

Accenture Develops MBSE Practice

Helping Clients Transform to Manage Growing Product Complexities

CIMdata Commentary

Key takeaways:

- *The shift to smart, connected products in a wide range of industries revealed the need for systems design thinking to tackle ever-rising complexity while ensuring products meet performance and safety requirements.*
- *Engineering, manufacturing, and service methodologies and processes need to evolve to take advantage of model-based systems engineering (MBSE) practices.*
- *Integrated MBSE provides engineers and managers the ability to see the effects of field results in context of a living product—it facilitates digital twins.*
- *Organizational adoption of MBSE methodologies requires training, coaching, and systems engineering skills as part of a transformation project.*
- *Accenture’s MBSE Practice and coaching capabilities enable Integrated MBSE using the 3DEXPERIENCE Platform and its digital twins.*

Model Based Systems Engineering improves Product Robustness

The pace of product evolution has never been as fast as it is now. Accelerated by digitizing products, product innovation continues with many companies applying systems thinking to help assure product and process reliability. Systems thinking improves a product’s life. CIMdata believes that holistic Systems Engineering (SE) must be integrated and used throughout a product’s life. A digital twin should evolve with the product it represents—especially after production. The context of a digital twin is improved when annotated with field experience, enhancing product understanding using more operational data.¹

CIMdata defines systems engineering as “a trans-disciplinary and integrative approach to enable the successful realization, use, improvement, and retirement of engineered systems, using systems principles and scientific, technological, and management methods.” In this definition, the terms “engineering” and “engineered” are used in their widest sense. working artfully to bring something about.”² SE improves decision making which spans product lines and lifecycles. Leading companies encourage this “systems thinking” by training people with techniques like Design for Six Sigma (DFSS)—encouraging engineers to understand noise³ and control elements when inventing new products.

As new insights are learned, systems engineers continuously explore the product architecture and performance to better understand risks and make refinements and upgrades throughout the product’s life. In today’s world, products are commonly driven by IoT opportunities. That said, a large volume of information can be traced back to the products’ performance. Using this gathered information to improve product models makes the digital twin even more valuable. Digital twin models of product usage and manufacturing form the basis of systemic MBSE—using models to improve SE.

¹ Research for this commentary was partially supported by Accenture.

² Production Definition Drives Integrated MBSE Commentary, December 2020 <https://www.cimdata.com/en/resources/complimentary-reports-research/commentaries/item/14794-product-definition-drives-integrated-mbse-commentary>

³ In a DFSS context, noise refers to environmental variation during product use, variation in manufacturing, and component deterioration.

CONNECTING THE DOTS

SYSTEM MODEL

Functional and behavioral modelling



CONTROL MODEL

Automation and control design, modelling and simulation, FMU co-simulation



3D MODEL

Digital mock-up with realistic and interactive rendering



PHYSICAL MODEL

Integration in physical architecture, MIL, HIL

Figure 1—Can MBSE Help Connect the Dots?
(Courtesy of Accenture)

Figure 1 illustrates the lifecycle breadth and integration requirements for key SE work products. In the past models were built by SE experts based on their knowledge of ideal systems interactions. Sometimes models were tuned with test data. Few efforts were made to have shared models, often the result of organizational design and a lack of systems thinking.

Competitive and complexity pressures require faster decisions made well. SE, DFSS, and design thinking are all skills which practicing engineers must embrace, regardless of their domain of expertise. Product requirements are best managed in a repository containing the authoritative truth that enables different views and analyses as product lines are conceived and enhanced. Accenture’s overall approach is technology agnostic to support the varied environments that exist at their many customers. As such, they need to have deep expertise in the solutions offered in the marketplace to address customer needs.

An example of a PLM ecosystem embracing and encouraging connected SE is provided by Dassault Systèmes CATIA and its modeling applications. While these tools are powerful, organizations need to consider new ways of working to take advantage of these capabilities. System Engineers must work throughout the product design, manufacture, and use phases of the product lifecycle to improve product robustness while handling new complexities. Dassault Systèmes is one of their many partners and is the focus of the examples in this commentary.

Organizations Need Help Applying MBSE Practices

CIMdata’s PLM definition emphasizes complete end-to-end product lifecycle: PLM is a strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition information across the extended enterprise and spanning from product concept to end of life—integrating people, processes, business systems, and information.

Modern PLM platforms offer services to find contextual data from different sources, while also taking advantage of computing evolution. CIMdata believes that PLM is needed to enable the best MBSE practices.

Companies need help understanding, promoting, and developing MBSE within their organizations. A starting point to embracing MBSE at scale is to onboard and upskill existing engineers on MBSE. MBSE use is not just for product model creation and architectural trade-offs, but also serves as a reference framework as products are validated, mass produced, and serviced. Too often application training explains the “how” without explaining the “why” and the “what.” MBSE is not another silo of experts creating another abstraction to make early product decisions. Applied correctly, it can enable whole new ways of developing products faster.

Accenture Helps Companies Needing to Embrace MBSE

Accenture understands how to make MBSE real in a full digital experience: integrating SE and PLM as CIMdata has defined them. Helping their clients acquire the skills and mindset to change their companies to make the MBSE story true is the hallmark of Accenture’s new MBSE practice.

Using the Integrated MBSE capabilities from Dassault Systèmes 3DEXPERIENCE platform Accenture provides experienced practitioners teaching their clients what MBSE is and how best to apply it. The steps summarized in Figure 2 focus on helping interdisciplinary teams understand MBSE and then apply it throughout prototyping and production.

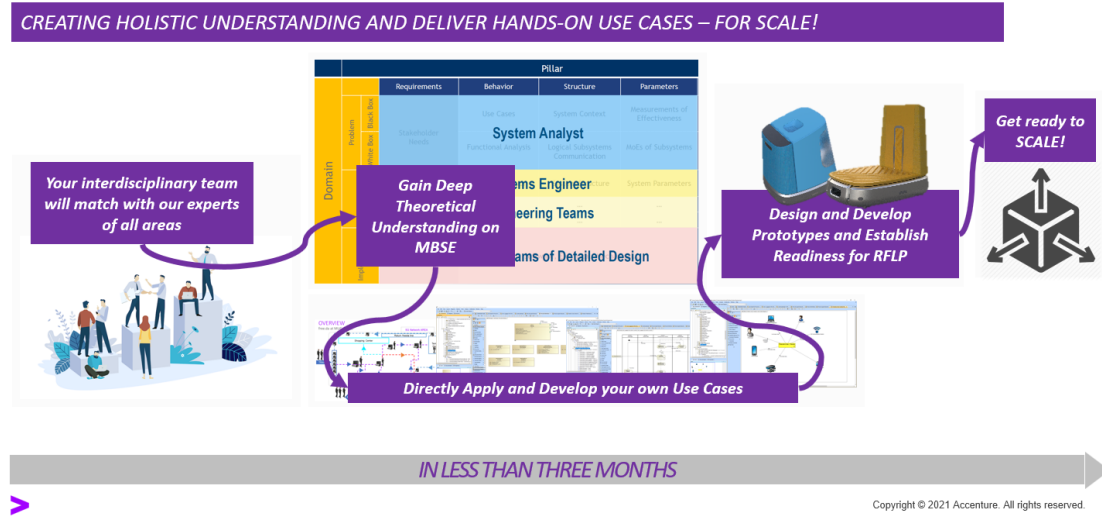


Figure 2—Making MBSE Work at Scale
(Courtesy of Accenture)

“From Zero to Hero in MBSE” is a story Accenture created that illustrates the application of MBSE at a startup company filling a need for a safe, robotic airport luggage carrier—driven by social distancing needs during the pandemic. They produced their first products in 10 weeks with Accenture’s MBSE training program applied during product development—making it real and relevant. Using MBSE models during validation drove success with an in-situ mockup in the airport lounge environment, shown in Figure 3. Applying MBSE models to the many usage scenarios helped to speed dynamic virtual validation.

The company attributed their success to Accenture’s experience in consultative practices and the focus on institutionalizing MBSE. They experienced the value of MBSE on relevant System of Systems use cases—from stakeholders needs to system requirements and system models—combining product, service, connectivity, and business models. They succeeded in creating and operating a well-integrated MBSE culture with one of the most capable PLM environments, even as the workforce collaborated from remote working locations.

Conclusion

As a major global systems integration and consulting firm, Accenture can support a wide range of customer initiatives, from major transformation programs where they leverage the vast capabilities of the Industry X practice down to initiatives focusing on important issues like MBSE.

Today's product complexities require a comprehensive MBSE approach well integrated in a PLM ecosystem enabling all engineers and managers to create and view systems models to help assure product success in the shortest time to market. Accenture has a new MBSE practice that is helping companies not just learn what MBSE is and how to create models but also helping refine the adopting a company's culture to use MBSE models through development, production, and service. Support from MBSE experts and focusing on applied learning and practice improves organizational adoption.

Considering people, process, and tools is essential to applying new product development techniques. PLM's digital twins have richer insights with the use of MBSE providing contexts beyond the product's 3D model and assembly. Accenture's track record of helping companies address skills with training and coaching, making sure it takes hold by applying an expert practice, and measuring and adjusting key processes with feedback provide the basis for long standing organizational evolution. CIMdata's recommends considering Accenture Consultive Services to support industrial MBSE efforts at any level but their expertise and approach is particularly valuable when MBSE is new to the organization, or the skills required do not exist within the organization.

About CIMdata

CIMdata, an independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design, deliver, and support innovative products and services through the identification and implementation of appropriate digital initiatives. Since its founding nearly forty years ago, CIMdata has delivered world-class knowledge, expertise, and best-practice methods on a broad set of product lifecycle management (PLM) solutions and the digital transformation they enable. CIMdata also offers research, subscription services, publications, and education through certificate programs and international conferences. To learn more about CIMdata's services, visit our website at <http://www.CIMdata.com> or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 734.668.9922. Fax: +1 734.668.1957; or at Oogststraat 20, 6004 CV Weert, The Netherlands. Tel: +31 (0) 495.533.666.



Figure 3—Virtual Mockup In-Situ Speeds Virtual Validation
(Courtesy of Accenture)