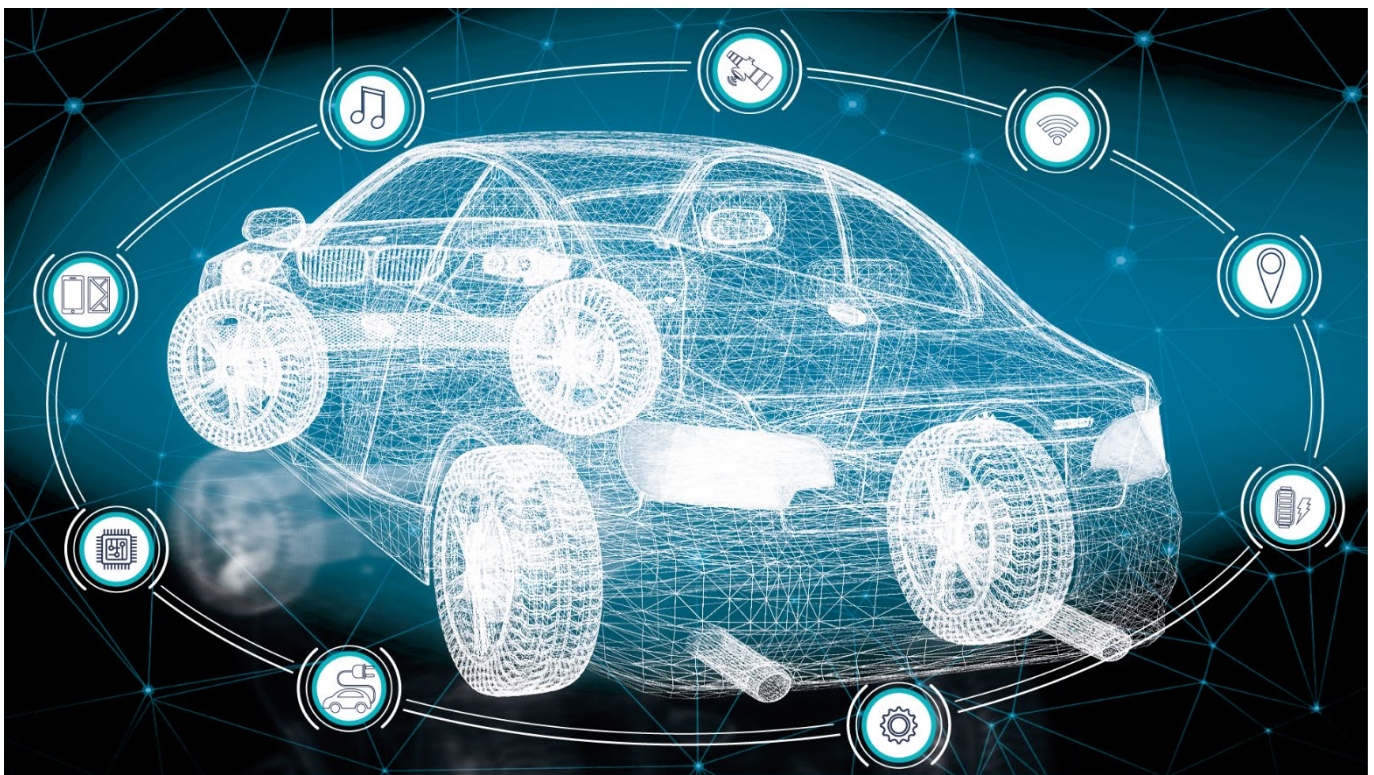


Creating Value Through Collaborative Automotive Engineering

A Period of Significant Change

Even before the covid crisis, the next few years looked like a period of significant change for the automotive industry. Pressure to innovate has perhaps never been stronger in its entire history than it is right now. Decarbonisation, autonomous vehicles and Brexit are changing regulatory demands, driving up product complexity, and encouraging the industry to invest in digital manufacturing and supply chain integration.

Increasing engineering complexity, and a rapid pace of technical and regulatory change, create particular challenges for a heavily optimised lean manufacturing sector like automotive, which needs to be able to guarantee the stability of both its resource and knowledge inputs.



To provide that stability, automotive engineering needs processes and tools equipped to manage complexity in an environment of change. Many in the industry are already looking to the techniques and software associated with systems engineering as a way to provide the rigour and stability necessary to take automotive into the next decade. But while systems engineering practices have become widespread with respect to requirements – including adoption of software like IBM® DOORS® – change has not yet gone as far as it might to better support the future of automotive products.

The most fundamental insight of systems engineering is that managing engineering complexity requires the capability to analyse and work on the system as a whole, independently of the sum of its parts, not just in terms of its emergent properties but also in terms of the whole journey through its life cycle. Systems engineering processes are designed to make that holistic view easy and productive to think about; systems engineering tools are designed to bring that holistic view to the whole team as a flexible and traceable single source of truth about the project.

In the automotive industry, the main benefits of a whole life cycle view come in making sure all the different teams and stakeholders involved in the development process are getting exactly what they need from each other: reducing risk by 'left-shifting' the moment when a defect or inefficiency is discovered, to before associated costs have been committed. This allows engineering to better anticipate and get in front of the risks of change, and for the project to proceed to a highly optimised lean manufacturing process with the assurance of stable engineering inputs.

As such, while using the systems engineering toolkit in a piecemeal way can provide useful project documentation and better stakeholder relationships, to fully deliver its potential value an organisation needs to move beyond a documentation orientation for its engineering processes, and shift toward the whole life cycle perspective of collaborative engineering management. A fuller embrace of systems engineering processes and tools can drive that shift in perspective and provide value by giving the whole team a perspective on the whole product throughout its whole life cycle; essential in an environment of growing complexity and change.

Key Benefits of Collaborative Engineering Management

Collaborative engineering management is about enhancing the life cycle value of a product by looking at the whole organisational environment through a systems engineering lens: talent, process, and tools.



TECHNICAL ARTICLE

Research has consistently shown that higher levels of systems engineering capability and the application of systems engineering effort improve project performance and deliver a significant, quantifiable return on investment, as high as seven to one in some cases^{1,2}. Although of course sensitive to context, this research indicated that the optimal systems engineering effort across studied programmes was as high as 14.4 percent of the total programme cost.

The most successful systems engineering efforts recognise that its value is derived not just from producing cleaner, more traceable documentation for requirements and stakeholder interaction, but from providing a way to fully integrate the engineering environment through a collaborative approach spanning talent, process and tools.

Systems engineering talent is about building depth of expertise amongst your engineering teams in the principles and practices of a formalised engineering management approach. Taking a whole-system and whole-life cycle view of a product requires specific approaches to analysis, modelling and implementation that go beyond the details of a particular workflow and instead consider the macroscopic picture of how those processes, and the subsystems produced, will interact with one another.



Growing systems engineering talent enhances your processes by giving you the ability to optimise and adapt the standard playbook to your particular context, recognising where systems engineering effort can be deployed most cost-effectively and how workflows can be driven by the needs of your industry. And it helps you make the most of your systems engineering tools by ensuring they are deployed and fully utilised to deliver maximum value and return on investment, especially in the area where most organisations fall short: getting teams and tools to work together across the whole life cycle.

Systems engineering processes provide confidence and assurance that teams and stakeholders with different skill sets and objectives are getting what they need from one another, by providing a standardised, comprehensive, and holistic approach to the engineering life cycle. In so doing, engineering teams can move past optimising their workflows with respect to their own narrow domain, and instead look at how those processes interact with other parts of development and manufacturing, providing a smooth value stream across all engineering functions as a whole.

By providing standardised processes covering the full product life cycle, systems engineering enables your talent to focus on where they can really add value, with creative and intuitive input into your product development. And it can enable you to make the most of your engineering tools by providing a stable and repeatable workflow in accordance with using them to their maximum capability.

Systems engineering tools are designed to enable an end-to-end system for managing the entire engineering life cycle, from requirements management through complete systems design, modelling and testing. The best-in-class tools can integrate information for and from all teams and stakeholders with a role in the product life cycle into a single, adaptable source of truth, improving traceability, communication and change-readiness. By having a full life cycle oriented set of systems engineering tools, your talent can work better together with enhanced collaboration and communication features, even with teams working from home, across geographies and even across partner organisations in your supply chain. They can also enhance your systems engineering processes by facilitating traceability, version and variant management, and integrating with other functions through Open Services for Lifecycle Collaboration (OSLC), as well as enabling consistent work across the entire engineering life cycle: from requirements to test, and from workflow management to systems design.

¹ Eric Honour. Systems engineering return on investment, PhD diss, 2013. University of South Australia.

<https://www.hcode.com/seroi/documents/SE-ROI%20Thesis-distrib.pdf>

² Joseph Elm and Dennis Goldenson. The Business Case for Systems Engineering Study: Results of the Systems Engineering Effectiveness Survey. Carnegie Mellon University. November 2012. https://resources.sei.cmu.edu/asset_files/SpecialReport/2012_003_001_34067.pdf

By levelling up capabilities across all three of these pillars, automotive engineering can address the challenges of increased product complexity by providing stable inputs to manufacturing and significantly reducing the risk of unanticipated defects and inefficiencies. And even when this environment of rapid change does catch you by surprise, it provides a smooth, efficient and intelligible perspective on how that change will impact the product and its life cycle as a whole, enabling you to adapt quickly and seamlessly.

Our Collaborative Engineering Management Offering

SyntheSys believes that a business transformation toward engineering integration and collaboration is best served by an integrated and collaborative partner. Our capabilities can address all three pillars of collaborative engineering management, providing you with a clear journey and a one stop shop for improving your systems engineering.

For talent, we can provide formal and bespoke training, mentoring and consultancy across all of your systems engineering needs, including the principles and practices of a formalised engineering management approach, preparation for International Council On Systems Engineering (INCOSE) certification, and how to make the most of your systems engineering tools.

For process, we can provide consultancy and support services to address the role systems engineering plays in an organisation, and how this can be developed and improved to achieve wider commercial objectives. We can help your teams transition to a more systems engineering oriented approach, and provide insights drawn from years of industry experience, and unrivalled knowledge of systems engineering processes, to help tailor your operations to the demands of your specific context.

For tools, as an IBM® Gold Business Partner, we provide application knowledge, experience, and flexible delivery mechanisms to provide our customers with a deep understanding of the software solution that is right for them, to ensure they can maximise effectiveness. We have the expertise and can offer flexible licensing options across the full suite of IBM® Engineering Lifecycle Management tools, including DOORS® and DOORS® Next, Systems Design Rhapsody®, Engineering Workflow Management, Engineering Test Management and Engineering Lifecycle Optimization.



About SyntheSys

SyntheSys provides defence systems, training, systems and software engineering and technical management services over a spectrum of different industry sectors. Along with distinct support and consultancy services, our innovative product range makes us first choice provider for both large and small organisations. Established in 1988, the company focus is on fusing technical expertise with intuitive software applications to solve common industry challenges.