

MBSE Industry Research: Future Investment, Technology Considerations & Summary Observations

2025 Market & Industry Forum—27 March 2025

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MBSE Industry Research: Future Investment, Technology Considerations & Summary Observations

PLM Market & Industry Forum

A CIMdata PLM Leadership Event

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Agenda

- Research Findings
 - Future Investment
 - Technology Considerations
- Concluding Remarks
- Questions & Answers

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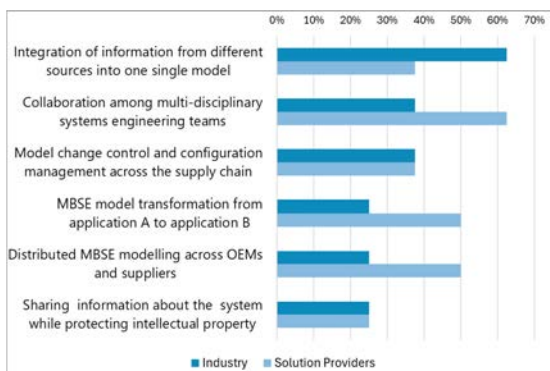
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Future Investment

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"Pain points" are points of friction in the information flow and way of working



Industry's top selections (% of interviewees)



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- Several top "pain points" relate to interoperability
- Others relate to collaboration across disciplines and across the supply chain
- These are two aspects of a successful digital thread implementation, which is foundational to MBSE

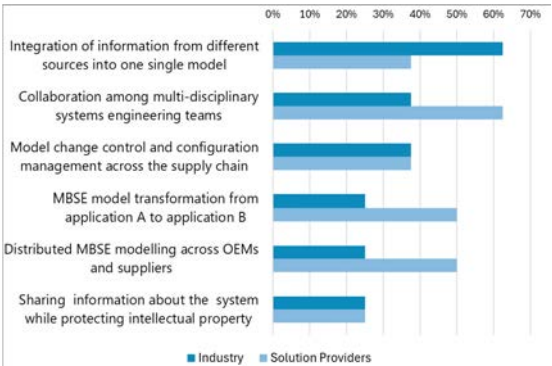
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
Pain Point	Industry (%)	Solution Providers (%)
Integration of information from different sources into one single model	~65	~45
Collaboration among multi-disciplinary systems engineering teams	~45	~65
Model change control and configuration management across the supply chain	~40	~40
MBSE model transformation from application A to application B	~25	~50
Distributed MBSE modelling across OEMs and suppliers	~25	~50
Sharing information about the system while protecting intellectual property	~25	~25

Perspectives of Note


"Being a Tier 1 requires us to align with the production systems of multiple OEMs. This causes us to take an agnostic approach to PLM that require coordination and agreement on model sharing."

"The digital thread is really important. It is astonishing that this topic is not sufficiently emphasized in industry".

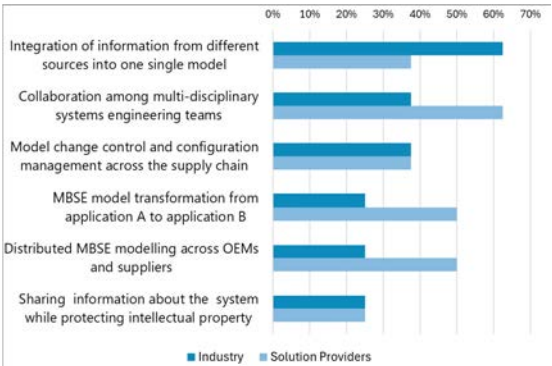
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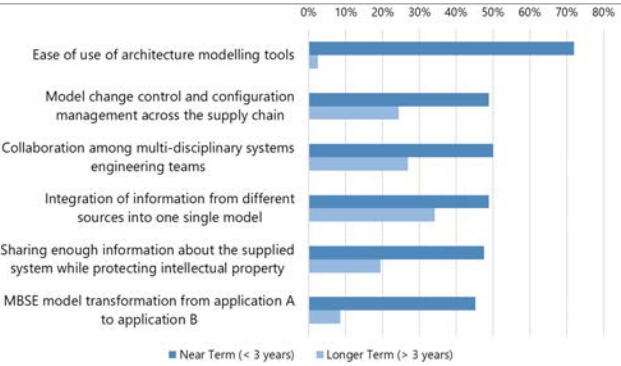

Pain points targeted in future MBSE implementations (interviews vs. survey)

Interview Results



Pain Point	Industry (%)	Solution Providers (%)
Integration of information from different sources into one single model	~65	~45
Collaboration among multi-disciplinary systems engineering teams	~45	~65
Model change control and configuration management across the supply chain	~40	~40
MBSE model transformation from application A to application B	~25	~50
Distributed MBSE modelling across OEMs and suppliers	~25	~50
Sharing information about the system while protecting intellectual property	~25	~25

Survey Results

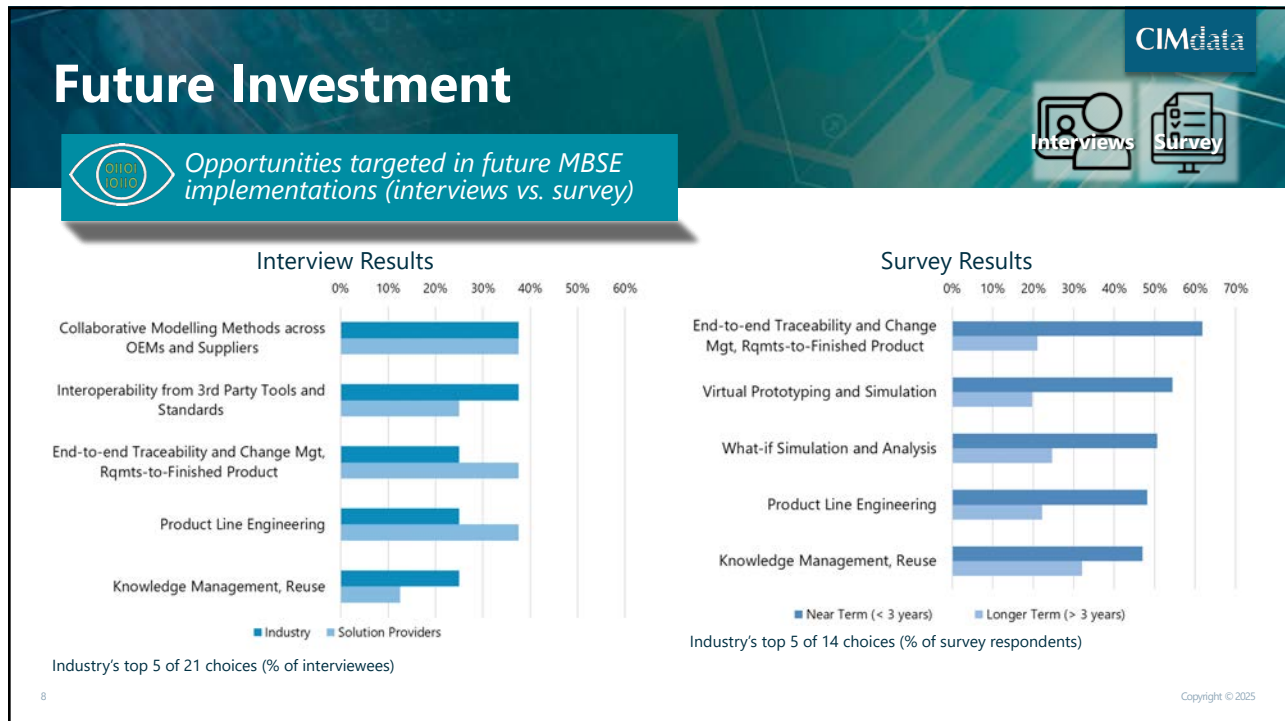
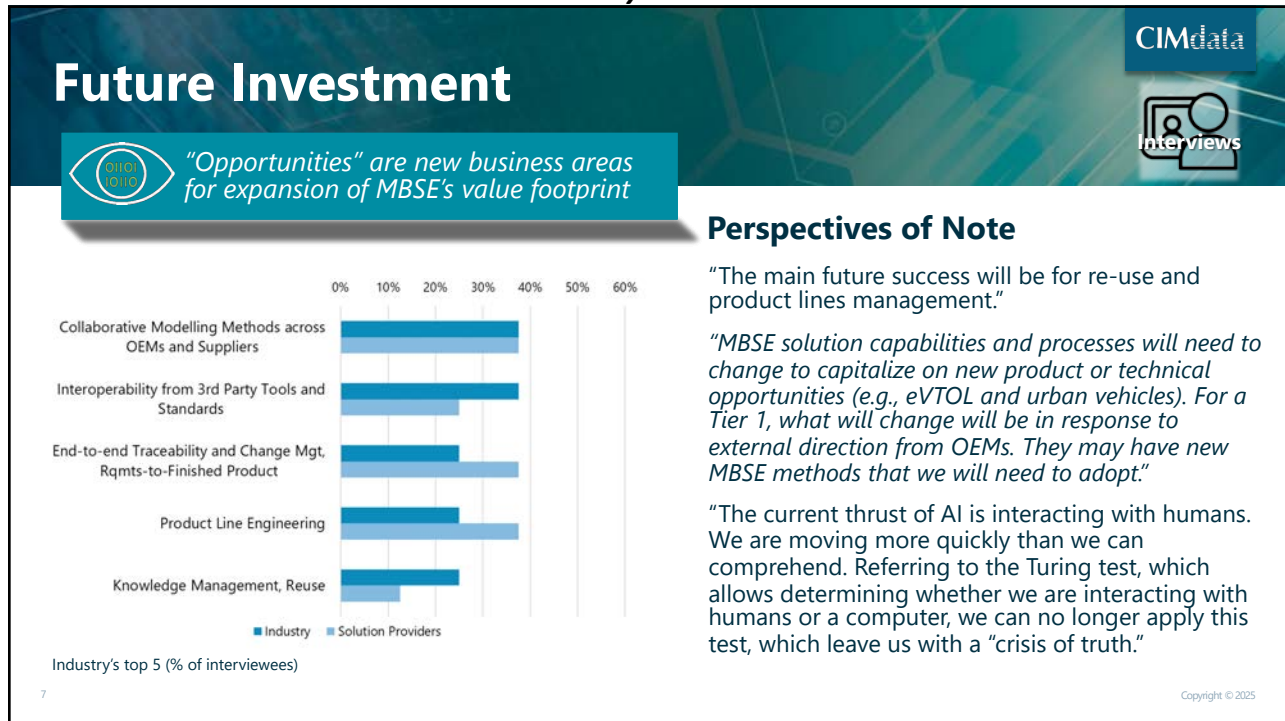


Pain Point	Near Term (< 3 years) (%)	Longer Term (> 3 years) (%)
Ease of use of architecture modelling tools	~75	~5
Model change control and configuration management across the supply chain	~50	~25
Collaboration among multi-disciplinary systems engineering teams	~50	~30
Integration of information from different sources into one single model	~50	~35
Sharing enough information about the supplied system while protecting intellectual property	~50	~20
MBSE model transformation from application A to application B	~50	~15

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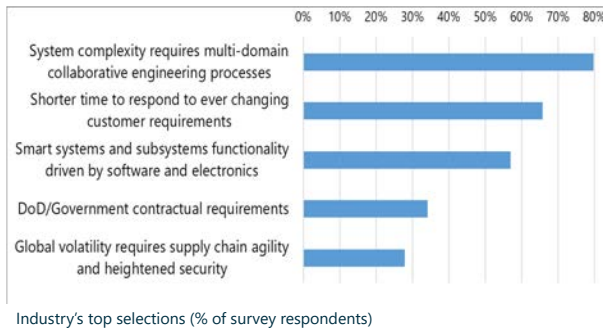
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Business drivers companies are responding to in future MBSE investment



- Earlier, we asked “What has changed over the past three to five years to elevate interest and investment in MBSE?”
 - Some of those changed conditions will be drivers for future investment, but not all
 - Some drivers for MBSE investment are not new and have not contributed to a change in the perceived value of MBSE
- System complexity, pressure for agility, and software and electronics enablement of smart products have increased and elevated the perceived value of MBSE, and they are drivers for future investment

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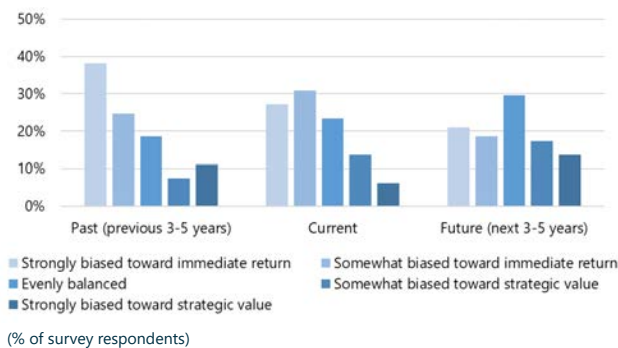
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Immediate return vs. strategic value in MBSE investment decisions



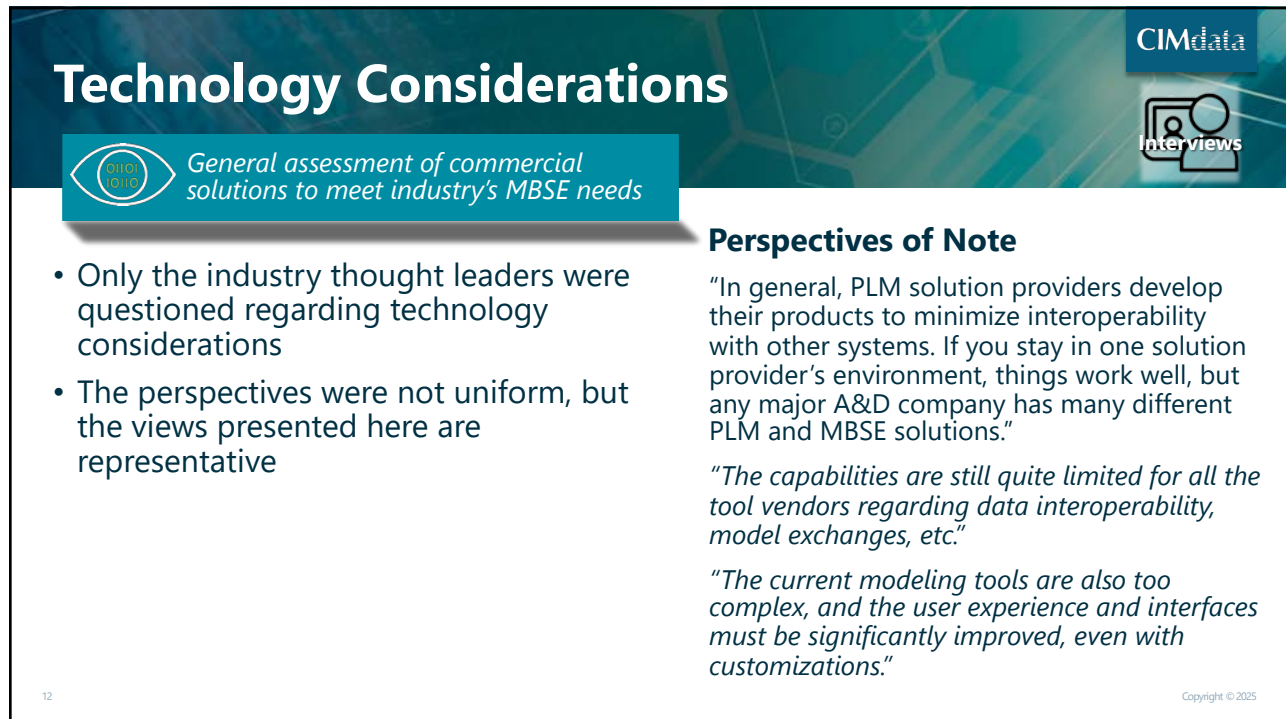
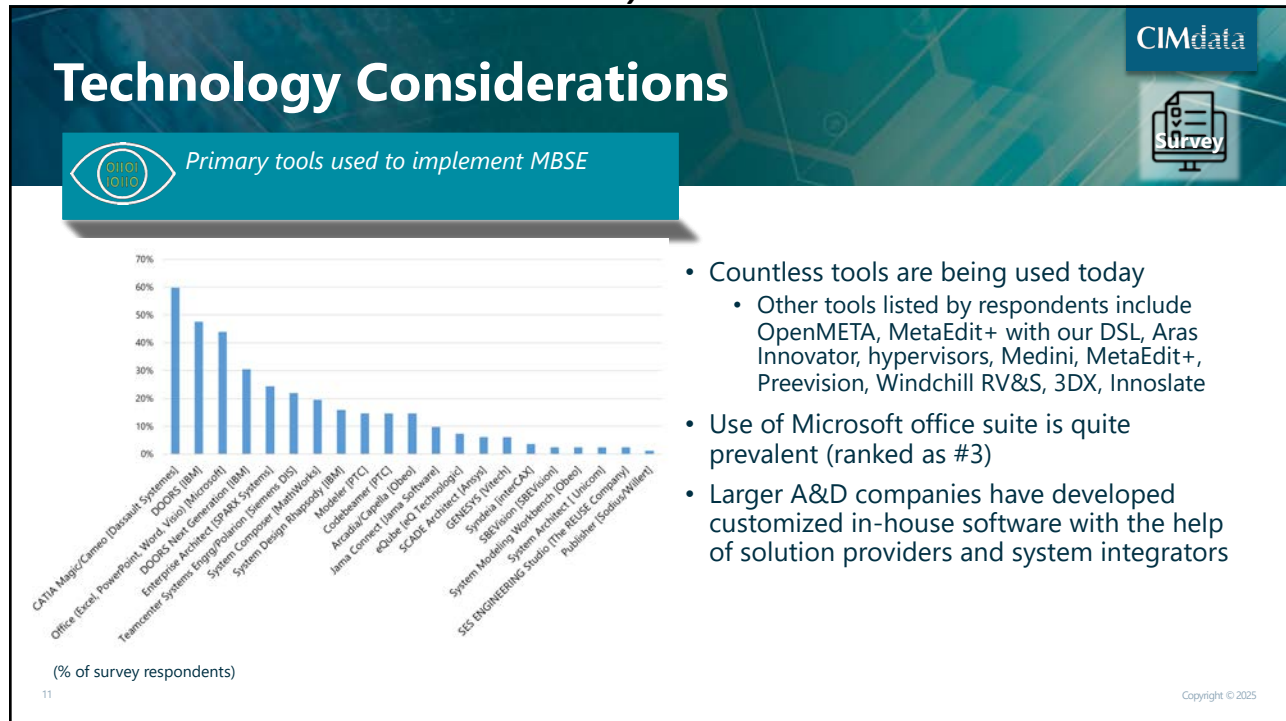
- In the past, the ROI value justification was heavily biased towards immediate returns (one to two years) versus longer-term strategic value (three to five years)
- That bias has gradually shifted to a more evenly balanced approach that is growing in acceptance today
- Over the next three to five years, the respondents see this trend continuing with a further shift toward the strategic value justification approach

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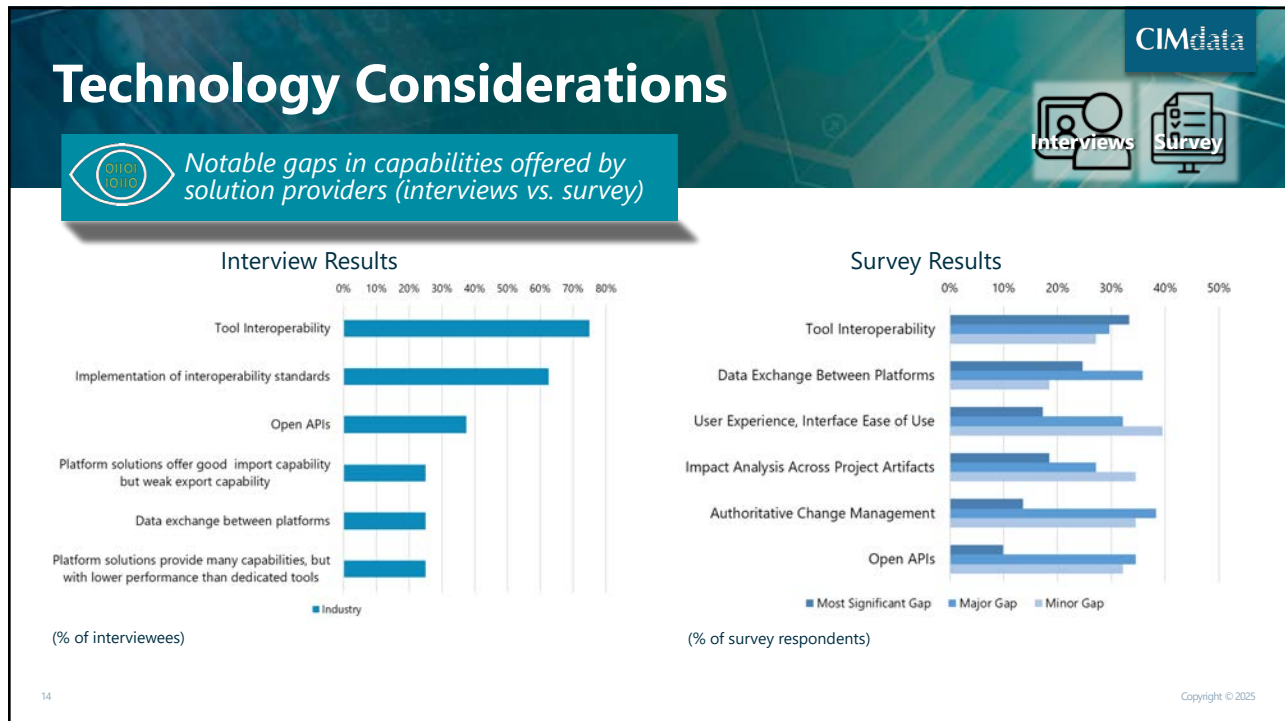
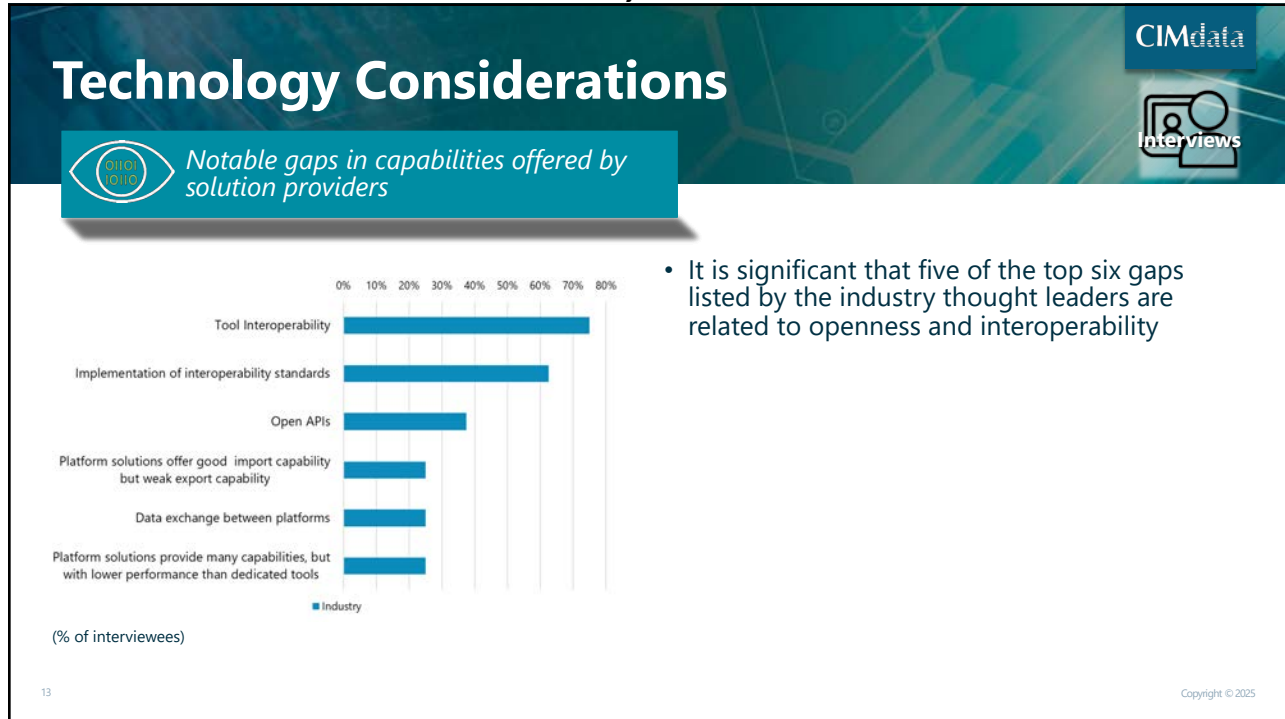
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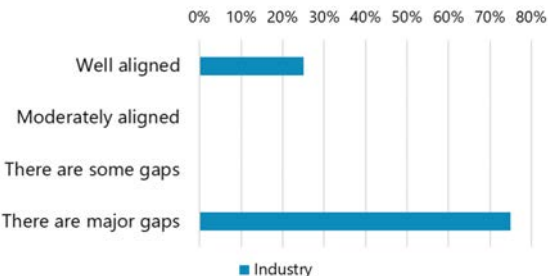
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Technology Considerations


Alignment of the PLM solution providers with industry's MBSE investment strategy





Alignment Level	Industry (%)
Well aligned	~25%
Moderately aligned	~0%
There are some gaps	~0%
There are major gaps	~75%


(% of interviewees)

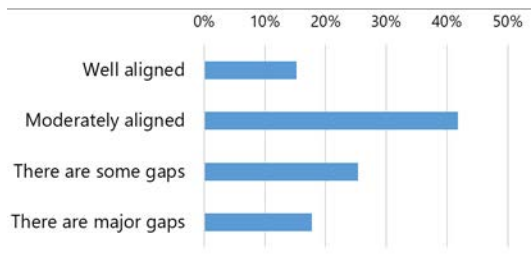
- Interviewees were asked how aligned their perspectives and strategies for MBSE investment are with those of their chosen PLM solution providers
- Some said they are well aligned, but the majority said there are major gaps
- For this pool of experts there was no middle ground

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Technology Considerations


Alignment of the PLM solution providers with industry's MBSE investment strategy



Alignment Level	Survey Respondents (%)
Well aligned	~15%
Moderately aligned	~45%
There are some gaps	~25%
There are major gaps	~15%

(% of survey respondents)

- The responses form a bell-shaped curve skewed more toward aligned than having gaps
- Some level of misalignment between the expectations of software users and the companies that build and support those tools is inevitable
- Answers to follow on questions reflected a positive view of respondents toward their software suppliers – approximately 70% indicated that their solution provider is a good partner, and ~20% held a neutral view.

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Concluding Remarks

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Key considerations for formulating an MBSE strategy (1 of 5)

- MBSE is gaining traction in the A&D industry due to factors such as increasing product complexity, the growing role of software in products, and the influence of the DoD's digital engineering strategy
 - Investment in MBSE is increasing and expected to continue to grow
- Current MBSE implementations are mainly concentrated in the early stages of the product lifecycle, specifically Conceptual Design and Development
 - However, there are plans to expand its use into later stages, including Production, Utilization, and Support, particularly as technologies like IoT, IIoT, and digital twins become more prevalent

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Concluding Remarks



Key considerations for formulating an MBSE strategy (2 of 5)

- The top MBSE use cases currently involve Requirements Definition and Allocation, System Architecture Definition, and Design Verification and Validation
- Future implementations are expected to include non-traditional applications such as software design, product line engineering, and design for safety and security
- The A&D industry is still in the initial phases of MBSE adoption, with maturity levels differing significantly across companies and programs

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Concluding Remarks



Key considerations for formulating an MBSE strategy (3 of 5)

- Organizational impact and cultural resistance pose the most significant challenge to successful MBSE implementation
- Essential success factors for MBSE adoption include a well-defined vision and strategy, strong executive commitment, appropriate methodologies, development of MBSE expertise, education and training initiatives, middle management support, and robust tool integration and standardization

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Concluding Remarks



Key considerations for formulating an MBSE strategy (4 of 5)

- A wide array of commercial and in-house software tools are used for MBSE
- The research highlights a crucial need for enhanced interoperability between different tools and platforms, facilitated by open APIs and adherence to standards
- Justifications for MBSE investments are shifting from a focus on immediate returns to a more balanced approach that considers long-term strategic value
 - This change reflects the increasing recognition of MBSE's potential to drive innovation and efficiency in the A&D industry over time

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Concluding Remarks



Key considerations for formulating an MBSE strategy (5 of 5)

- There is a strong need for collaboration between companies and their solution providers to address existing gaps and advance MBSE capabilities in a way that benefits the entire industry

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What is the Business Opportunity?



How can the PLM Economy best support these requirements? (1 of 3)

- There is strong justification for providers to invest in solution development
 - The research clearly indicates that MBSE is broadly viewed within industry as a competitive imperative and that industry spending on MBSE implementations will continue to increase
 - There is ample evidence that MBSE is in early days and that industry has expansive aspirations

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What is the Business Opportunity?



How can the PLM Economy best support these requirements? (2 of 3)

- Four MBSE use cases have been identified where more than 40% of respondents are planning near-term investment
 - Requirements definition, allocation & traceability
 - System verification and validation
 - Software design optimization & validation
 - Safety and security optimization & validation
- Providers who address identified pain points will enjoy a significant competitive advantage over their peers, especially if they address
 - Interoperability and openness
 - Ease of use

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What is the Business Opportunity?



How can the PLM Economy best support these requirements? (3 of 3)

- Solution providers will find willing buyers for services to assist with establishing critical success factors for their MBSE programs, especially
 - Executive commitment
 - Vision and strategy
 - Methodology to apply MBSE
 - MBSE expertise

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 - Is PLM Becoming Digital Engineering?, AD PAG Insight, Sep 2024
 - The Emerging SysML 2.0 Standard: Will It Enable Multi-Party Digital Design Collaboration?, AD PAG Insight, Jul 2024
 - MBSE Data Interoperability Specification Report, report, Dec 2020
 - MBSE Data Interoperability: Architecture Model Exchange Solutions, presentation, Nov 2020
 - Model-Based Systems Engineering (MBSE) Data Interoperability, position paper, Jan 2019
- Access CIMdata resources at www.CIMdata.com
 - The Elevation and Expansion of Model-Based Systems Engineering: And What to Do About It, webinar, Aug 2024
 - The Elevation and Expansion of Model-Based Systems Engineering: Initial Findings from Industry Research, webinar, Sep 2024
- Contact for further discussion

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Questions & Answers



What's on your mind?



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