

Product Innovation Platform Assessment

Aras PLM Platform

Key Takeaways

What You Need To Know

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

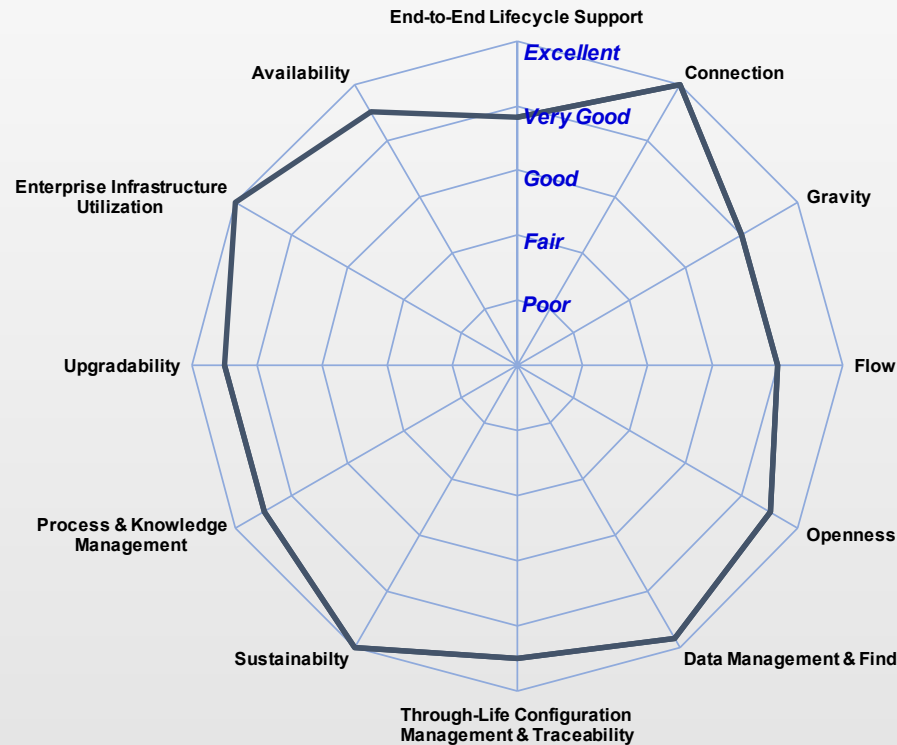
Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Aras PLM Platform's Scores on CIMdata's Product Innovation Platform Assessment

Takeaway #1

Product complexity has increased dramatically since the time when many companies deployed their current PLM systems.

Takeaway #2

CIMdata has developed a set of criteria that define the Product Innovation Platform needed to manage the end-to-end lifecycle of today's smart, connected products—from concept through life.

Takeaway #3

Aras PLM Platform meets CIMdata's expectations for supporting the purpose of a Product Innovation Platform and ranks extremely high across CIMdata's criteria.



Introduction

CIMdata's Assessment of the Aras PLM Platform

CIMdata has received many inquiries from industrial companies and solution providers about Product Innovation Platforms. As understanding and knowledge of the benefits of the Product Innovation Platform approach to enabling Product Lifecycle Management (PLM) grows, industrial companies want to ensure that their PLM solutions can enable their future Product Innovation Platform. Additionally, solution providers want to understand how well their technologies meet Product Innovation Platform requirements. Aras is one such provider that believes their solution can satisfy Product Innovation Platform requirements and approached CIMdata to evaluate the Aras PLM Platform against CIMdata's Product Innovation Platform definition.



Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Product Innovation Platform Drivers

Key Drivers for a Platform Approach to Product Innovation

Increased Product Complexity

There are many examples of product complexity, but the biggest driver is the inclusion of electronics and software and network connections into virtually every product. Smart, connected products, those with embedded software that communicate in real-time with server based backend applications in the cloud are perhaps the most complex.

For example, today's automobiles have orders of magnitude more complexity, millions are produced each year, and are operated by hundreds of millions of people every day. Managing product development, manufacturing, and after-sales operations is already complex. Add to that the rapid industry moves to autonomous connected vehicles and an approach to PLM is required beyond what has been typically offered by commercially available PLM solutions.

Failure of Legacy PLM

Today's reality is that most PLM implementations reviewed by CIMdata have rarely gone beyond the enablement of core product data management (PDM) capabilities. The better implementations become a single source of truth for released data and thereby provide significant value to organizations, but unfortunately still do not achieve their full potential. In Table 1, the usual scope of traditional PDM implementations are compared to a Product Innovation Platform's intent and support required.

Digital Transformation Initiatives

As global competition continues to increase and multiple technologies such as social, mobile, analytics, cloud, and IoT rapidly mature, manufacturers are recognizing that they must undertake a digital transformation, replacing manual and spreadsheet-enabled processes and retiring legacy systems. Under this initiative, forward-looking companies are taking a fresh look at what Aras

calls the business of engineering and recognizing the need to implement a Product Innovation Platform.

In addition, manufacturers are recognizing the value of the digital thread and the digital twin. The digital thread connects a product and its digital assets (i.e., parts, CAD models, documents, process plans, service manuals, etc.) over the course of the product's complete lifecycle while the digital twin refers to the digital representation of a specific real-world asset (e.g., an aircraft, a specific railway locomotive, etc.) in-service in the field at a specific moment in time.

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Platform Defined

Why is a Product Innovation Platform Necessary?

The goal of a Product Innovation Platform is to connect all users and their information in a single environment to cultivate continuous creativity, yielding improvements in products and processes, plus inspiring new and better ones throughout full lifecycles and across generations of products. The Product Innovation Platform is critical for companies that design and deliver smart, connected, and innovative products.

A Product Innovation Platform spans the enterprise, to support all users across all functions and disciplines. The platform provides a comprehensive set of heterogeneous process-enabling capabilities including platform-native applications which can be packaged and configured to establish and support standardized end-to-end business processes, and related data access. A Product Innovation Platform enables the creation of both the digital thread and the digital twin

CIMdata has published a [dossier](#) on our website that contains reference material and publications related to the Product Innovation Platform.



CIMdata's Product Innovation Platform

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



PDM vs. Platform

The Expanded Scope of a Product Innovation Platform Drives Increased Capability Requirements

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion

Traditional PLM vs. Product Innovation Platform

Domain	Traditional PLM	Product Innovation Platform
Lifecycle Scope	Product Development	Full product lifecycle
Discipline Scope	Primarily mechanical, electrical, and software	Systems—mechanical, electrical, electronic, software, control systems, manufacturing and service
Information Scope	Some CAD, documents, parts, and BoMs	All product items across all lifecycle disciplines
Supply Chain Scope	Limited supplier involvement	Full supply chain and customer support



Platform Measurements

Strategic Imperatives

Using research done over the last few years on PLM investment, sustainability and enterprise application architecture frameworks, CIMdata developed the Product Innovation Platform assessment model. Our researchers used their knowledge gained from more than 30 years of PDM and PLM project support as well as input from key CIMdata clients to determine the key criteria. These criteria define not just the technology offered by a PLM vendor but also associated services and the overall business model.

The most important criteria that define the Product Innovation Platform are the five Strategic Imperatives, shown in the Table to the right

Strategic Imperative	Definition
Connection	The platform's ability to share & transact value.
Gravity	The platform's ability to attract participants, both producers (i.e., application builders) and consumers (i.e., users).
Flow	The platform's ability to foster the exchange and co-creation of value.
Openness	The platform's ability to provide unencumbered access to managed data and related services.
End-to-End Lifecycle Support	A platform's ability to support the full product and plant lifecycle, from concept through life. Supporting the entire extended enterprise, including all its engineering and non-engineering disciplines that create and/or use product data.

Connection, Gravity, and Flow are identified as the primary elements of a successful platform strategy in the seminal *Harvard Business Review* article "Three Elements of a Successful Platform Strategy." CIMdata extended this generic platform definition with characteristics critical to the Product Innovation Platform definition by including "End-to-End lifecycle support" and "Openness."

Mark Bonchek and Sangeet Paul Choudary. "Three Elements of a Successful Platform Strategy." *Harvard Business Review*. Jan 31, 2013.

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Platform Measurements

Foundational Characteristics

The Foundational Characteristics shown in the table below are similar to more traditional measures of PLM with the proviso that they must meet the goals implied by the Strategic Imperatives defined earlier.

Foundational Characteristic	Definition
Data management & find	The platform's ability to manage and find data.
Through-Life configuration management & traceability	The platform's ability to manage a product's configuration from concept through its entire lifecycle and provide traceability forward and backwards.
Sustainability	The platform's ability to support a company's data and process management requirements over a long period, at a reasonable cost, even as the business needs evolve.
Process & knowledge management	The platform's ability to represent business processes and capture process outputs, as well as capture and organize data representing knowledge.
Upgradeability	The platform's ability to easily be updated to use a newer version of a solution.
Enterprise Infrastructure utilization	The platform's ability to effectively leverage existing and future IT infrastructure to meet a business's requirements.
Availability	The platform's ability to provide its services.

Each Strategic Imperative and Foundational Characteristic is further divided into a set of sub-elements. For more information on the Strategic Imperatives and Foundational Characteristics please refer to our recently published [position paper](#).

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

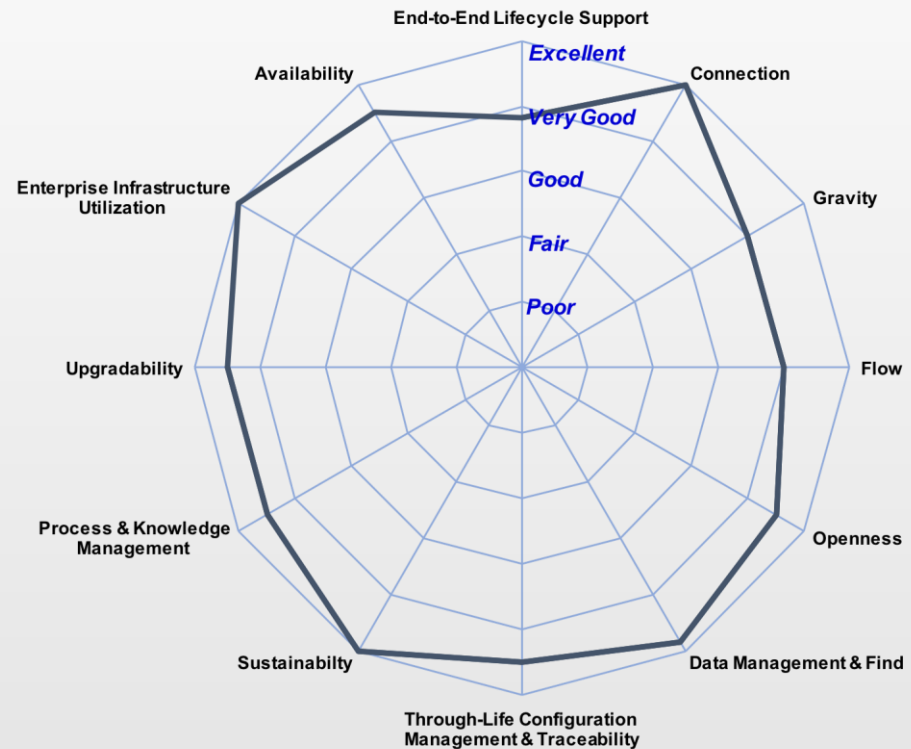
Conclusion



Aras & the PLM Platform

The Aras PLM Platform ranked extremely high across CIMdata's recently released Product Innovation Platform criteria

Overall, CIMdata found that the Aras PLM Platform meets or exceeds the requirements of a Product Innovation Platform. In addition, the Aras Enterprise Open Source business model and technology roadmap should allow Aras to meet their customers' needs long into the future.



Aras PLM Platform Scores on CIMdata's Product Innovation Platform Assessment

Achieving high scores on the five strategic imperatives is required for a solution to be considered a Product Innovation Platform, and the Aras PLM Platform did just that. In fact, it received Excellent scores in four of

the areas and Very Good in the fifth. CIMdata scored each element based on a review of public literature of the solution, select customer implementations, Aras responses to questions, demonstrations, and

provided documentation. Average scores were then calculated for each item.

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Aras Differentiators

Strategic Imperative: Connection

Requirement: The underlying architecture must be consistent and modular with complete, fully documented APIs that support all appropriate standards and can be combined into services and applications. Product data and associated business processes must be easy to access, create, modify, and consume via a cohesive set of APIs and related services.

The Aras PLM Platform's architecture, illustrated on the right, is comprised of a number of robust functional layers. The Service-Oriented Architecture (SOA) and application Modeling Engine provide Aras customers with extensive flexibility in building applications (or modifying the available OOTB applications) to meet their needs and take advantage of the fast upgrade service that Aras offers as an inclusive part of their service subscription.

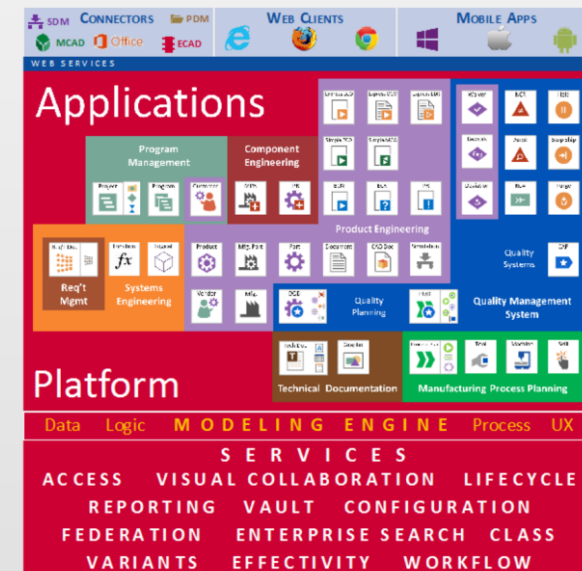
Aras keeps its services layer lean and clean. The services are atomic (i.e., there is little if any duplication of functionality) and they form the

building blocks of the platform. For example, the security service is the only service that manages protections, all other services use it to provide security and any application configured by customers uses the same service. When an existing service is extended to add functionality, the original syntax does not change so applications can easily be upgraded to the new release. Yet, any application using the extended service can now take advantage of the new functionality. Aras' services approach is well proven and core to the platform's extensibility and upgradeability.

The Aras PLM Platform easily supports platform connection requirements, and multiple connection strategies are supported, including:

- Direct API access to the Aras PLM Platform Services (e.g., vault, visualization, workflow, and configuration) are included in the service oriented architecture (SOA)

- SOAP and REST support
- Flexible data federation service
- OOTB and field implemented connections to Enterprise Service Buses (ESB)



Aras PLM Platform
(Image courtesy of Aras)

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion

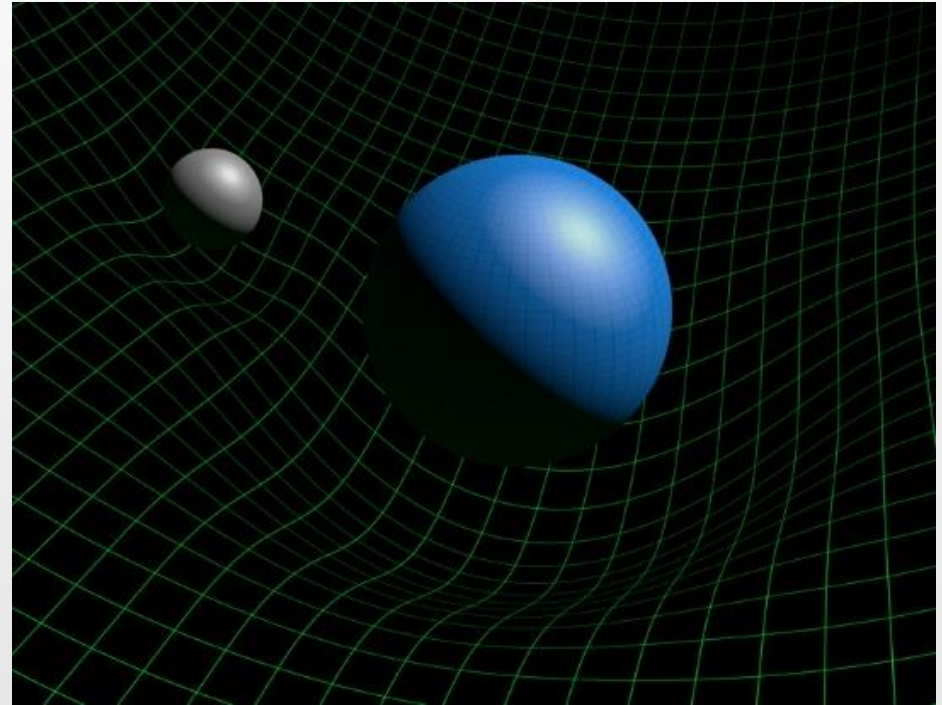


Aras Differentiators

Strategic Imperative: Gravity

Requirement: The platform must be able to attract participants, both producers (i.e. application builders) and consumers (i.e. users).

Aras has had a lot of success with their Enterprise Open Source business model (see Openness) which attracts both customers and partners. Despite Aras' small market size when calculated in sales dollars, CIMdata has identified Aras as a PLM Mindshare leader in our 2017 Executive PLM Market Analysis Report because of its large impact on the global PLM market and broad partner ecosystem. Both Aras customers and partners report on the flexibility of the data model as a critical differentiator. They are able to supplement the OOTB applications and develop their own solutions using the data modeling and services—an example of a platform approach to solution development.



Aras was named a “PLM Mindshare Leader” in the CIMdata 2017 Executive PLM Market Analysis Report based on the company’s industry vision, platform approach, and the impact that Aras is having in the market.

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Aras Differentiators

Strategic Imperative: Flow

Requirement: The platform's ability to foster the exchange and co-creation of value.

A critical, but perhaps less obvious, element of flow is that a platform must create an ecosystem that the platform provider and platform application developers benefit from beyond just selling software to end users for product lifecycle management. To be a platform, value must be created and exchanged for all participants, not just the platform users.

The Aras PLM Platform makes it easy for users from different functions and domains to collaborate. Systems engineers, mechanical and electronics engineers, software developers, manufacturing engineers, quality specialists, and more can all connect to the same Product Innovation Platform to share information and work with common processes. For example, the Visual Collaboration service allows users to review, markup and comment on content from almost any application,

including CAD tools and Microsoft Office. The service can be accessed by any user, has a simple interface, and requires no client installs or browser plugins.

In another example that demonstrates Flow, Aras has an interesting partnership with IHS, a cloud based supplier of electronic component data. The Aras PLM Platform enables ECAD users to access IHS data and find appropriate components for a given electronic design, then manage the item data within the Aras database. As IHS updates component master data, such as changing a component lifecycle state from production to end-of-life, the Aras PLM Platform can identify the impact of that change on products in development or production so appropriate action can be taken.

Flow support is also demonstrated by the integration to No Magic's Cameo Systems Modeler. Systems engineers are able to generate functional and logical structures in Cameo using

requirements created and managed within the Aras PLM Platform, and automatically create physical structures (EBOMs) in Cameo using the Aras PLM Platform part data and manage those EBOMs within Aras.

Aras gains value when such advanced capability is released because it results in additional subscribers within an organization's systems engineering discipline. No Magic should also gain value because it brings systems engineering to mainstream design thereby increasing the size of their market and sales revenue.

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Aras Differentiators

Strategic Imperative: Openness

Requirement: The platform must provide unencumbered access to managed data and related services.

Aras is unique in the PLM market with their use of a permissive open source license for their OOTB solutions. Thousands of companies have downloaded and installed an open release to check it out, and many smaller organizations run in production without a subscription. Although applications may be freely developed, shared and modified (including the open source OOTB applications provided by Aras), customers have no need to modify the underlying services, which enables easier platform upgrades. CIMdata sees this as a testament to the scope and quality of the Aras PLM Platform.

The Aras PLM Platform supports appropriate IT and product related standards such as XLM, STEP, SysML, and the [Codex of PLM Openness](#). An extensive set of APIs can be accessed without cost and full documentation is publicly posted on the Aras

website. Access to data is open at all times and does not require a subscription. Data can always be accessed via the application that created it or directly from the underlying repository if required.

Finally, Aras publishes their product roadmap on their website and prioritizes it based on public input.

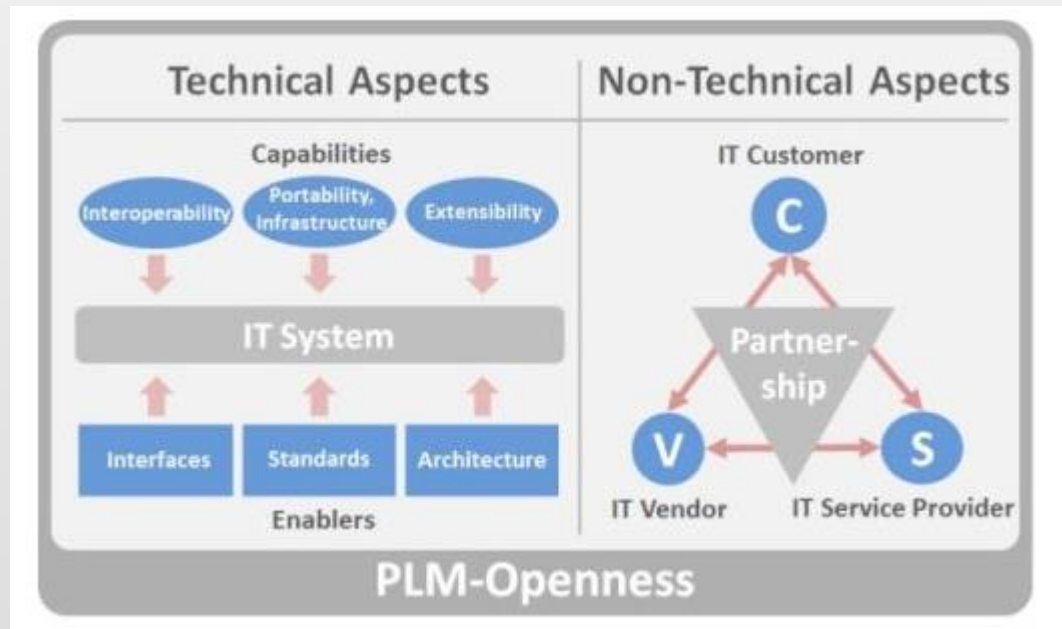


Image courtesy of ProStep

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Aras Differentiators

Strategic Imperative: End-to-End Lifecycle Support

Requirement: A platform's ability to support the full product or plant lifecycle, from concept through life. Supporting the entire extended enterprise including all its disciplines.

The Aras PLM Platform provides support for the complete product lifecycle from requirements gathering through modeling, design, development, simulation, manufacturing planning, quality,

service maintenance, and finally end of life support. Aras has many examples of customers using the Aras PLM Platform to support aspects of the product lifecycle that have often presented challenges to legacy PLM systems:

- A large aerospace company is using the Aras PLM Platform across multiple sites to manage MBOM authoring and EBOM reconciliation.

- A DoD manufacturing facility is using Aras to manage MBOM, routings, work instructions, preventive maintenance, and tooling as well as Six Sigma processes including Gauge R&R.
- The U.S. Air Force is using Aras to manage as-maintained configurations of multiple early warning radar stations.

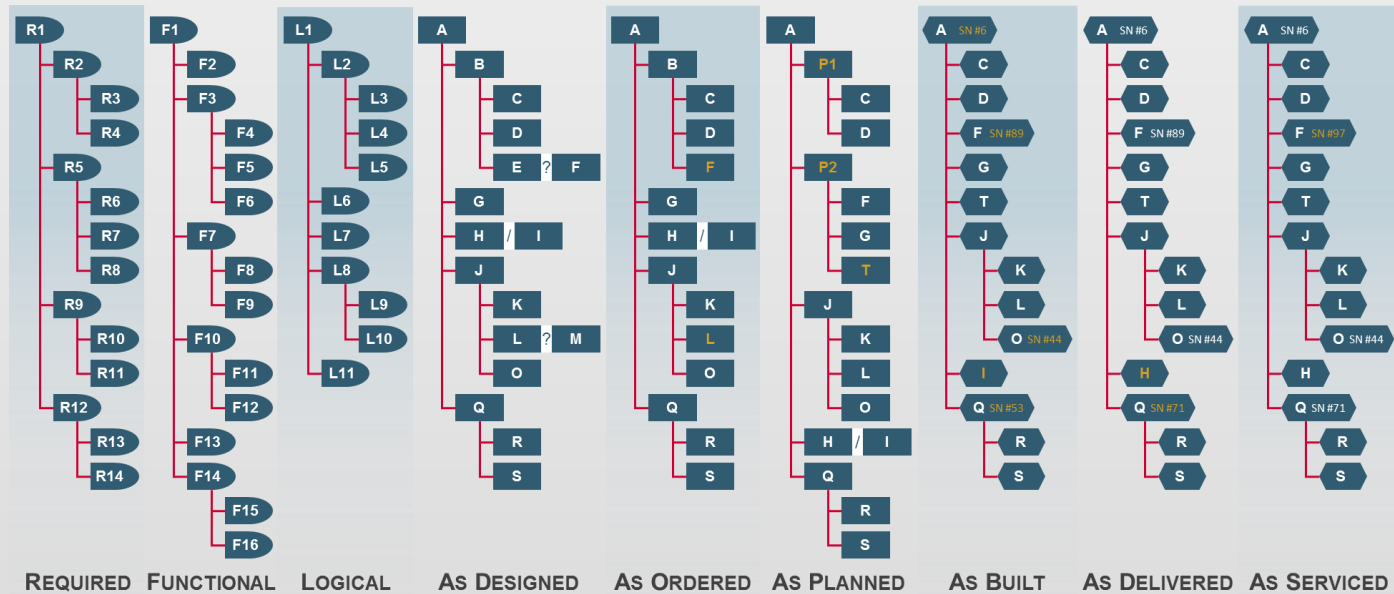


Image courtesy of Aras

Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



The Path Forward

The Aras PLM Platform Roadmap

Aras has demonstrated that the Aras PLM Platform performs well against CIMdata's criteria for Product Innovation Platforms. Many of the capabilities in the Aras PLM Platform are relatively new and have not been widely adopted by customers yet. We look forward to seeing broader adoption of these capabilities in the near future.

No vendor provides 100% support for the Product Innovation Platform at

this time but Aras continues to broaden and deepen the capabilities of the Aras PLM Platform. For example, the following aspects of the product roadmap were presented at the recent ACE user conference:

- Graph visualization
- Branch and merge (configuration management)
- Generalized effectivity management
- Extended federation services

- Procedure modeling
- Transaction management and data recording
- Advanced requirements and simulation management
- Manufacturing execution
- Maintenance and repair

We look forward to seeing these and other capabilities becoming available and being adopted by customers.

The screenshot shows the Aras Roadmap website. On the left is a navigation menu with the following items: Aras Community, Projects, Ideas, Forums, Blogs, Academic Program, ACE Events, Support, Roadmap, and Downloads. The main content area is titled "Aras Roadmap" and includes a note: "NOTE: Target dates and contents of future releases change often based on customer feedback." Below the note is a search bar with the text "Search for future features by number or keyword:" and a "Search" button. The main content area lists several product releases and features:

- ▶ Aras Innovator
- ▼ Office Connector
 - ▶ 11.0R4 Released: January, 2017
 - ▶ 11.0R5 Released: May, 2017
 - ▶ 11.0R6 September, 2017
- ▶ EPDM Connector
- ▶ Requirements Management
- ▶ Component Engineering
- ▶ Quality Management System

On the right side of the screenshot, there are three promotional graphics: a yellow arrow pointing down with the text "aras INNOVATOR ADVANCED PLM DOWNLOAD NOW", a red play button icon with the text "Aras PLM Roadmap: Architecture Update", and a red play button icon with the text "Aras Vision & Roadmap".

Aras' Product Roadmap is Public and Available Online: <https://www.aras.com/plm-roadmap/>

Key Takeaways

Introduction

Product Innovation Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion



Conclusion

CIMdata's Final Thoughts

CIMdata's assessment of the Aras PLM Platform against the criteria of the Product Innovation Platform resulted in a set of high scores. Overall, CIMdata was very impressed with how well the Aras PLM Platform met our definitions of both the Strategic Imperative and Functional Characteristic criteria. Although we have yet to formally review other solution providers' offerings against the Product Innovation Platform criteria, it is our belief that the Aras PLM Platform and the Aras business model and services sets the bar high.

The separation between the underlying platform framework and applications, the scope and quality of the platform services, the enterprise open source business model, and the quick upgrade service included in the Aras subscription provide excellent support for the Product Innovation Platform criteria.

Aras enables the world's leading manufacturers of complex, connected products to transform their product lifecycle processes and gain a competitive edge. Aras' open, flexible, scalable, and upgradable PLM platform and applications connect users in all disciplines and functions to critical product information and processes across the extended enterprise. Aras customers include Airbus, BAE Systems, GE, GM, Hitachi, Honda, Kawasaki Heavy Industries, and Microsoft. Visit www.aras.com and follow Aras on Twitter @aras_plm.

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Key Takeaways

Introduction

Product Innovation
Platform Drivers

Platform Defined

PDM vs. Platform

Platform Measurements

Aras & the PLM Platform

Aras Differentiators

The Path Forward

Conclusion

