

The Promise & Reality of Digital Thread

PLM Road Map & PDT NA – 3 May 2023

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PLM Road Map™ & PDT North America 2023
The Digital Thread in a Heterogeneous, Extended Enterprise Reality
A call for PLM Professionals to share their knowledge & experience
May 3 & 4

The Promise and Reality of the Digital Thread: Insights from Industry Research

3 May 2023—Washington D.C. USA

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Presenter's Profile



James Roche
Aerospace & Defense
Practice Director

- 35+ years of experience in transformation and IT enablement of product development and manufacturing processes.
- Strategic advisor and program manager for PLM programs across the Americas, Europe, and Asia.
- PLM Practice Manager at CSC Consulting and at A.T. Kearney.
- Previously with EDS, served as chief architect for General Motors' worldwide engineering systems.
- Areas of Focus
 - Facilitating cooperation within the aerospace and defense industry
 - Strategically expanding PLM within aerospace and defense companies
 - Extending PLM from airframe and propulsion OEMs to their external value chains

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Digital Thread Status and Trends in Industry



Key Research Findings Review


- Introduction
- Research Findings
 - The What and Why of the Digital Thread
 - The Current Reality of Digital Thread in Industry
 - Planning Investment for Digital Thread Expansion in Industry
 - Solution Capability and Provider Alignment
- Concluding Remarks

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Aerospace & Defense PLM Action Group


Mission


An association of aerospace & defense companies within CIMdata's globally recognized PLM Community Program, which functions as a **PLM advocacy group** to:


- Set the direction for the aerospace & defense industry on PLM-related topics that matter to members
- Promote common industry PLM processes and practices
- Define requirements for common interest PLM-related capabilities
- Communicate with a unified voice to PLM solution providers
- Sponsor collaborative PLM research on member-prioritized industry and technology topics


Founded in February 2014 – Website: www.ad-pag.com


Members

















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Collaborative Research Program



Study Digital Thread current state and future trends

Sponsors












Objective

The A&D PLM Action Group members and the PLM solution provider sponsors share a common objective for this research – To gain understanding of needs and opportunities within industry that will inform Digital Thread solution strategy and roadmap

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Information Gathering



Subject matter (domain) expert interviews & an online survey of committed professionals

Interviews

- Interviews were conducted by CIMdata with three communities:
 - 5 participating PLM solution providers,
 - 5 key A&D customers nominated by the participating solution providers, and
 - 5 AD PAG member companies
- The 10 A&D companies interviewed included
 - 9 of the Top 40 (23%),
 - 7 of the Top 20 (35%), and
 - 5 of the Top 10 (50%)
- The learnings from the interviews were applied to develop the line of inquiry in the web-based survey

Survey

- A total of 90 complete and validated online survey responses were received and analyzed
- The survey was intentionally designed to be a challenge for the respondent
 - Answering the questions required a deep understanding of the current status and future plans for digital thread realization within the respondent's company
 - The average time to complete the survey was approximately 30 minutes
- Achieved desired effect
 - Only domain experts on the topic of digital thread invested the time and effort needed to complete the survey

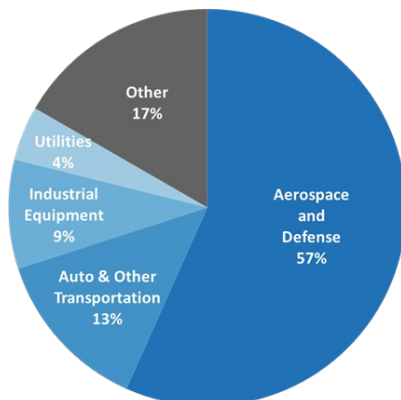
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Survey Respondent Demographics

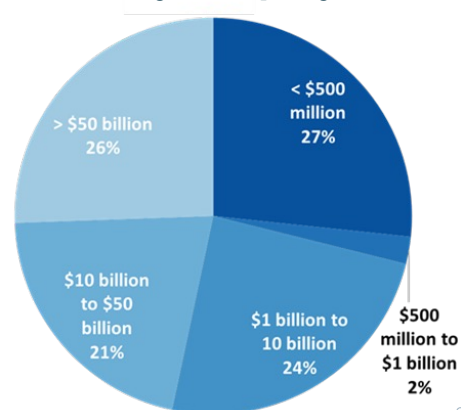


Heavily aerospace & defense with a broad representation across the supply chain

Distribution by Industry



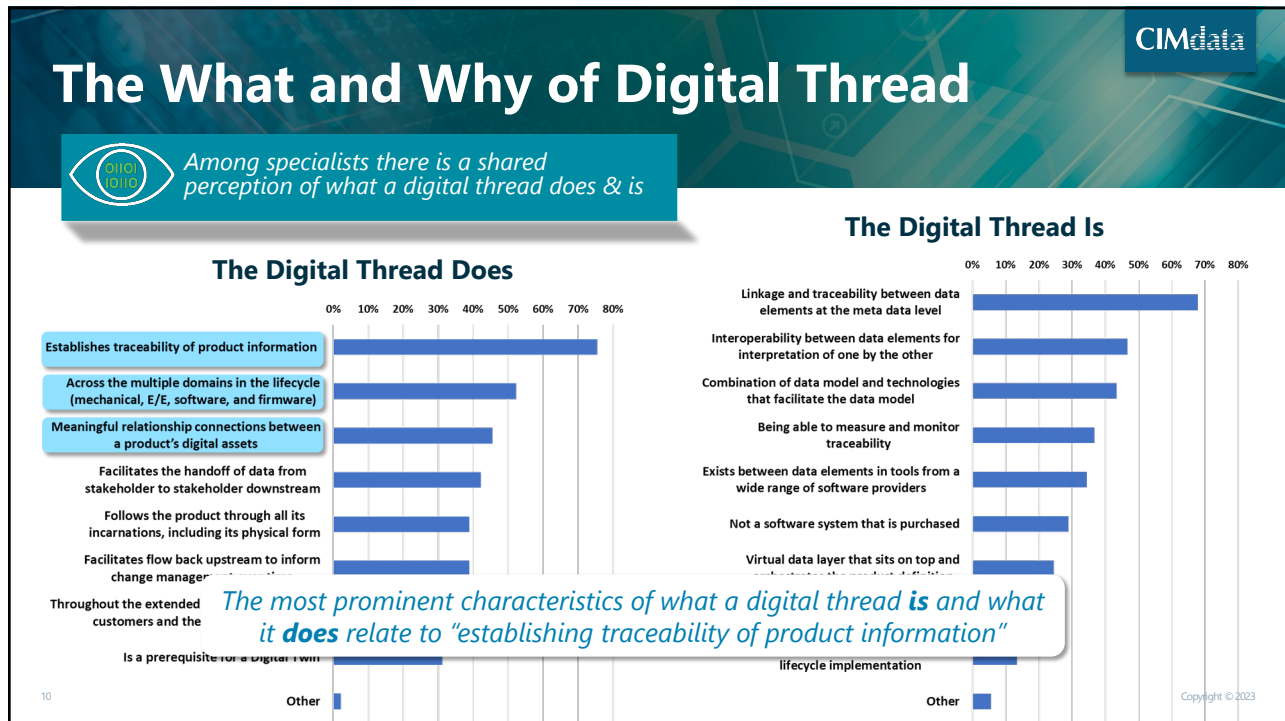
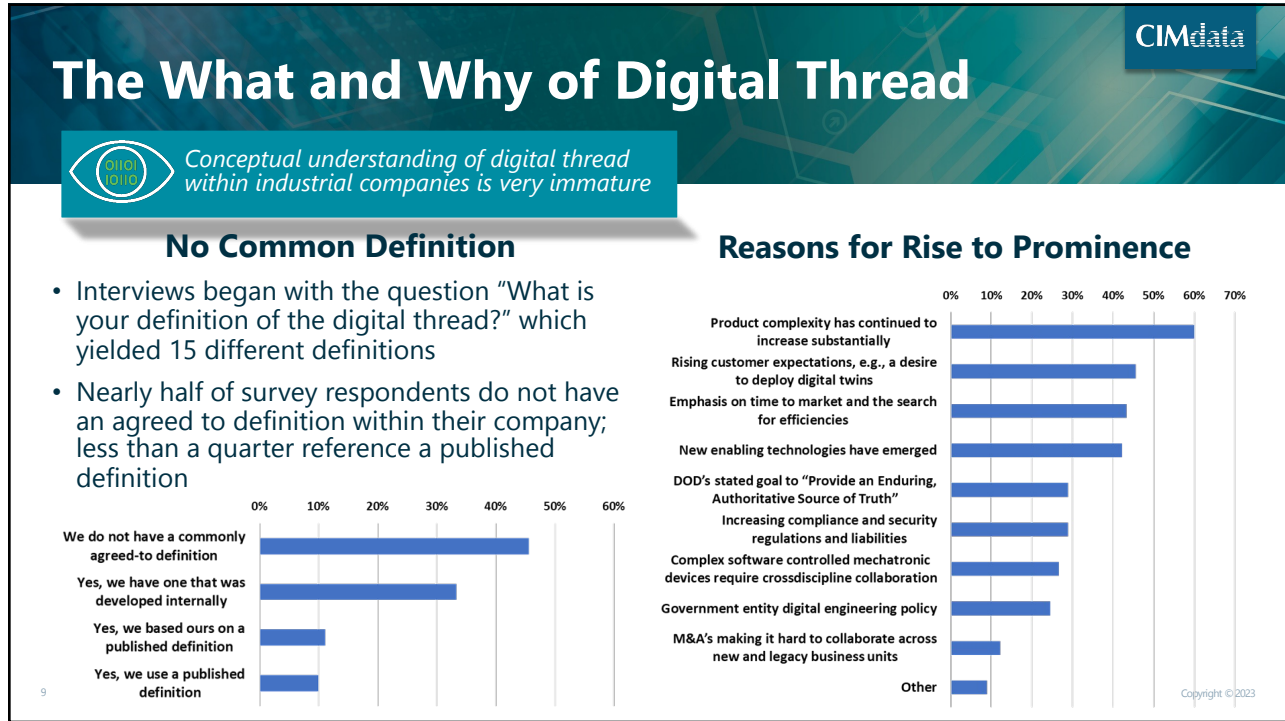
Distribution by Company Revenue



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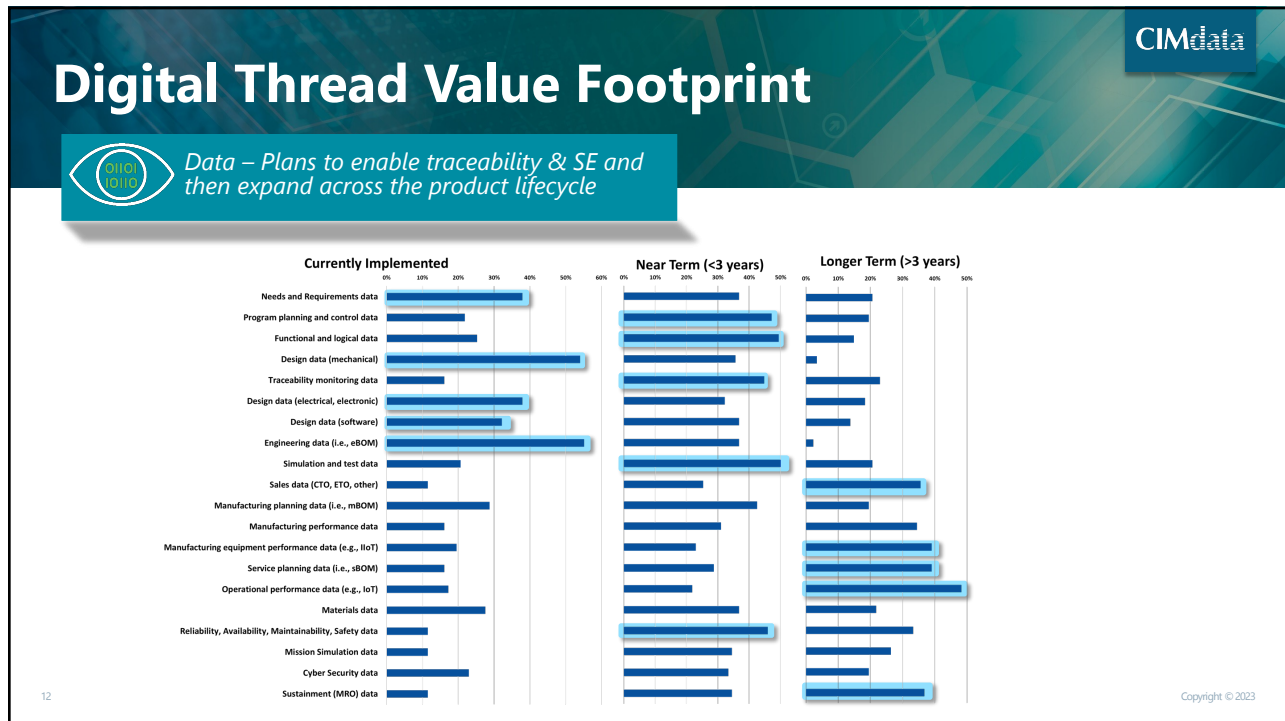
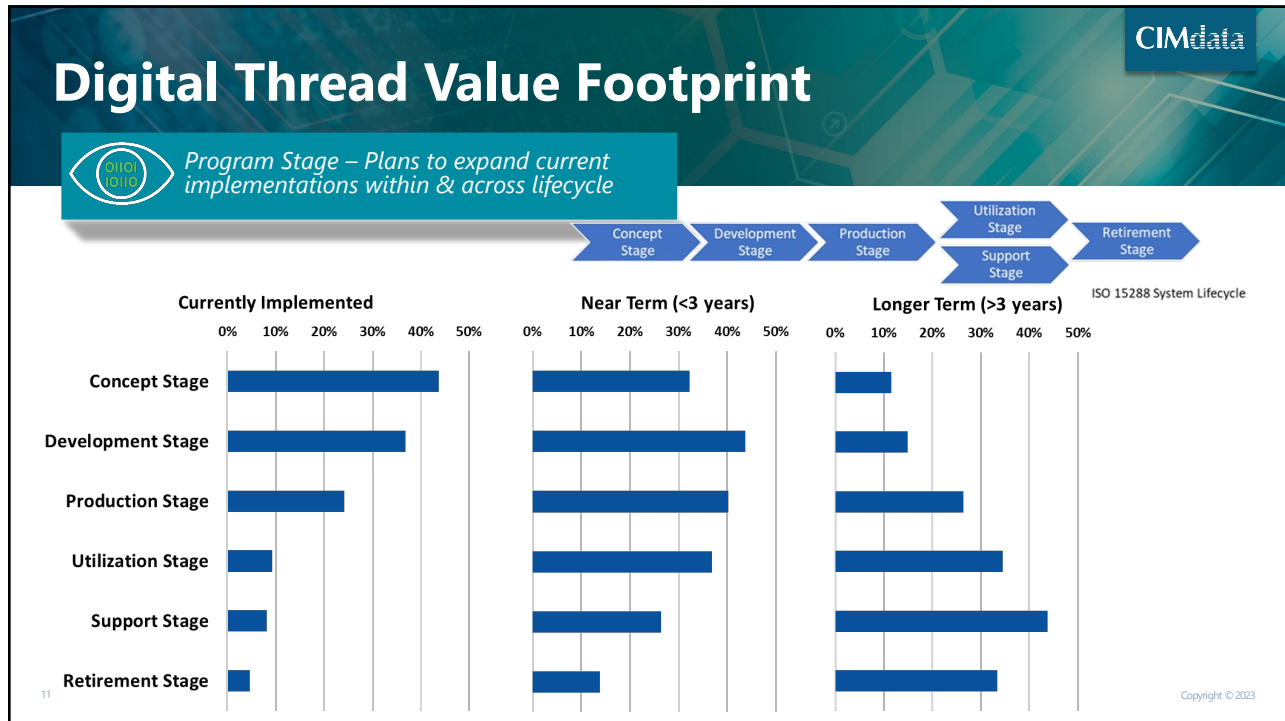
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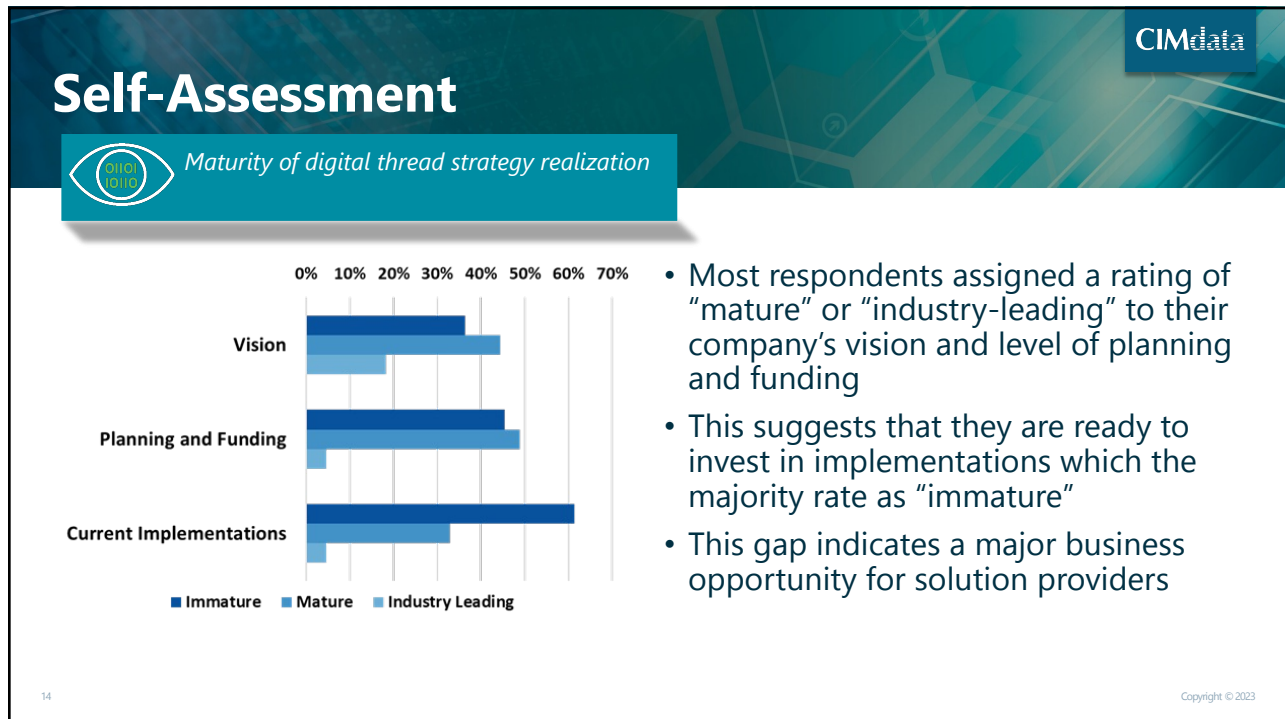
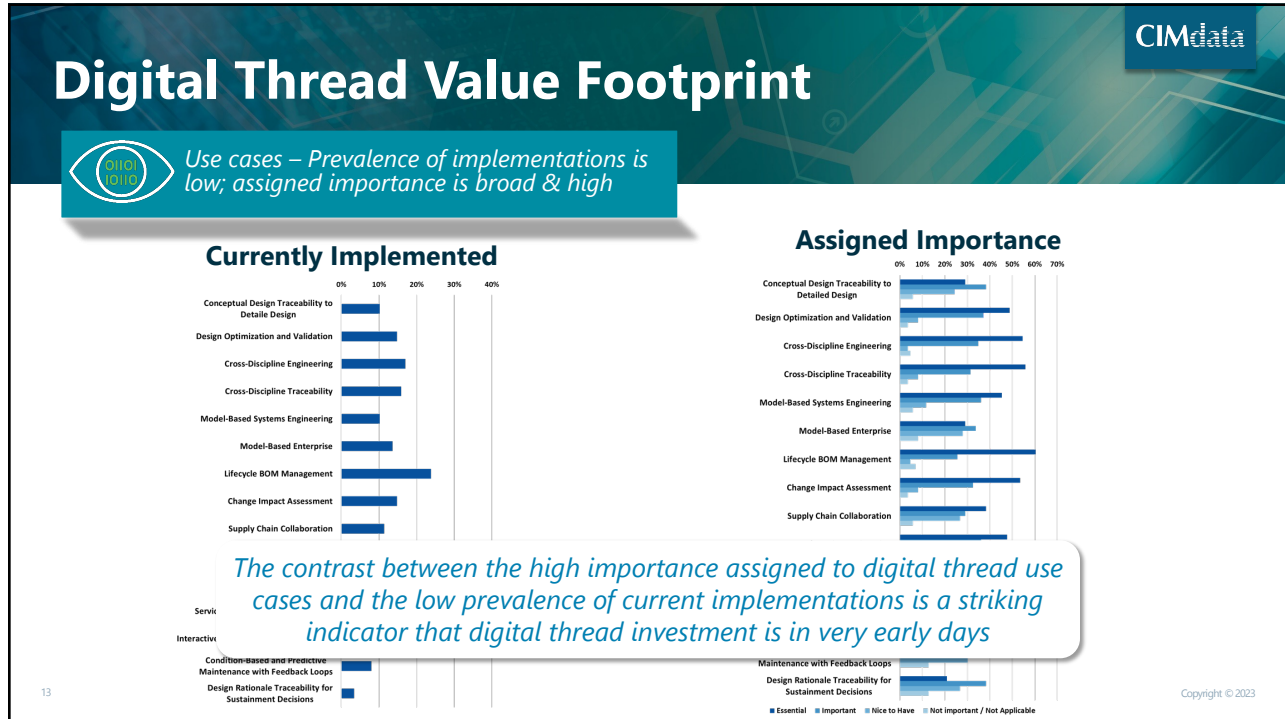
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Looking to the Future



Industry leaders are taking a broader view as they enter a more complex phase

- There will be more investment in production and service
- There will be increased emphasis on extending the digital thread community to include customers, partners, and suppliers more fully
- MBSE will be a fundamental driver of future investment
- The next stage will be more complex and transformative
 - There are examples of established programs that enjoy strong support from a well-informed and motivated senior management
 - But many are struggling to build awareness within their leadership and achieve early successes as proof points to motivate executive engagement and funding for execution

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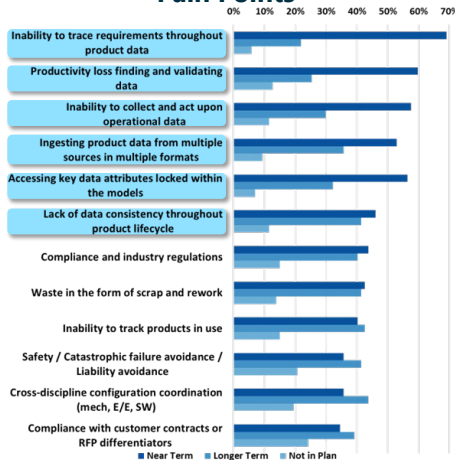
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Future Investment Priorities



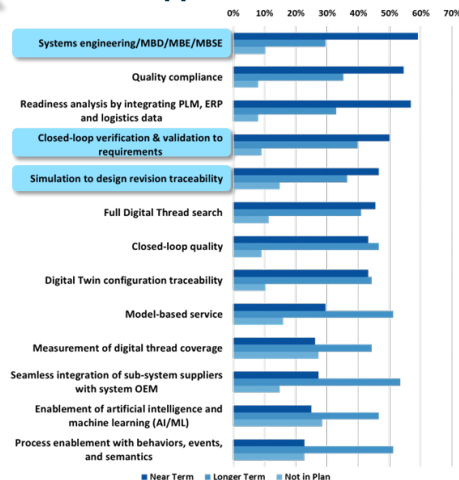
Top pain points relate to accessibility and traceability; top opportunities relate to SE

Pain Points



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Opportunities



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Strategies for Success



An area of divergence between industry leaders is the focus of their implementations

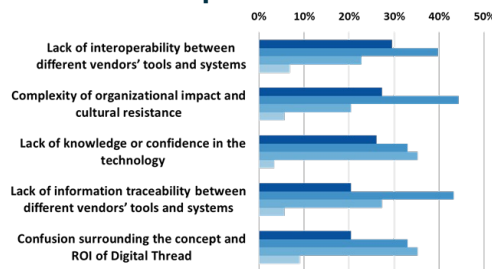
- For some, it is providing **interfaces to source applications** to extract and associate product data artifacts and attributes, something like a search engine
- For others, the key is the **association and traceability of dependencies** between artifacts in support of a use case, such as the linkage and traceability of requirements through functional/physical design to simulation and test
- For a few, their current focus is on **data governance**, which they believe is foundational for a richer and more extensive set of product lifecycle use cases

Strategies for Success

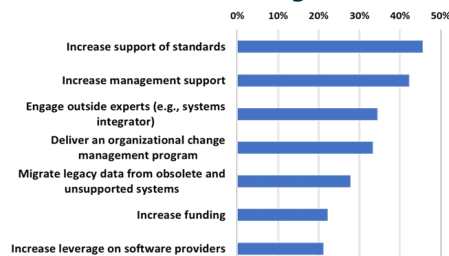


Inhibitors to formulating & executing a digital thread strategy & proposed mitigations

Principal Inhibitors



Means for Mitigation



The number 1 inhibitor to formulating and executing a digital thread strategy is "lack of interoperability between different vendors' tools and systems"

The number 1 proposed means for mitigation is to "increase support of standards"

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Solution Technologies



Key technical considerations

- **Core to the value of digital thread is traceability** across source and derivative product-related artifacts along the lifecycle & throughout the extended enterprise
- The **digital thread value landscape is distributed across a heterogeneous value chain** from customer to OEM to partners and multiple tiers of suppliers. This reality drives the need for data interoperability and elevates the importance of standards and openness of enabling solution architectures
- **Proven technical solutions exist for enabling the digital thread**, and leading solution providers are investing heavily in research-guided strategies and roadmaps to further strengthen their offerings
- **Data is the foundation of the digital thread**. This reality elevates the importance of sound data governance and a cleansed repository, especially as use case implementations proliferate and must be interlinked into an extended thread

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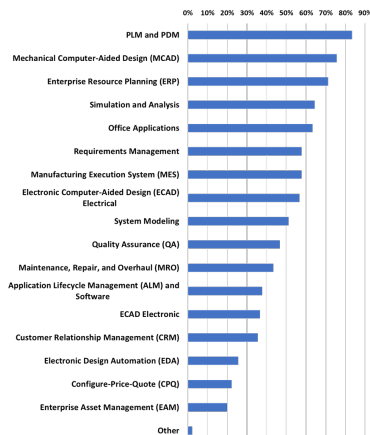
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Solution Technologies



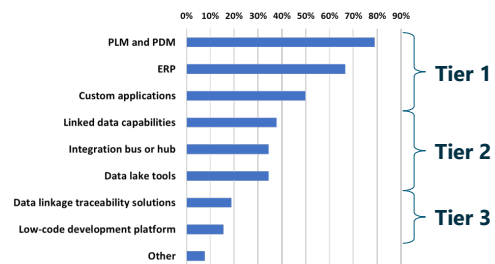
Enabling technologies in use today to create, consume and link product lifecycle data

Technologies Used to Create & Consume



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Technologies Used to Link



Three tiers of linkage technologies

- Tier 1: Traditional solutions with the longest history
- Tier 2: Application and data integration tools
- Tier 3: Newer specialty technologies for combining data from multiple sources and establishing linkages and traceability
 - Expect the ranking of these to rise significantly over the next few years

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Solution Technologies



Solution capability and provider alignment

- Attitudes on solution capability and provider alignment are mixed
- Some industry leaders are quite critical, especially regarding data model accessibility and flexibility to comply with a corporate data governance strategy
- Others are somewhat neutral or slightly positive. They feel that some providers are moving in the right direction; some are not
- Several feel that solutions have improved significantly in the last 5 to 10 years and, despite some remaining gaps, are now fully capable
- Some express satisfaction that “good partnering” is happening

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Closing Remarks



Learnings from the research – the what and why

- The conceptual understanding of digital thread within industrial companies is immature, but specialists within those companies have a surprisingly consistent view of what the digital thread is and does
- New realities, such as rising customer expectations (e.g., DoD's authoritative source of truth) and new enabling technologies, are major drivers of the digital thread's rise to prominence

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Closing Remarks



Learnings from the research – the current reality

- Industry investment planning is widely based on use cases and the associated ROI
- Digital thread investment within the ecosystem of industrial users, their customers, suppliers, and solution providers is poised for rapid growth
- Lack of interoperability between different vendors' tools and systems is rated the number 1 inhibitor to achieving a digital thread strategy
- Promotion of standards is rated the number 1 means for mitigation
- Current digital thread implementations are relatively modest in comparison to industrial companies' visions and plans

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Closing Remarks



*Learnings from the research – planning
future investment*

- The top six pain points all relate to accessibility and traceability across data elements, especially of requirements throughout the lifecycle
- Systems engineering is ranked as the top new value opportunity
- The next stage of digital thread realization will be more complex and transformative
- Most industrial companies seem to be unaware of the complexities and prerequisite foundational elements as they pursue their visions
- A few have sophisticated programmatic approaches with strong support from a well-informed and motivated senior management

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Closing Remarks



*Learnings from the research – solution
capability and provider alignment*

- There is a broad sense that solution capabilities have improved significantly in the last 5 to 10 years and that, despite some remaining gaps, these solutions are now fully capable
- The majority feel that their PLM solution providers are moderately or well aligned with their strategies for digital thread investment
- Lack of openness and dependence on 3rd parties for connectivity and data interchange with the PLM solutions is a universal concern
- Specialty technologies for combining data from multiple sources and establishing linkages and traceability are emerging to challenge the traditional platforms

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For contributing their knowledge and for funding this important work



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- Access A&D PLM Action Group resources at www.ad-pag.com
 - Digital Twin/Digital Thread Solution Definition for Aerospace and Defense: Phase 3, position paper, Feb 2023
 - Digital Twin/Digital Thread Solution Definition for Aerospace and Defense: Phase 2, position paper, Jul 2022
 - Multiple View Bill of Materials (BOM) Solution Evaluation Benchmarks, report, Jul 2020
 - Multiple View Bill of Materials, position paper, Feb 2019
- Access CIMdata resources at www.CIMdata.com
 - Multi-view BOM Value Potential, webinar, Apr 2022
 - The Digital Thread is Really a Web, with the Engineering Bill of Materials at Its Center, webinar, Sep 2021
 - Making Multi-view BOM a Reality, webinar, Mar 2020
- Contact for further discussion
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Questions & Answers

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What's on your mind?



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