Can AI help close the Digital Engineering gap?

CESAMES **INSIGHTS**

May 2026

PROBLEM

Can AI help close the Digital Engineering gap?

Digital Engineering promises faster, safer and more consistent product development, bringing innovative products to market while managing risks, costs, cybersecurity and regulation.

Yet the gap between ambition and reality remains wide.

TOOLS

They don't connect smoothly. Heterogeneous models and standards, proprietary concepts, document-based activities are poorly synchronized.

DATA

Inconsistent structures across standards prevent digital continuity and product optimization.

DECISIONS

Decisions are made in meetings. The models capture them after the fact, rarely before – and are often too disconnected from the real process.

" The digital thread remains difficult to implement: requirements are evolving, interfaces remain complex to manage, and model-based systems engineering (MBSE) remains too disconnected from the actual decision-making process."

STATEMENT

Even with regard to architectural activities, AI is useful when applied to the workflow itself

The value of AI in engineering will facilitate the completion of unit tasks, but will also improve the consistency, reliability, and continuity of decisions that shape a complex system.

WHAT AI CAN DO

- Detect inconsistencies across models
- Identify impact chains between decisions
- Suggest missing links: requirements → functions → components → interfaces → risks
- Support decision traceability

THE CRITICAL CONDITION

- Without a shared semantic structure, AI outputs are hard to compare, verify, and reuse
- Deployment becomes expensive if each use case needs custom data prep
- Applying AI on unstructured data is not recommended: limited gains, high effort, non-comparable results

"The important condition is to avoid using AI on an unstructured engineering landscape - without common semantics, outputs are hard to verify and expensive to scale."

POINT OF VIEW

The CESAMES answer: AI anchored in a structured metamodel

CESAMES resolves fragmentation by anchoring AI to the CESAM metamodel - a common semantic structure that aligns data between tools and standards, enabling consistent and efficient use of AI through tool-independent analysis.

GUIDES AI OUTPUTS

It constrains interpretation and ensures consistent and comparable datasets in all use cases.

SUSTAINS DIGITAL THREAD

It works in all use cases, with or without a specific MBSE tool – it is tool-independent by design.

SCALES WITH MATURITY

From structured prompt engineering to full agentic toolchains as project and enterprise maturity increases.

"The objective is pragmatic: use AI where it improves the quality, speed and cost-effectiveness of engineering decisions."

The opportunity, the landscape and the prioritized use cases

Further details

CESAMES point of view on GenAI opportunity

Digital Engineering ambition faces **fragmented, evolving standards and models**, which then prevent consistency, **digital continuity** and **product optimization**. AI can help address these gaps, yet remains limited by **variability**, lack of semantic **consistency** and difficulty to scale. CESAMES overcomes this by anchoring AI on a structured **meta-model**, guiding its use through **architecture-driven workflows** and integrating it directly within engineering processes.

PROBLEM

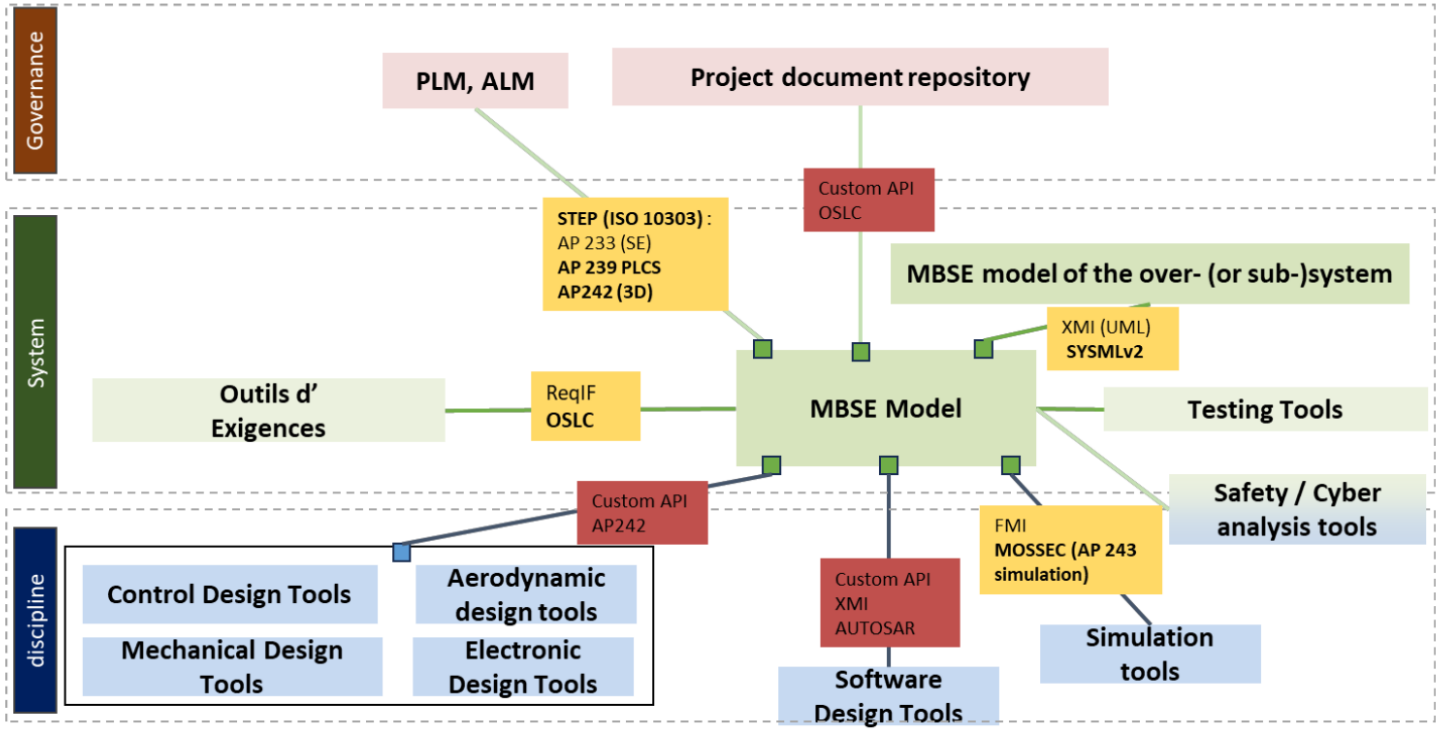
Digital thread remains a core issue due to **multiple tools** and **evolving standards** with **incompatible data structures** : engineering environments rely on **heterogeneous models, proprietary concepts, document-based activities** that are **poorly connected and difficult to synchronize**.

OPPORTUNITY WITH AI AND LIMITATIONS

AI can help fill gaps, extract and link data from different sources, but it remains limited without a **unified semantic structure** enabling a **true digital common thread** between use cases and tools.

CESAMES POINT OF VIEW

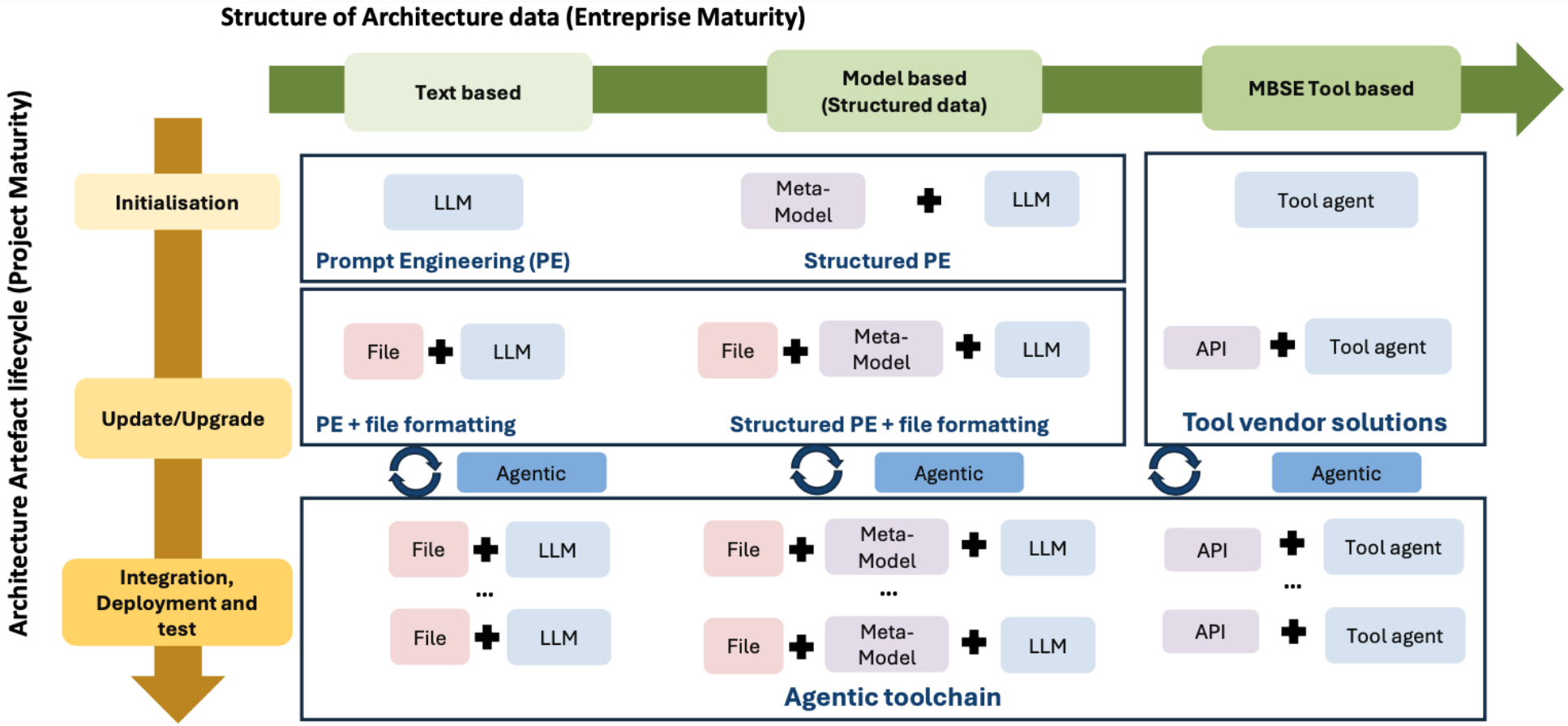
CESAMES solves this problem by providing a common **meta-model (CESAM)** that aligns data across tools and standards, enabling consistent integration and **effective use of AI** through **tool-independent analysis.**



Integrating models and data with architecture : engineering standards are multiple and evolving

CESAMES point of view on GenAI opportunity

Deployment of **GenAI** solutions depends both on the use case (**Project Maturity**) and the structure of the architecture data (**Enterprise Maturity**). It can vary from simple **prompt engineering** on LLM to **complex agentic automation** with structured **metamodel**. The first are very easy to deploy with **low performance**, the latter are very complex to deploy and only suits some **specific use case**.

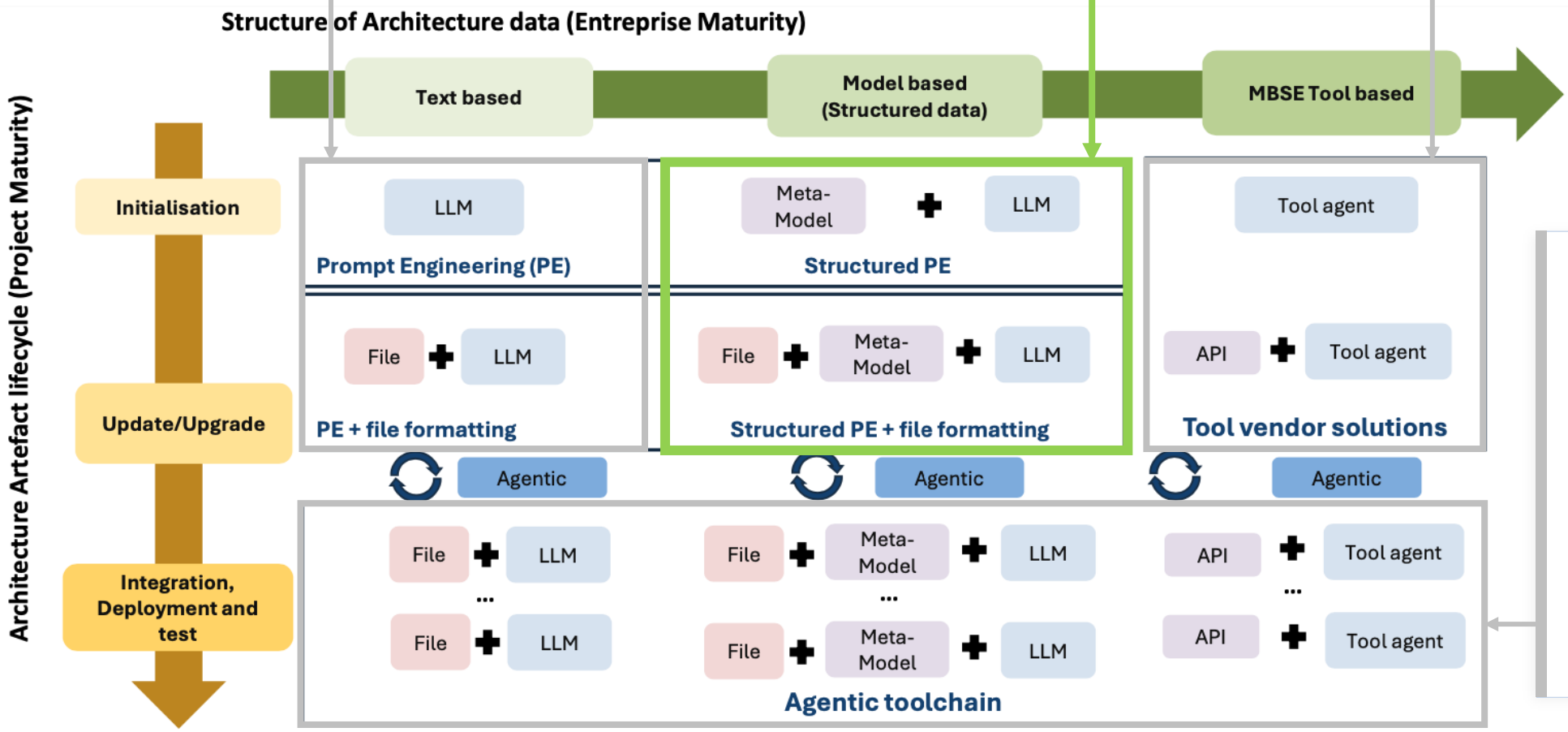


Current limitations and prioritized use cases

The use of AI on unstructured data is very limited and is not recommended by CESAMES, except for a preliminary **initial analysis of existing data.**

Introducing **a metamodel to structure data** is essential for quickly constraining GenAI and optimizing the use of its results through **consistent and comparable** datasets, all with a reasonable deployment effort. This is a recommended use case to prioritize for **AI and architecture.**

These solutions are directly integrated into the **vendors' tools** and must solve the problems related to proprietary formats, poor interoperability and **the need for a pivot model between tools**.



Deploying AI at scale is primarily an **enterprise architecture** issue. A robust enterprise architecture for the digital thread and **model interoperability** are essential for specific priority use cases. Limitations remain due to the difficulty of implementing reliable **automated testing** across the entire dataset using only the LLM model.

Contact

Gauthier Jourdain
Chief Product Officer
gauthier.jourdain@cesames.net

C.E.S.A.M.E.S. Institut
SAS au capital de 1.070.000 euros
SIRET : 529 638 314 00052
Siège social : 10, rue de Penthièvre – 75008 PARIS
Bureaux Paris / Toulouse / Lyon

CESAMES