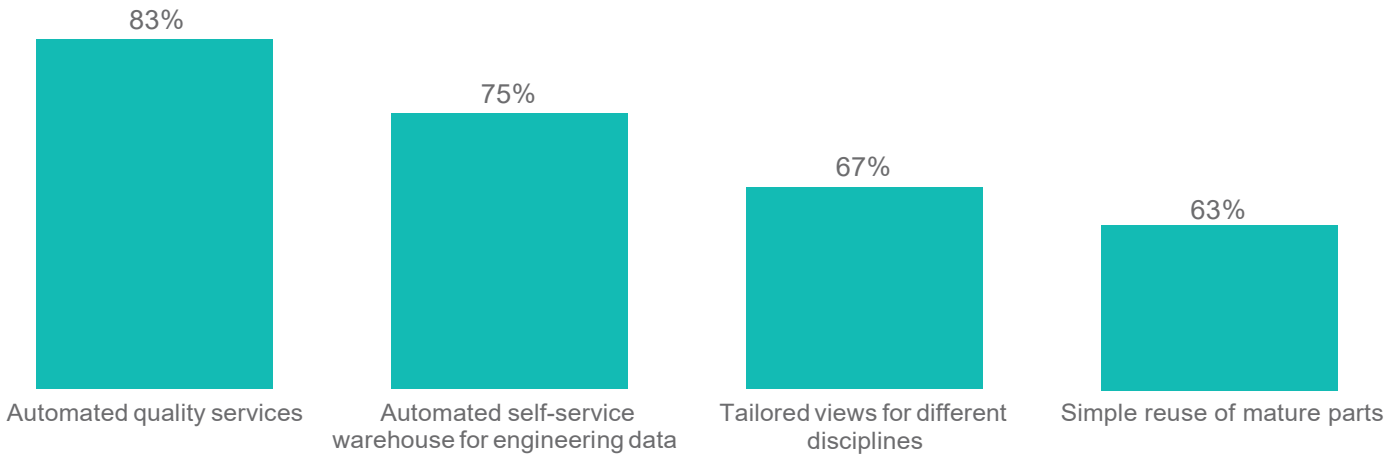
- **Laggard**

  Bottom 30% of respondents based on performance

Quality Takes Center Stage

Delivering high-quality products while bolstering operations with more efficient machinery and software is vital. For this reason, quality is top-of-mind for many manufacturers. A recent Aberdeen survey of 100 senior executives within large discrete manufacturing organizations revealed that automated quality services are most commonly cited as critical features of PLM systems (Figure 1).

Figure 1: Top Rated Features of Today's PLM Systems



n = 100, Source: Aberdeen, March 2020

The ability to house and centralize access to engineering data is important, as is the ability to create specific tailored views for different roles and disciplines. However, regardless of industry or job title, the automation of quality services takes center stage as most critically important. In fact, it has proven to be the most important PLM feature among all survey respondents, with the priority intensifying even more when looking at specific industries (see Figure 1-1).

The electronics and automotive industries place the most importance on having high-caliber quality services. The consumer durable goods industry, while slightly less concerned, still made quality a top priority. Using automated quality services within PLM platforms, manufacturers will have the ability to trace quality data throughout the product lifecycle, providing greater insights for product development, supply chain, operations, and service. This allows for continual monitoring of performance long-term, rather than at disconnected points in production or solely during testing.

Figure 1-1:

Importance of Top PLM Features by Industry*

Electronics:

- Automated quality services – 94%
- Self-service engineering DW – 76%

Automotive:

- Automated quality services – 93%
- Self-service engineering DW – 73%

Consumer Durable Goods:

- Automated quality services – 77%
- Self-service engineering DW – 64%

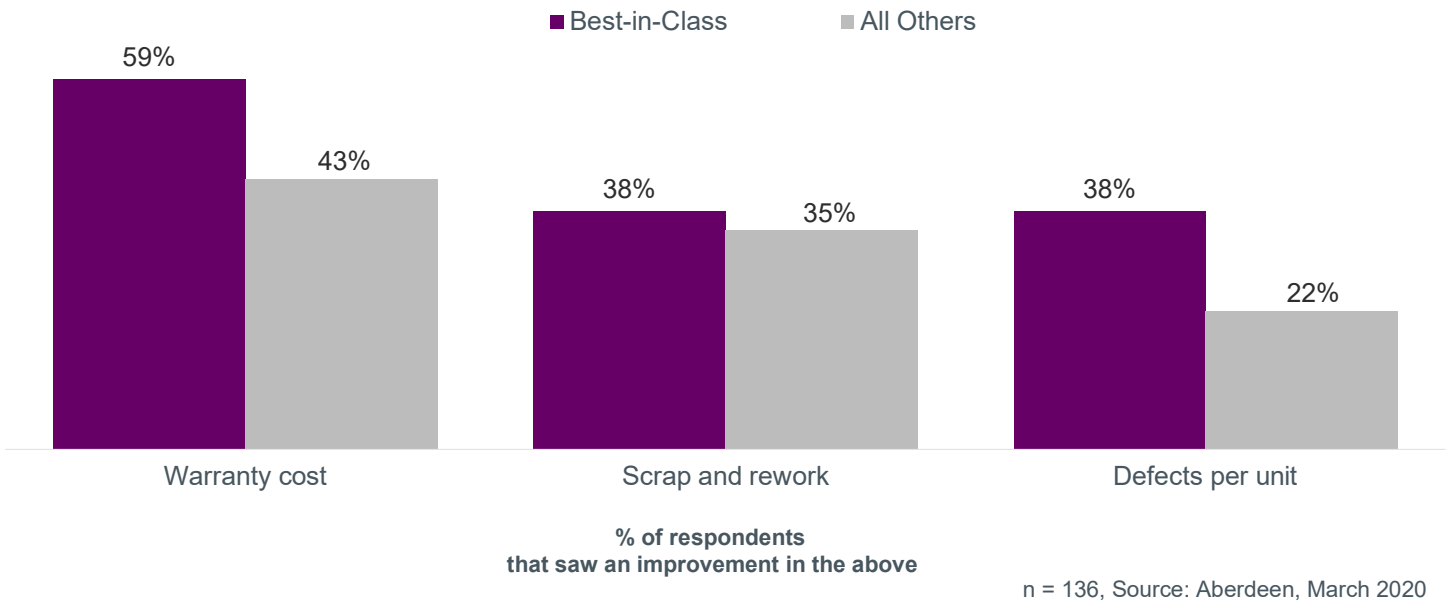
**% of respondents 4 or 5 ranking on a 1-5 scale*

With the rise of digital thread as a strategic priority, these companies recognize quality as something that needs to be built into the end-to-end process lifecycle, rather than layered on as an after-thought. In addition to the necessity of quality within PLM, executives recognize the value quality and cost savings bring to today's disjointed engineering processes.

The Inextricable Link Between Cost and Quality

To truly be leaders in new product development, executives understand that customer satisfaction equals success. By focusing on quality, they can improve performance and lower costs. In a prior study of PLM digitization, Aberdeen's results revealed that top performing companies share several key characteristics which help support elevated performance. Chief among those characteristics is their insistence on weaving aspects of their quality initiative throughout the product lifecycle. This recognition of quality as a major value driver in their product environment leads to several improvements in key areas: lower warranty costs, less scrap and rework, and fewer defects per unit (Figure 2).

Figure 2: Best-in-Class Reap the Benefits of Improved Quality Processes



n = 136, Source: Aberdeen, March 2020

These key performances metrics demonstrate how these Best-in-Class companies are succeeding in producing high-quality, long-lasting products. Scrap and rework are costly, but with visibility into quality data from design through production, manufacturers can reduce the need for

additional prototypes and materials as well as their subsequent costs. Similarly, fewer defects imply that fewer units need to be rejected, decreasing the time and money spent on recycling those units.

Additionally, 88% of Best-in-Class companies saw an increase in first pass yield (see sidebar), making them 2.7x more likely to drive improvement in this key metric. This indicates that Best-in-Class companies are making updates to their quality processes, and these changes are allowing manufacturers to produce more high-quality units.

Top-performing companies have been directing their energy toward quality management, and they are seeing results. There is an undeniable link between quality and cost, but still more than half of manufacturers have not made this leap to integrating quality into their digital thread initiatives with PLM.

88%

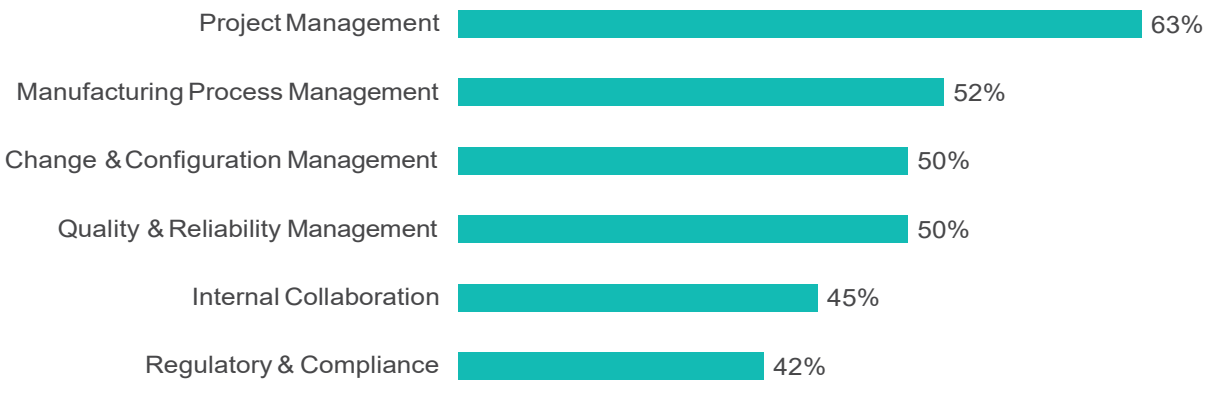
of Best-in-Class companies saw an improvement in first pass yield.

Quality Capabilities Underutilized in the Digital Thread

As companies build more robust processes and capabilities leveraging the digital thread and PLM, there is an increasing number of technology modules that can have an impact. From project management and collaboration, to configuration management and many others, organizations have key decisions to make as they extend and enhance their product lifecycle.

Ironically, despite the self-reported importance of quality management described previously, companies as a whole are less likely to take advantage of automated quality and reliability management tools — the research demonstrating that only half of all respondents have currently implemented these capabilities (Figure 3).

Figure 3: Capabilities Currently Implemented in PLM



n = 393, Source: Aberdeen, March 2020

Project management capabilities, which are essential for collaboration and organization throughout product development, are the building blocks of PLM and thus should be the most commonly implemented. Nevertheless, it is noteworthy to see quality and reliability management so far down the list when manufacturers perceive it to be such an important feature. This lack of current implementation could be due to disconnected data in PLM and Quality systems causing a broken digital thread. With this type of system disparity, companies struggle with locating certifications, test information, and non-conformance data, resulting in challenges to performing proper root cause analysis. Merging these two systems will provide a current, accurate, and traceable single source of truth for product and quality information.

The lack of quality management within PLM is more prevalent in certain industries although quality output is ranked highly in importance across multiple industries. However, this output varies substantially by industry (see Figure 3-1). Flipping the data on its head, the research reveals that nearly across the board, more than one-third of products launched do not meet quality standards. With quality and reliability management implementation being underrepresented, this high percentage is not a surprise.

As their technology stack and overall approach to PLM catches up with their demonstrable needs and desires, companies will be better positioned to enhance quality practices and reap the benefits that Best-in-Class companies enjoy. Therefore, it is extremely beneficial for all manufacturers, especially those in the automotive and industrial equipment industries, to move toward integrating unified PLM and Quality Management Systems (QMS).

Figure 3-1:

Percentage of new products meeting quality standards at launch, by industry

Life Sciences – 70%

Electronics & High Tech - 66%

Industrial Equipment – 62%

Automotive – 62%

Building Quality into the Process – The Roadblocks

Strategic quality measures come at a premium, in large part due to the challenges inherent in today's product development processes and culture. Most prevalent for Best-in-Class companies is the disconnected nature of their systems and processes, and the insulated nature of their various internal teams (Figure 4).

Figure 4: The Challenges of Today's Development Process

n = 136, Source: Aberdeen, March 2020

As many products continue to evolve from interconnected electromechanical systems to electronic and largely software-controlled entities, companies need to place more emphasis on reducing the heterogeneity in their environment and the all-important concept of data quality. There is more than 10% gap between the Best-in-Class companies and All Others when it comes to data quality.

Product complexity not only rears its head when it comes to discrete moving parts, but also in the sophistication of the software systems that govern these products. Companies with a strong handle on data quality will be better positioned to implement more product quality initiatives at multiple stages of the development process.

There are plenty of ways to integrate quality throughout product development from complexity reduction to IoT to collaboration initiatives. Doing so creates a closed-loop quality system and connects quality information to design, manufacturing, and distribution teams. Learning about best practices for closed-loop quality systems can catapult companies into the new age of quality-centric PLM.

Best Practices for Closed-Loop Quality

Successful quality initiatives hinge on stability, flexibility, and communication across key departments. Companies will survive and thrive based on their agility in handling the multiple required changes to the product specifications and associated processes.

One method for improving product quality is weaving quality data management processes into IoT. A modern PLM environment bolstered by smart, connected IoT devices is a target objective of most manufacturing organizations today. Whether just embarking on their IoT journey or refining and continually improving their strategy, 86% of companies envision a variety of benefits, with quality near the top of the list (Figure 5-1).

Underlying a Best-in-Class strategy is a critical reliance on change and configuration management capabilities to update and centrally manage the various configurations across products and processes as they change (Figure 5).

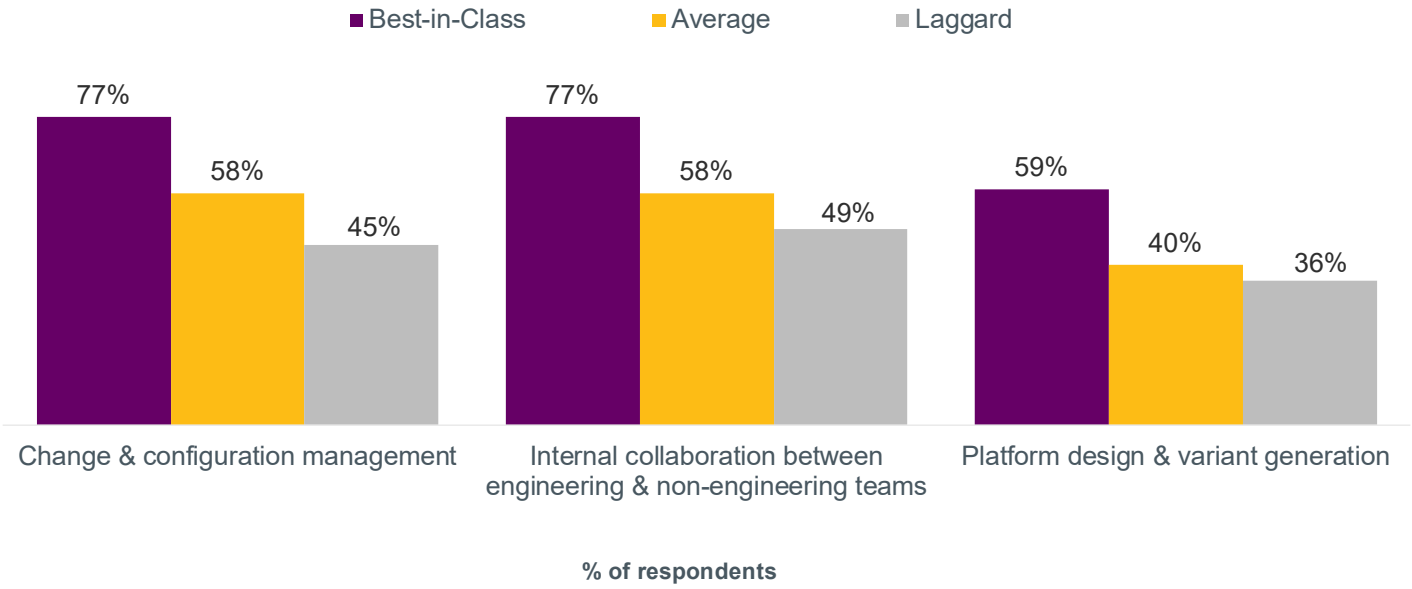
Figure 5-1:

Key Benefits of IoT Implementation*

- **Improved product design** - 52%
- **Improved product quality** – 50%
- **Improved customer satisfaction** – 45%
- **Improved manufacturing lead times** – 37%
- **Reduced service costs** – 36%

**% of respondents*

Figure 5: Essential PLM Capabilities in Place



n = 136, Source: Aberdeen, March 2020

Top companies remain ahead of the competition with implemented collaboration processes. By connecting their upstream and downstream teams from both sides of the house, they help improve the flow of information and adapt to new changes. With increasing customer requests for customization, managing product variants while maintaining high quality standards has become even more difficult.

Best-in-Class companies are more likely to take a platform approach in their design process to help generate, manage, and validate product variants, and are ultimately better able to serve customers while maintaining quality.

Key Takeaways

Quality plays a large role in increasing customer satisfaction, decreasing costs, and improving performance — thus, continuous access to quality data within PLM systems is ideal for optimizing the entire product development cycle. When reflecting on the importance of quality and the impact it has on PLM, there are three aspects to highlight:

- **Senior executives view automation of quality services as a critical value driver.** With senior executives leading the way toward implementing quality services, companies are in good hands as digital transformation efforts drive ahead. This stress on the importance of quality can result in improvements in metrics such as warranty costs, defects per unit, scrap and rework, and first pass yield.
- **Top companies see major improvements in waste and cost reduction with a focus on quality.** With the proper implementation of Quality systems, the percentage of product quality failures at launch will greatly decrease.
- **Technology and process maturity stand our as critical best practices driving performance.** By applying PLM best practices such as change management and collaboration, companies can overcome hurdles like siloed departments and product complexity when merging quality with their digital thread initiatives.

The need for quality in today's complex, innovative engineering environment is paramount. Acting as the digital thread that connects numerous product development teams, strategic, closed-loop PLM based automated quality processes can uphold manufacturing standards and unite entire organizations.

Related Research

- The Role of MES for Smart Manufacturing in Electronics; October 2018
- Connected Product Lifecycle Management Meets (and Beats) Product Complexity; March 2018
- Integrated Product Lifecycle Management in the Era of IoT; June 2017

About Aberdeen

Since 1988, Aberdeen 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 is headquartered in Waltham, Massachusetts, USA.

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