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SAPinsider Benchmark Report

# Intelligent PLM Benchmark Report

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# Table of Contents

# Executive Summary

Product Lifecycle Management (PLM) can provide strategic value to an organization, driving top-and bottom-line improvements across the product lifecycle. However, powered by analytics tools that allow critical information to be accessed quickly and easily, agile and intelligent PLM is poised to take the use of data and intelligence across the product lifecycle to a whole new level.

In a survey that included responses from 217 SAPinsiders PLM decision-makers and technology leaders across a range of industries from retail to automotive, over 85 percent of survey respondents indicated that they were either currently in some stage of implementing (46%), or evaluating (18%) or planning to evaluate (22%) Agile Product Development Tools and Processes to support their product development efforts. In addition, nearly 80% of respondents reported that they were either currently in some stage of implementing (28%), evaluating (24%), or planning to evaluate (30%) Intelligent PLM Tools and Processes (i.e. AI - driven decision-making, predictive analytics tools, 3D visualization/collaboration tools, digital twins, etc.).

Survey results show that Agile and Intelligent PLM Leaders share several common characteristics:

- Industry Leaders are focused on developing an Agile and Intelligent PLM roadmap and strategy that integrates the use of analysis and agile methodologies across the product lifecycle. Nearly 60% of Leaders cite this as a top priority, compared to 40% of their peers.

- Leaders are also much more likely to empower their decision-makers to make more informed product design, development, and sourcing decisions by leveraging analytics. More specifically, 52% of Leaders

**PERSPECTIVE**

> You need to align engineers and manufacturing to produce, deliver, and operate products. This collaboration is becoming more and more important.
>
> **~ Thomas Ohnemus, Vice President, Solution Marketing for Digital Supply Chain, SAP**

reported haven taken this step versus 26% of Industry Average performers, and just 13% of Laggards.

- Leaders also place greater importance on support for integrated AI (artificial intelligence) and machine learning capabilities (54%) as compared to their peers (23%); and on the capture/use of sensor-based IoT data to enable real-time insights (52%), as compared to their peers (27%).
- Not surprisingly then, Leaders realize several key business benefits from Agile and Intelligent PLM: They are 1.5x more likely to cite improvements in product quality; and are 3x more likely than Laggards and 1.5x more likely than Industry Average to cite more new product introductions.

## Required Actions

In order to achieve the gains realized by these Industry Leaders, SAP insiders must:

- **Execute on any existing PLM strategies to more fully digitalize business, engineering, design and manufacturing operations.** Digitalization serves as the foundation for becoming a digital enterprise – and for supporting data-driven, intelligence-based decision-making.
- **Engage in the use of analytics to improve product quality and performance and extend the use of agile methodologies across the product lifecycle – beyond software.** Seek out executive support and invest in the training and education required to facilitate an agile development environment. As one user puts it, "Work globally with agile methods. Collaborate with your colleagues daily with tools like scrum." Couple this focus on agile with the use of analytics to aid decision-making and drive innovation.

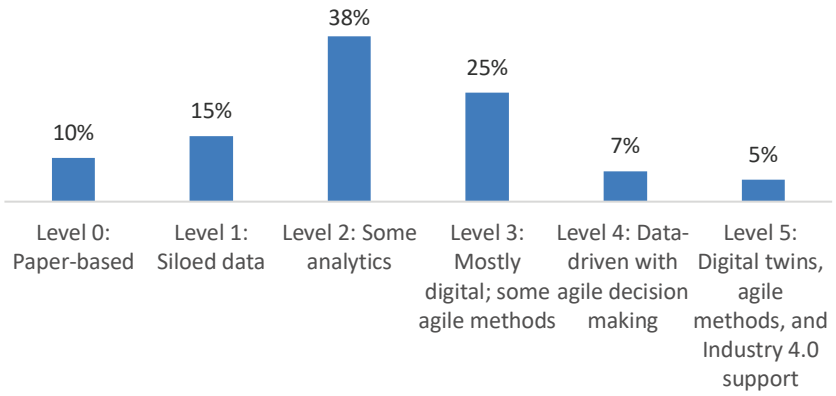
- **Explore ways to more fully leverage cloud/edge-based computing to reduce costs and improve on-demand access to data and analytics.** Secure access to data via the cloud supports mobility and flexibility. Having cloud capabilities in place empowers companies to implement many other technologies.
- **Seek to perform more intelligence-driven "What-if?" analysis** and continue to explore how Industry 4.0 technologies like AI/machine learning, AR/VR, additive manufacturing, and IoT "connectedness" can help to support your organizations' financial and business objectives.

# Chapter One: Market Overview

Interest in agile and intelligent PLM is on the rise within the SAPinsider community. In fact, nearly 3 out of 4 SAPinsiders surveyed indicate that they are currently either implementing or evaluating tools to support Agile and Intelligent PLM or are planning to do so within the next few years.

In order to better understand the extent to which SAPinsider customers are engaged in Agile and Intelligent PLM, survey participants were asked what best described their organization's current PLM environment with respect to digital strategy, product development process, and how it leveraged product data and analytics. Based on their responses, survey participants were classified according to their level of maturity, as noted in **Figure 1** below:

**Figure 1: Agile and Intelligent PLM: Maturity Framework**




Source: SAPinsider, October 2019

## Competitive Maturity Assessment

For the purposes of this report, participants were categorized based on their "Maturity Level" and placed into one of three categories — Leaders, Industry Average, or Laggards, as follows:

SAP PERSPECTIVE

"R&D needs to be agile and flexible to speed up delivering innovations to market."

**~ Thomas Ohnemus, Vice President, Solution Marketing for Digital Supply Chain, SAP**

- **Leaders:** These are the companies that are the early adopters and high achievers – they are ahead of the competition both in terms of adoption of Agile and Intelligent PLM and financial performance.
- **Industry Average:** These are companies that have a majority of the skills and capabilities in place to perform satisfactorily in the marketplace -- but they are neither significantly ahead nor significantly behind the competition in terms of their adoption of Agile and Intelligent PLM.
- **Laggards:** These are companies that are viewed as being followers, lagging behind their competitors both in terms of adoption of Agile and Intelligent PLM and overall performance.

Respondents' answers to our survey and interview questions revealed clear trends within the leader group, which are summarized in **Table 1** and will be examined over the course of the rest of the report.

### Table 1: DART framework for Agile and Intelligent PLM

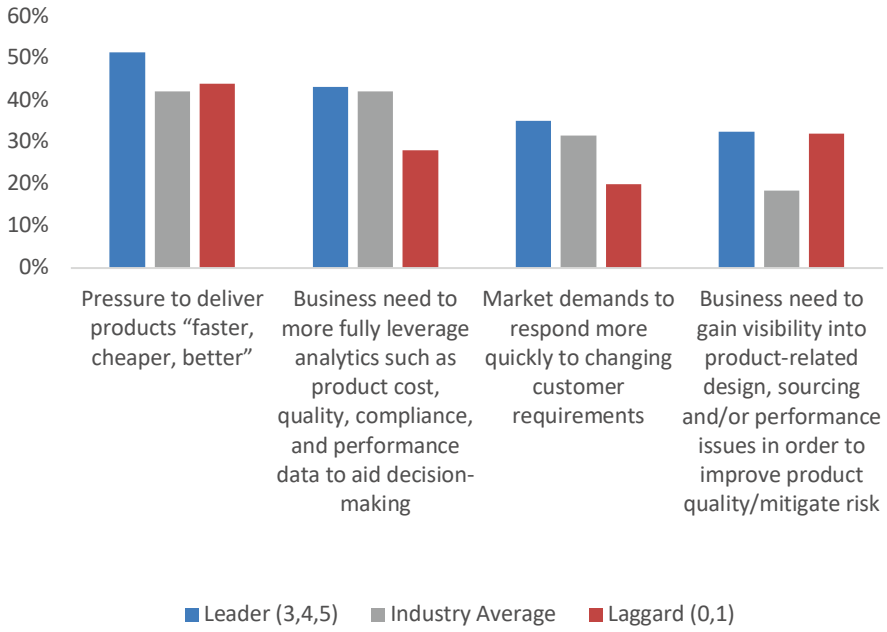
| Category | Drivers | Actions | Requirements | Technologies |
|---|---|---|---|---|
| Leaders | • Pressure to deliver products "faster, cheaper, better" | • Developing an agile and intelligent PLM roadmap and strategy that integrates the use of analytics and agile methodologies across the product lifecycle<br>• Mitigate risk and improve product quality | • Support for integrated agile development<br>• Support for integrated AI/Machine Intelligence to aid decision-making<br>• Support for capture/use of sensor-based IoT data to enable real-time insights<br>• Secure cloud/edge-based computing capabilities | • Agile methodology training tools<br>• Agile change management tools<br>• Agile requirements management tools<br>• Real-time collaboration tools<br>• Workflow management solutions<br>• Project and portfolio management solutions<br>• Engineering bill-of-materials (BOM) management tools<br>• Configuration management tools<br>• Dashboards<br>• PLM for product data/information management<br>• 3D visualization/collaboration<br>• Digital twins |

Source: SAPinsider, October 2019

## What Is Driving Customers' Adoption of Agile and Intelligent PLM?

Overall, the adoption of Agile and Intelligent PLM is being driven primarily by the pressure to deliver products "faster, cheaper, better." While this is a primary driver — there is also a growing business need to more fully leverage analytics such as product cost, quality, compliance and performance data to aid decision-making among all groups — which points to a new set of challenges for manufacturers and product developers.

**Figure 2. Key Business Drivers for Agile and Intelligent PLM by respondent group**




Source: SAPinsider, October 2019

In fact, both Leaders and Industry Average performers alike cite the ability to more fully leverage product analytics to aid decision-making as a key business driver, nearly 1.5x more than their poorer performing peers. But Leaders set themselves apart by being able to more successfully derive business value from these analytics — by leveraging tools

SAPinsider PERSPECTIVE

"Data quality improvement is the first step; the next is to secure buy-in across your organization before proceeding..."

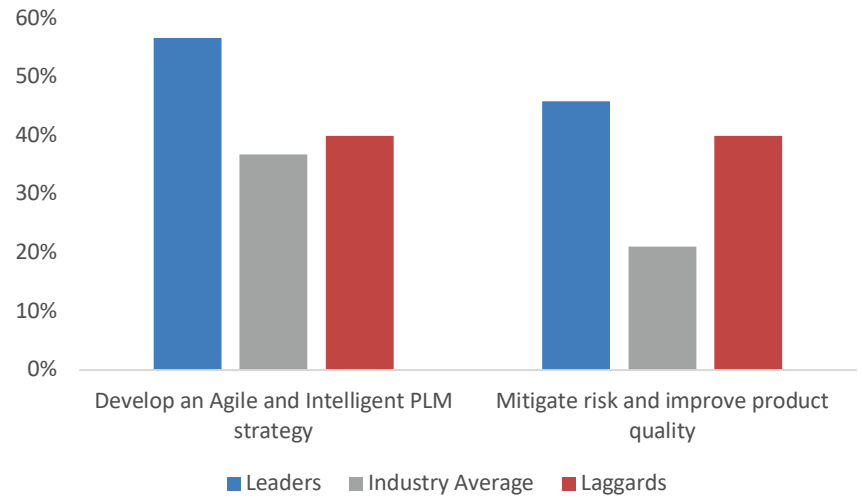
**~ SAP ERP/PLM Systems Analyst, Retail Manufacturer**

such as agile and intelligent PLM to improve product quality and performance and up to 4x more new product introductions than their peers.

## What Sets Leaders Apart?

This emphasis on digitalization is just one of the ways that Leaders set themselves apart from their peers. As noted in **Figure 3**, to better address this growing need for data-driven, intelligence-based product development, Industry leaders are focused on developing an Agile and Intelligent PLM roadmap and strategy that integrates the use of analytics and agile methodologies across the product lifecycle. This is a clear differentiator for Leaders — nearly 60% of leaders cite this as a top priority, compared to just 40% of their peers.

**Figure 3. Top Priorities for Leaders, Industry Average, and Laggards: Agile and Intelligent PLM**




Source: SAPinsider, October 2019

Leaders cite mitigating risk and improving product quality as their other top strategy. Leaders are typically more risk averse and quality conscious out of a need to protect their reputation in the marketplace.

**SAPEXPERTS PERSPECTIVE**

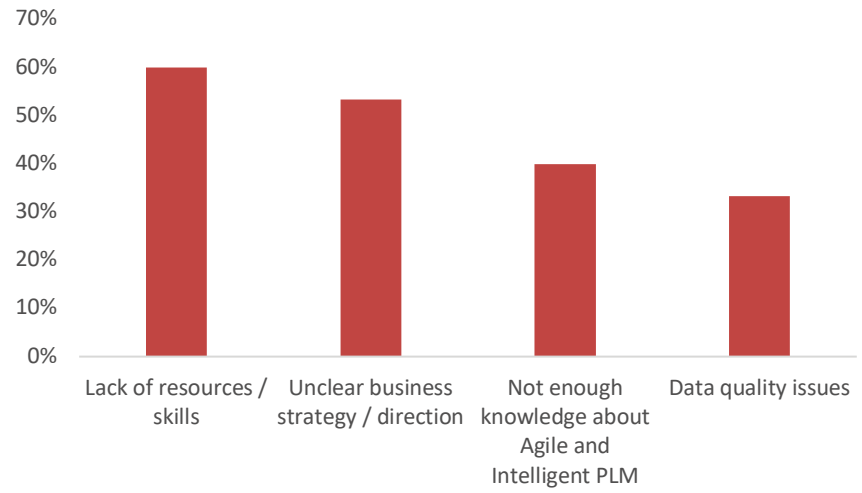
"Moving forward, the ability to design and deliver products using an AI-enabled, agile approach will offer a key competitive advantage to organizations. Already, leaders are experiencing significant product quality and performance improvements and up to nearly 4x more new product introductions than their peers as a result of such agile and intelligence-driven strategies."

**~ Amy Rowell**
**SAP Expert and Principal Analyst, Rowell Associates**

## What Holds Laggards Back?

Laggards face a myriad of challenges when it comes to adopting Agile and Intelligent PLM. As noted in **Figure 4**, more than half of laggards indicate that a lack of resources/necessary skills and an unclear business strategy is preventing adoption of enterprise Agile and Intelligent PLM in their organizations.

**Figure 4. Challenges Facing Laggards Seeking to Adopt Agile and Intelligent PLM**




Source: SAPinsider, October 2019

Lack of knowledge about Agile and Intelligent PLM is also cited as a key barrier by 40% of Laggards. Nearly 1 in 3 Laggards also cite data quality issues as barriers to adoption of Agile and Intelligent PLM. To address these challenges, Laggards must make it a priority to acquire the necessary skills to implement Agile and Intelligent PLM. While lack of resources may represent a roadblock — gathering information about and learning about Agile and Intelligent PLM shouldn't be. Training and user groups devoted to agile methodologies are accessible and affordable.

SAPinsider PERSPECTIVE

"The time, effort, and resources required to implement and maintain Agile and Intelligent PLM mandates a COE (Center of Excellence). Also, Data Data Data! must manage and keep clean."

**~ SAP Customer, Data Analyst III**

## Key Takeaways

Based on our research, with respect to Agile and Intelligent PLM and the SAPinsider community, the following takeaways are clear:

- **Lack of Knowledge About Agile and Intelligent PLM** is cited as a barrier to adoption by all groups. This presents an opportunity for both the SAP community and the providers of agile and intelligent PLM.
- **Development of an Agile and Intelligent PLM Strategy and Roadmap** is a top priority for Industry Leaders – and they are paving the way for others. Adoption of Agile and Intelligent PLM is driven both by the need to more fully leverage analytics such as product cost, quality, compliance and performance data to aid decision-making, as well as the need to respond more quickly to changing customer requirements.
- **Deployment of cloud-based/edge-based computing to reduce costs, enabling "on-demand" access, and supporting mobility are important enablers for the intelligent enterprise.** Leaders know this and have already made investments in these areas to improve access to "real-time" data.
- **With the growing need for more data-driven and AI-enabled decision-making, SAP customers will want to take a closer look at Agile and Intelligent PLM** if they haven't already done so- to determine how it can help them to support their product development efforts. As an enterprise IT stalwart, SAP is in the enviable position of having helped many of its customers to both capture and manage a wealth of data for years. And this data — both historical and "real-time" — is now being viewed as an invaluable source of guidance for decision-makers.

**SAP EXPERTS PERSPECTIVE**

"As an enterprise IT stalwart, SAP is in the enviable position of having helped many of its customers capture and manage a wealth of data for years. And this data - both historical and "real-time" - is now being viewed as an invaluable source of guidance for decision-makers."

**~ Amy Rowell**
**SAP Expert and Principal Analyst, Rowell Associates**

# Chapter Two: Requirements for Success

When it comes to Agile and Intelligent PLM, all groups cite improvements in time-to-market, innovation, and financial performance. Leaders, however, report more new product introductions and higher levels of product quality and performance than their peers. In fact, over 40% of Leaders cite improvements in new product introductions as a result of agile and intelligent PLM versus 26% of Industry Average performers, and just 12% of Laggards. Clearly, these Leaders are Innovators — translating innovations into products — and the data supports this.

So, the question is -- how do they do it? For one, leaders are nearly 2x more likely than their peers to be either currently using or planning to use predictive analytics to support decision-making. They are also nearly 2x more likely than laggards to be using or planning to use IoT devices and applications and are more than 1.5x times more likely to be using or planning to use mobile applications to support Agile and Intelligent PLM. Leaders also cite support for integrated agile product development as a top priority. And over the next two years, research indicates that leaders plan to more fully embrace AI/Machine Intelligence to perform more "What-if?" analysis.

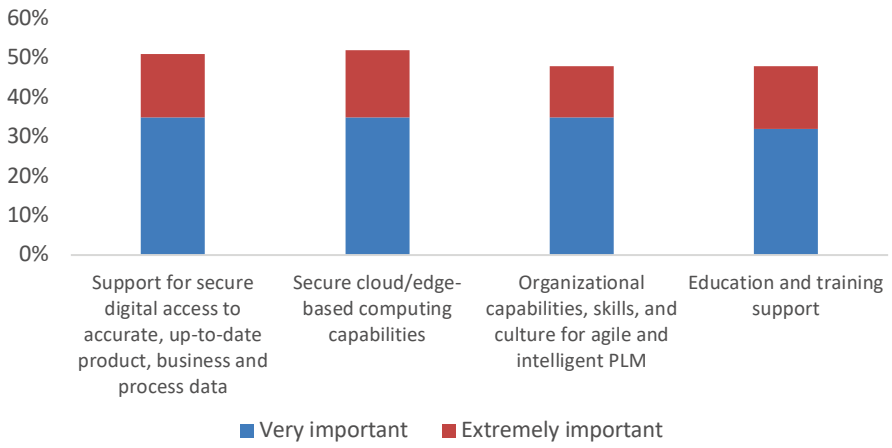
But they didn't get to this point overnight. Before they could embrace more advanced technologies, they had to more fully digitalize their operations, enable easier, secure access to data via cloud/edge-based computing, and create a culture that was receptive to Agile and Intelligent PLM.

**PERSPECTIVE**

"Engineers have to think from the customer perspective. With globalization, customers have transparency into competitive products and how other customers review your services. It's not only engineers coming up with great ideas and delivering models but also working together with manufacturing, services, and digital departments throughout the value chain to make the customer happy."

**~ Thomas Ohnemus, Vice President, Solution Marketing for Digital Supply Chain, SAP**

## Figure 5. Key Capabilities: Agile and Intelligent PLM




Source: SAPinsider, October 2019

In particular, nearly half of SAPinsiders surveyed are quick to point out the importance of several key capabilities associated with Agile and Intelligent PLM (**Figure 5**):

- Support for secure digital access to accurate, up-to-date product, business and process data
- Secure cloud/edge-based computing capabilities,
- Organizational capabilities, skills and culture for agile and intelligent PLM, and
- Education and training support

Research suggests that SAPinsiders view these as essential capabilities that must be in place ahead of any Agile and Intelligent PLM implementation. Integrated agile product development capabilities rank next in line – with agile capabilities cited as being of high importance by nearly 40% of SAPinsiders.

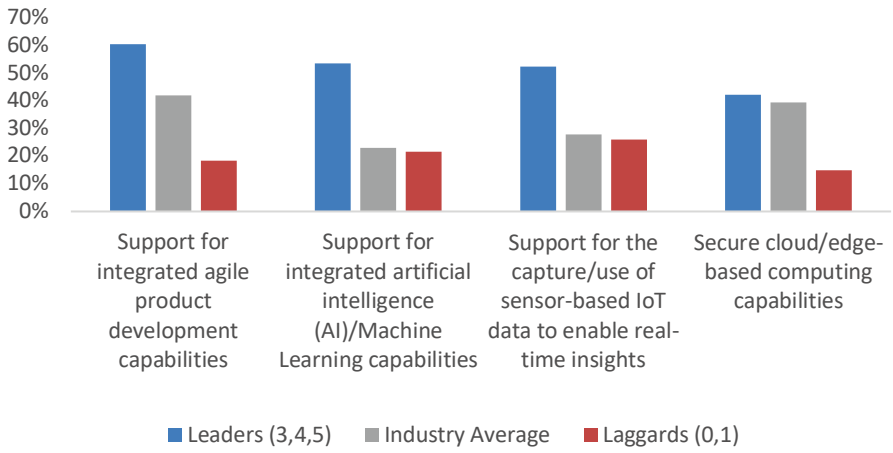
Not surprisingly, support for AI/Machine Learning and the ability to use a digital twin to perform "What If" analysis, in context — along with the ability to capture and use sensor-based data — are all cited as important, as well, but not *as*

important as other aspects of Agile and Intelligent PLM — since most SAP customers are still in the early stages of understanding and adopting Agile and Intelligent PLM.

## "Best-in-Class" Capabilities for Agile and Intelligent PLM

The story takes an interesting turn when you look more closely at what Leaders are focused on compared to their peers (see **Figure 6**). Most notably, support for integrated agile product development is cited as a top priority for Leaders (61%), versus Industry Average (42%) and Laggards (18%). Support for integrated artificial intelligence (AI)/Machine Learning (54%); the capture/use of sensor-based IoT data to enable real-time insights (52%), secure cloud/edge-based computing (42%), demonstrated executive support for agile and intelligent PLM (30%) and integrated AR/VR visualization (26%) are also viewed as important by Leaders. These capabilities serve as clear differentiators for Leaders.

**Figure 6. Leaders vs Laggards - Key Capabilities for Agile and Intelligent PLM**




Source: SAPinsider, October 2019

**SAPEXPERTS PERSPECTIVE**

"With respect to intelligent PLM, organizations need to leverage real-time data to the extent they can, but most companies have a long way to go with simply managing their existing data. These companies can leverage historical data much more effectively. Leaders, on the other hand, can leverage real-time data in context using appropriately set up sensors while considering security risks. This raises the level of intelligence to a whole new level."

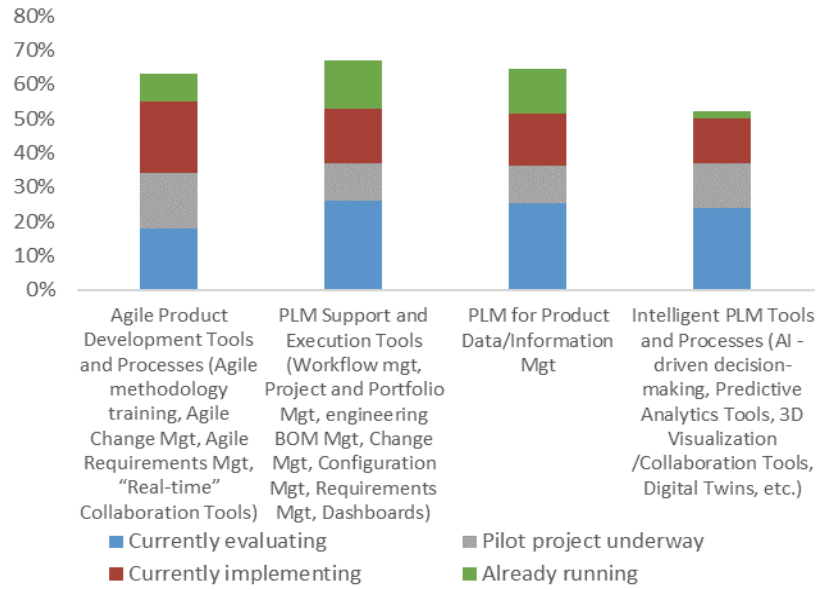
**~ Amy Rowell**
**SAP Expert and Principal Analyst, Rowell Associates**

Driven by the need to more fully leverage analytics such as product cost, quality, and performance data, Leaders place importance on capabilities like secure data access, and the ability to gather "real-time" data for more informed decision-making. Support for AI/Machine Learning is also important because it enables these top performers to leverage the intelligence gained by machine learning and AI-enabled design to drive innovation, improve product quality and mitigate risk.

## PLM Technology for Agile and Intelligent Product Development

To best enable Agile and Intelligent PLM, overall — nearly 45% of those surveyed report currently using, implementing or piloting Agile Product Development Tools (with nearly 40% evaluating these tools or planning to do so); and over half indicate that they are in the midst of evaluating or planning to evaluate Intelligent PLM Tools, as shown in **Figure 7**.

**Figure 7. Agile and Intelligent PLM Technology Investment**




Source: SAPinsider, October 2019

SAP PERSPECTIVE

"You are the father of the smart product. You need to listen to its data and what it tells you about how this product is performing and how you can make it better with the information that it provides to you. AI can help you analyze this data with where the product is and compare it to other products in similar situations to make more precise and fact-based decisions."

**~ Thomas Ohnemus, Vice President, Solution Marketing for Digital Supply Chain, SAP**

## Key Takeaways

When it comes to equipping organizations with the capabilities and technology enablers required to successfully implement Agile and Intelligent PLM, our research findings offer the following key takeaways:

- **Leaders cite support for integrated agile product development as a top priority.** And over the next two years, research indicates that leaders plan to more fully embrace AI/Machine Intelligence and Digital Twin technologies to perform more "What-if?" analysis.
- **Digitalization across the product lifecycle is a critical component of Agile and Intelligent PLM.** Leaders are much further along the digitalization journey than their peers, but even Leaders are still working towards digitalizing their operations so that they are more fully digitally-enabled.
- **Top performers know that the ability to leverage analytics provides a competitive advantage.** Compared to their peers, industry Leaders are much more likely to empower their decision-makers to make more informed product design, development, configuration, sourcing, pricing and delivery decisions by leveraging analytics.
- **Ultimately, organizations should seek to leverage Industry 4.0 technologies like IoT-enabled devices and equipment to enable them to capture "real-time" analytics to drive more informed drive decision-making.** Industry Leaders are much more likely than their poorer performing peers to leverage "real-time" analytics to enhance product quality, reliability, and performance.

# Chapter Three: Required Actions

## Leader Steps to Success

- **Execute on an Agile and Intelligent PLM Roadmap and Strategy to support your future product development efforts.** Extend the use of analytics and agile methodologies across the product lifecycle — beyond software.
- **Leverage cloud/edge-enabled computing to support mobility and enable "on-demand" access to both "real-time" and historical product data/analytics.** The cloud offers many advantages to organizations — it enables users to both store and access data "anytime, anywhere" and to do so more affordably.
- **Implement the Industry 4.0 technologies — i.e. digital twins, AR/VR and AI/Machine Learning that will empower your organization to make the most important decisions based on the most relevant data and information.** Industry 4.0 is not just about advanced technologies — it's about fully embracing a digital environment and capitalizing on this.
- **Leverage digital twins to perform more intelligence-driven "What-if?" analysis** to accelerate innovation, improve product quality/performance, and to mitigate risk. Digital twins are more than just virtual representations of equipment or products in development — coupled with analytics (real-time or historical), they provide valuable sources of insight for design, manufacturing, maintenance and repair, and product marketing.

## Industry Average Steps to Success

- **Execute on any existing PLM strategies to digitalize business, engineering, design and manufacturing.** But also seek to expand your organizations' knowledge of Agile and Intelligent PLM and begin to explore how Agile and Intelligent PLM strategies might benefit your business.
- **Begin looking more closely at ways to leverage Industry 4.0 technologies like digital twins to perform more intelligence-driven "What-if?" analysis, in context** and continue to explore how Industry 4.0 technologies like cloud/edge computing, digital twins, and IoT "connectedness" can help to support your organizations' business goals.
- **Look into PLM integration tools and ways to better manage multi-CAD integration to support development of smart/connected IoT products.** As products become more complex — containing more electrical/electronic, mechanical and software components, the challenge of managing all of these capabilities within a single environment grows.
- **Leverage product data and intelligence to drive innovation – not just productivity.** In order to move beyond productivity improvements, increase innovation, and improve financial performance, Industry Average performers need to be able to more fully leverage product data/intelligence in their organization.

## Laggard Steps to Success

- **Commit to a PLM digitalization strategy that meets your organizations' business goals and objectives.** Then focus on executing on this strategy.

- **Begin looking at ways to more fully leverage even historical data/analytics in decision-making.** Once a digitalization strategy is in place, Laggards can begin to take steps towards leveraging more data/intelligence in their decision-making.
- **Explore ways to more fully leverage cloud/edge-based computing to reduce costs and improve on-demand access to data and analytics.** Secure access to data via the cloud is one way that organizations can both support anytime/anywhere product development and cut costs.

## Summary

When it comes to Agile and Intelligent PLM, the "Best-in-Class" organization is characterized as follows:

*PLM data is fully or mostly digitized and routinely shared; in some cases, in tandem with a digital twin to perform "What-if?" analysis; predictive analytics are used to inform and drive decision-making; an agile product development environment (beyond software) is supported; and Industry 4.0 technologies are enabled (i.e digital twins, AR/VR collaborative sessions, cloud/edge computing, and AI/Machine Learning enabled decision-making, IoT platform support, etc.)*

For organizations seeking to reap the benefits of Agile and Intelligent PLM, they should seek to invest in the technologies and organizational and educational skills required that will enable them to progress to the next level of maturity, as outlined and recommended in this report. Ultimately, Leaders have invested in both agile methodologies and more advanced data-driven, intelligence-based PLM to achieve key financial objectives, drive agile innovation, improve product quality/performance and deliver more new product introductions. Others can do the same, by following in their footsteps.

# Methodology

In July of 2019, SAPinsider examined the issues, intentions, and experiences of business and technology professionals related to their plans for Agile and Intelligent PLM. Our survey was administered to over 300 SAP customers and generated over 100 responses from across a wide range of industries.

Respondents completed an online survey and provided feedback in customer interviews that questioned them on topics such as:

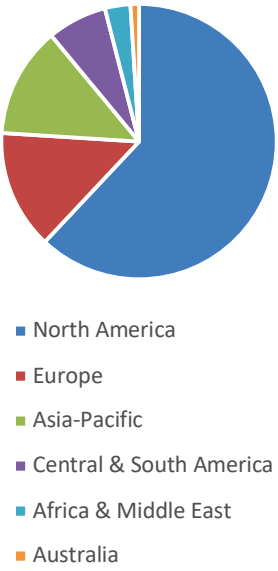
- When it comes to Agile and Intelligent PLM, how they would describe their organization's digital strategy, its product development process, and how it leverages product data and analytics
- The key business and technology drivers that influenced their plans for Agile and Intelligent PLM
- The strategies they prioritize to address their top drivers of change
- The capabilities they need to implement their top strategies
- The Agile and Intelligent PLM technologies they are using or are planning to use
- The business or functional areas driving their Agile and Intelligent PLM strategies
- The SAP PLM systems, modules, and technologies they are currently using or are planning to use

Demographic information on the respondents included the following:

- **Job title:** The job titles of the survey respondents included VP (4%), Director (8%), Manager (15%), Architect (17%), Analyst (18%), Consultant (15%),

## PARTICIPANTS

### PROFILE



Developer (8%), Administrator (3%), and Project Manager (8%).

- **Job Function:** Functional areas reported by respondents included: IT Management (77%), Product Design and Engineering (14%), Product Portfolio Management (9%), Manufacturing Management (8%), and R&D Management (6%).
- **Industry:** The survey respondents represented a wide range of industries from retail (8%) and consumer goods (4%) to automotive (6%), high tech (6%), industrial equipment (4%) and aerospace & defense (3%). Other key industries included energy (9%), biotech and pharmaceuticals (6%) and government (6%).
- **Company size:** A majority of the respondents came from larger organizations with 17% reporting revenue of more than $10 million; 28% reporting revenue of $1-$10 billion; 11% reporting revenue of $500 million to $1billion; 6% reporting revenue between $200 - $500 billion; 16% reporting revenue of $10 - $200 million; and 5% reporting revenue of $10 million or less.
- **Geography:** Of our survey respondents, 62% were from North America, 14% from Europe, 13% from Asia-Pacific region, 7% from Central & South America, and 3% from Africa & the Middle East.

# Appendix A: The DART™ Methodology

SAPinsider has rewritten the rules of research to provide actionable deliverables from its fact-based approach. The DART methodology serves as the very foundation on which SAPinsider educates end users to act, creates market awareness, drives demand, empowers sales forces, and validates return on investments. It's no wonder that organizations worldwide turn to SAPinsider for research with results.

The DART methodology provides practical insights, including:

- **Drivers:** These are macro-level events that are affecting an organization. They can be both external and internal and require the implementation of strategic plans, people, processes, and systems.
- **Actions:** These are strategies that companies can implement to address the effects of drivers on the business. These are the integration of people, processes, and technology. These should be business-based actions first, but they should fully leverage technology-enabled solutions to be relevant for our focus.
- **Requirements:** These are business and process-level requirements that support the strategies. These tend to be end-to-end for a business process.
- **Technology:** These are technology and systems-related requirements that enable the business requirements and support the company's overall strategies. The requirements must consider the current technology architecture and provide for the adoption of new and innovative technology-enabled capabilities.

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