

Managing Product Complexity with Systems Engineering from PTC

AN ADVANCED VISION AND COMPREHENSIVE SOLUTION FOR SYSTEMS ENGINEERING

Leading organizations will transform their systems engineering approach to gain product and service advantage as the mechatronic era gives way to a new class of software-intensive systems and products. PTC has the most comprehensive solution today and an advanced vision to tackle product complexity and focus on product innovation.

The Product Complexity Challenge

Engineering executives are increasingly challenged to accelerate the delivery of innovative products and manage the proliferation of product variants with fewer resources, while improving quality. The only way to overcome these challenges is through a comprehensive, multidisciplinary (i.e. hardware and software) approach that drives collaboration in the design of complex systems. The exponential growth of software in products has only magnified the complexity. Increased complexity requires an iterative, closed-loop process with system-level requirements flow-down and granular traceability – from system requirements through design and test. The optimal system architecture can be developed through iterative modeling and simulation. When iteration is fostered early in the system design process, collaboration becomes more effective, significantly reducing late lifecycle rework. Time to market is shortened, quality improved, and costs reduced.

Traditional Engineering is Mechanical-Driven

Many organizations today take a mechanics-centric approach to designing systems. They may only bring software into the 3rd or 4th design review. This approach tends to view the system definition primarily through CAD diagrams and static product structures. Figure 1 shows a Venn diagram that depicts this traditional approach.

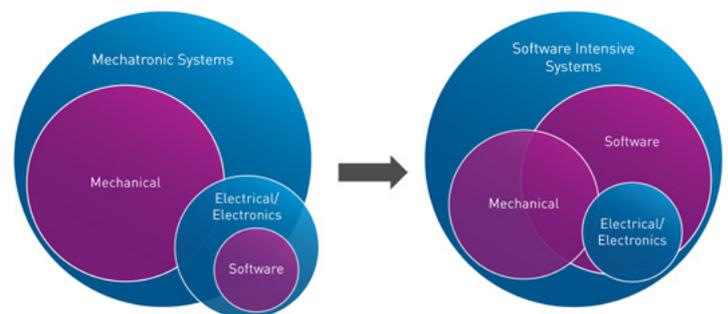


Figure 1—Moving from mechatronic systems to software intensive systems requires a new systems engineering approach.

The problem many companies have with this approach is late development cycle breakage and rework. This delays time to market and can dramatically increase costs, not to mention the impact in overall product competitiveness and quality. Figure 2 depicts this challenge in the V-model, where too much effort is expended on the right side of the V.

A Balanced Systems Engineering Approach

In order for organizations to differentiate their products and systems they must rethink their systems engineering approach. To ensure product and service advantage for the next decade, organizations must move to a multi-disciplinary, collaborative systems engineering process. The following characteristics embody this type of solution:

- Accurately capture the voice of customer (VOC) and efficiently transform it into comprehensive system requirements to ensure the right product is being built
- Automate the flow-down of system requirements into system architecture and software, electrical/electronic, and mechanical requirements and design
- Ensure lifecycle traceability both vertically (from system to subsystem to component) and horizontally (across software, electrical/electronic, mechanical)
- Provide an integrated VVT (verification, validation, and test) solution such that requirements and design are implicitly and explicitly linked
- Foster a collaborative, iterative, and closed loop design process that efficiently allows for trade-off analysis
- Enable organizations to transform text based approaches to model based systems engineering beginning with the harmonization of models with other lifecycle artifacts, such that trace to and through models as well as change management are seamlessly executed in the solution

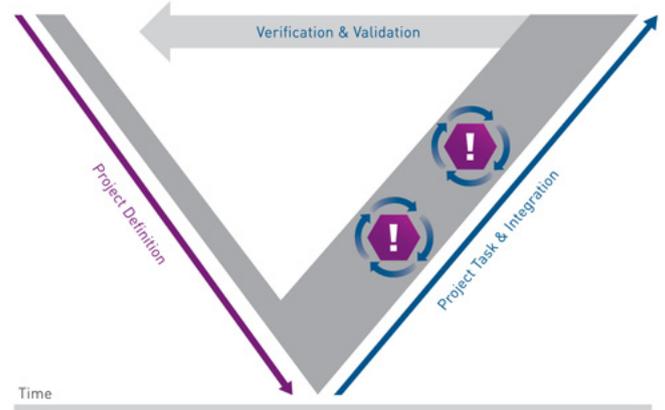


Figure 2—Traditional engineering causes late development breakage and rework.

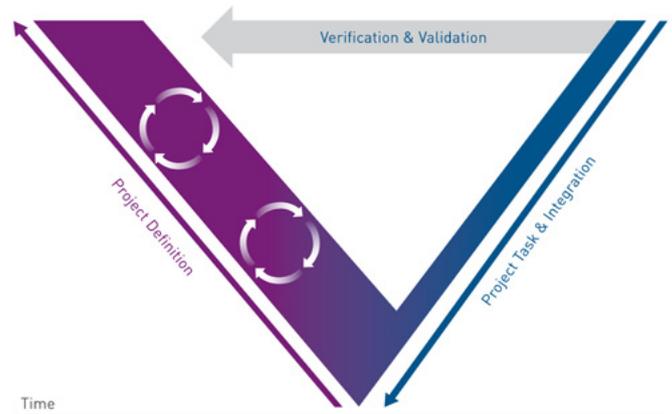


Figure 3 –A collaborative and iterative systems engineering approach.

PTC's Market-Leading Technology Forms the Foundation of a Comprehensive Systems Engineering Solution

PTC is committed to providing a complete, end-to-end solution for systems engineering. With the acquisition of the market-leading MKS Integrity ALM solution, PTC laid the groundwork for a world-class systems engineering solution with integrated requirements engineering and test management capabilities. Since the acquisition, PTC has invested heavily in this technology platform to integrate modeling technologies providing full traceability from requirements to model elements, including simulation and test. In addition, PTC has released the most advanced ALM-PLM integration available today between PTC Integrity and PTC Windchill® supporting:

- Publishing the rich text requirements authored and managed in PTC Integrity to PTC Windchill allowing complete visibility of requirements (including text, diagrams, tables, models, graphics) in context within the PTC Windchill product structure
- Enable requirements flow-down and linking within the PTC Windchill environment for a better designs and complete traceability
- Provide the ability for simple navigation between the environments for editing and real-time updates to requirements, including change notification and impact analysis as links become suspect

The PTC Systems Engineering Vision

With integrated ALM and PLM technologies and an aggressive roadmap to unify these technologies, PTC has the most balanced and advanced vision for systems engineering in the market today. The diagram below shows how PTC Integrity and PTC Windchill allow customers to manage the entire systems engineering V-model ensuring optimal design and development of software-intensive systems and products.

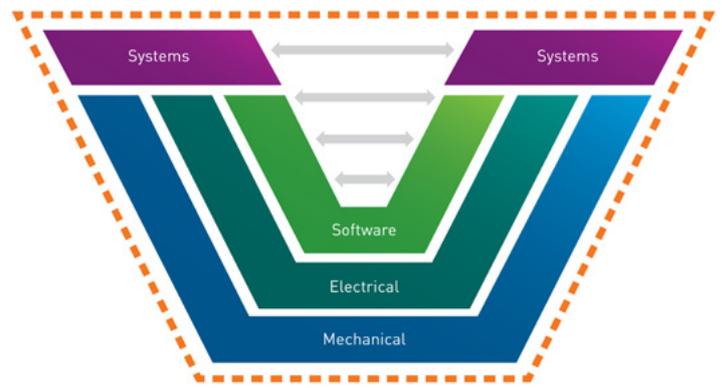


Figure 4 – The PTC Systems Engineering Solution – providing a holistic, multidisciplinary and collaborative approach to analyzing, architecting and evolving complex systems.

For more information visit: PTC.com/product/integrity.

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