

SYSTEMS THINKING AND DIGITAL TRANSFORMATION





INTRODUCTION

The ever-increasing complexities of today's and tomorrow's intelligent and connected products lead to increased costs, missed market opportunities, and resources that are unable to scale.

This brief discusses why Systems Thinking is essential to managing this ever-increasing complexity and why this approach is critical to the success of Digital Transformation.

THE RISKS OF EVER-INCREASING COMPLEXITY

Today's products—called system-of-interest—are a complex system (e.g., a self-driving car) that functions within a broader system (e.g., other self-driving cars) and interacts with many other related systems (e.g., car-as-a-service). This shift from a product-centric to a system-centric environment creates new risks that often create significant threats to the company's overall business. The traditional engineering IT environments, particularly legacy PLM/PDM solutions, were never designed to manage such risks:

- Risks of a catastrophic failure that come from undesirable emergent properties that arise at the boundaries of these systems when systems interact.
- Risks of overdesign that come from Reductionism which is an approach to studying complex systems by reducing the overall system to a set of simpler stand-alone components.
- Risks of overconfidence that come from overreliance on the perceived advantages of legacy, such as established design, manufacturability, supply-chain, or branding practices.

SYSTEMS THINKING

Systems Thinking is a holistic approach to analyzing and understanding how the system's constituent behaviors and elements interrelate, how they change over time, and how they fit in the context of a larger system. It is not a tool, but it is enabled through the right set of data models, tools, processes and underlying platforms. Systems Thinking is very relevant to Digital Transformation since it also focuses on transformation of the same data models, tools, processes.

Systems Thinking is meant to be a permanent characteristic of the enterprise's approach to product conception, design, manufacturing, asset operation, maintenance, and disposal and the continuous feedback between all of these. It allows Digital Transformation to continuously evolve.



KEY BENEFITS OF SYSTEMS THINKING

Systems Thinking is central to the identification and mitigation of undesirable emergent properties within complex systems. Its effectiveness depends on the combination of: company's commitment, how people think, methodologies they select, tools they use, and platforms on which they manage the overall product lifecycle. Systems Thinking benefits include:

- Increased value and effectiveness of Digital Transformation
- Early identification and mitigation of risks that can lead to a catastrophic failure
- Elimination of purposeful overdesign
- Better processes for managing new technology insertions
- Saving time, resources, and costs



ENABLING SYSTEMS THINKING

Implementation phases of Systems Thinking and Digital Transformation must reflect business priorities since transforming everything at the same time would be a costly and disruptive overreach. These priorities are always specific to the enterprise's business and they may involve any of the following objectives of Digital Transformation (this list is not exhaustive):

- Eliminating systems engineering silos created by MBSE authoring tools and data models
- Pervasive use of, and easy access to, simulation at every stage of the product's lifecycle
- Unified definition of product variability (features, option and rules)
- Management, maintenance (MRO) and evolution of assets in the field
- Ease of query, visualization and navigation of any data models, structures and relationships

The next step is identification of the Systems Thinking enablers that are most relevant to the implementation priorities. Chances are that all enablers listed are highly relevant to all above priorities:

- Digital Thread and traceability across all design and lifecycle states
- Systems architecture as a connective tissue
- Pervasive simulation across all design and lifecycle states
- Digital models of all implementation disciplines
- Unified variability model across all design and lifecycle states
- Digital Twin as a model of an asset in the field



BENEFITS OF THE ARAS INNOVATOR PLATFORM

As companies shift their focus to Systems Thinking, they need a PLM platform that is resilient enough to keep evolving together with the various phases and maturity levels of the Digital Transformation. This includes moving targets of the best-in-class tools, the latest technology insertions (e.g., Internet of Things (IoT) or Artificial Intelligence (AI)) and the ever-evolving company-specific needs. It simply can't be a legacy PLM/PDM system rooted in management of mechanical structures.

Aras' resilient platform adapts to changing business requirements while never locking users into a specific technology. It is a platform that is made to be upgraded while maintaining all previous customizations and one in which the data is fully transparent. Its layers work together to create the most flexible environment in the industry. From the low-code modeling engine to Aras' Platform Services, the platform is built to adapt and evolve.

- **YOUR Digital Thread**

There is no such thing as a standard out-of-the-box Digital Thread. The platform allows you to start defining Digital Thread anywhere within the V-model and beyond as a single Digital Thread or as a series of Digital Thread segments to be connected later.

- **YOUR Design Intent**

The platform includes a family of applications for capturing design intent (e.g. requirements, systems model, simulation studies, etc.) and its relationship to design data at various levels of abstractions and representations.

- **YOUR Data Sources**

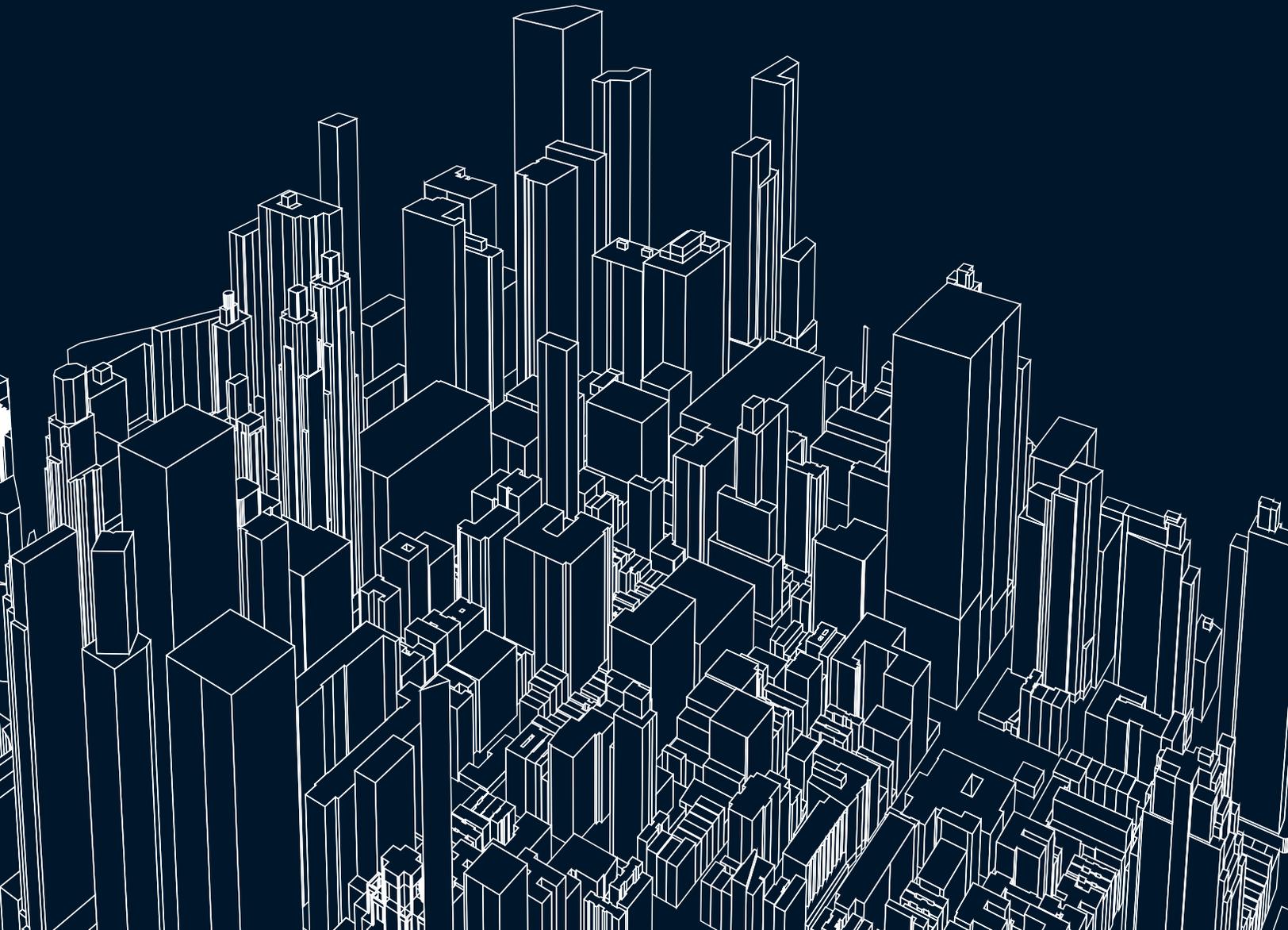
The platform provides multiple options for integrating data that resides in other systems and tools through open data models, open API, data federation services and dedicated connectors with stand-alone authoring tools.

CONCLUSIONS

Systems Thinking, together with Digital Transformation, enables companies to create lasting advantages in the marketplace by managing the exploding product complexities and by mitigating the related undesirable emergent properties.

While Aras can't teach organizations how to practice Systems Thinking, it does offer an enterprise low-code Aras Innovator Platform (open, flexible, scalable and upgradeable) that enables all the key Systems Thinking enablers as an integral part of a Digital Transformation and beyond.

Companies can start exploring the benefits of Systems Thinking by installing Aras Platform today without incurring any costs.





Aras provides a resilient platform for digital industrial applications. Only Aras offers open, low-code technology that enables the rapid delivery of flexible, upgradeable solutions for the engineering, manufacturing, and maintenance of complex products. Aras' platform and product lifecycle management applications connect users in all disciplines and functions to critical product data and processes across the lifecycle and throughout the extended supply chain. Headquartered in Andover, MA with major offices throughout the world, Aras supports more than 350 global multinational customers and over 250,000 users. The Aras Innovator platform is freely downloadable. All applications are available at a single subscription rate, which includes all upgrades performed by Aras. Aras customers include Airbus, Audi, Denso, GE, GM, Honda, Kawasaki, Microsoft, and Nissan.

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