

Dassault Systèmes' "Science in the Age of Experience" Conference

CIMdata Commentary

Key takeaways:

- *The conjunction of engineered materials, generative design, and additive manufacturing is leading to profound changes in design and manufacturing paradigms*
- *Dassault Systèmes, through their BIOVIA and SIMULIA brands, displays a compelling vision of how science will enable multiple forms of innovation*
- *BIOVIA and SIMULIA applications have capabilities that cover scientific data management and biological, chemical, and materials modeling and simulation*

Over 1,000 people converged on Boston's Back Bay for the first Dassault Systèmes' "Science in the Age of Experience" conference. This event was for customers and partners for two of Dassault Systèmes' brands, BIOVIA and SIMULIA. The BIOVIA brand, which was formed two years ago after the acquisition of Accelrys, has capabilities that cover scientific data management and biological, chemical, and materials modeling and simulation.

SIMULIA is an integral part of Dassault Systèmes' 3DEXPERIENCE® platform, and its applications accelerate the process of evaluating the performance, reliability, and safety of materials and products before committing to physical prototypes. The SIMULIA portfolio has been built through strategic acquisitions like Abaqus, Engenious (Isight), FE-Design (Tosca), Safe Technology (fe-Safe), and Simpack.

One reason to have a joint event is clear: Engineered Materials. BIOVIA simulations can begin at the atomic and molecular level, up through nano- and micro-scale material properties. Results from these can be converted to continuum descriptions of material properties for use in applications like Abaqus. Companies are indeed driving down this path; Mr. Mark Meili, Director of Modeling and Simulation at Procter & Gamble (P&G) commented when presenting at the event that "P&G does simulations that cover ten orders of magnitude in space and twelve orders of magnitude in time." When talking about where P&G is heading, he mentioned: "Simulation is a way to learn. Building a deterministic simulation requires science that we often have not done yet."

Mr. Bernard Charlès, President and CEO of Dassault Systèmes, set the tone in his opening remarks entitled: Enabling Science-Driven Innovation. "Science is at the center of everything we do. It is transforming the world; the way we use it in life, society, and physics," he said. Mr. Charlès highlighted engineered materials, additive manufacturing (AM), and the Internet of Things (including big data) that he saw leading to advances like precision medicine, where the treatment regimen, special drugs, and medical devices are customized for a particular patient.

Later, Mr. Scott Berkey, CEO of SIMULIA, and Mr. Max Carnecchia, CEO of BIOVIA, added, "Nature optimized life over billions of years. Let's make use of that experience." They continued, "Additive manufacturing provides us with the unique opportunity to create bio-inspired generative designs. The technology is at a point where one can create material for purpose, not purpose for material." It clearly indicates the trend that we are at the verge of being able to engineer innovation. Still, there is a long way to go to create the foundational

culture within organizations with a supporting, well-functioning, and cost-effective infrastructure to enable this.

SIMULIA showed substantial progress in two areas of generative design, or topology optimization. One is a tool embedded in CAD (SolidWorks) that suggests shapes for a component designer. The other leverages Tosca technology to generate an AM-capable optimized shape, followed by CATIA technology to express that shape as a traditional CAD entity (in NURBS), all done within the user environment of the 3DEXPERIENCE platform.

Many of the day's speakers stated that they see the conjunction of engineered materials, generative design, and additive manufacturing as leading to profound changes in design and manufacturing paradigms. Sessions on these topics were heavily attended. Compared to previous SIMULIA conferences, the end user community is much more open to those new ideas and knows it is essential for the companies in general if they want to have a competitive advantage, but understands that this involves a steep learning curve. They are eager to listen and learn from the leaders.

At the center of all of this is the Dassault Systèmes' 3DEXPERIENCE platform which is data-driven and model-based, providing the ability to combine the virtual world with the real world (V+R). As a foundational innovation platform it creates a "business experience." For this to function properly (i.e., to bring all the different disciplines properly together) a multi-system, multi-discipline, and multi-scale (in space and time) approach is needed. At the same time, the vision is to connect the virtual and the physical representations through IoT and big data. For example, by using the 3DEXPERIENCE platform, you can define, simulate, and validate an experience. In today's world of autonomous equipment, the environment under which the equipment operates has to be modeled as well (for example, in an autonomous car, which helps you stay within a lane, the roads, lanes, lane conditions, etc., have to be modeled, in addition to the camera and the lane recognition system); this is done before a car is physically prototyped. This is the essence of simulating an experience. Thus, realizing the benefits of V+R.

For sure, this vision is grand and proper. The main challenge is to implement cultural change in the way companies operate in order to make this happen. Virtual and physical engineering need to be brought together. This starts with a consequent deployment of systems thinking, and understanding of the engineering Vee in terms of iterative processes and not just a sequential approach.

In the 3DEXPERIENCE platform the applications are made available on a common platform that includes a number of foundational capabilities like viewing, data management, process automation and orchestration, and data analytics that greatly enhance and simplify the user experience. For example, SIMULIA demonstrates a workflow that begins with generative design with Tosca, goes to CAD (CATIA) for cleanup and final design detailing, then transitions to Abaqus for simulation confirmation, and finally to FE-Safe for fatigue and durability assessment. Because the data transfer between applications is taken care of by the platform, executing the workflow is much simpler than manually coupling the applications in a stand-alone environment. Note that parts of this workflow can be wrapped with an optimizer for further design space exploration and robust design.

A major point in all of the discussions was that to achieve progress in all the areas mentioned above, both the environment and the apps deployed in the environment need to be open and intuitive. Otherwise, it will be too much of a challenge to achieve a cultural transformation and democratization of simulation in general.

In CIMdata's view, platforms like the 3DEXPERIENCE platform now make it possible to include and integrate customer proprietary and other applications such as multi-CAD much more easily than in the past.

Simulation Process and Data Management (SPDM) plays a central role within the platform. SPDM is nowadays more so recognized as moving out of the traditional CAE community to enable model-based systems engineering and cultural transformation of companies. It helps to enable a data-driven and model-based enterprise while simultaneously tearing down the silos to allow collaboration, not just within but also among companies. Yet, the trend to a complete virtual environment requires a cultural transformation as stated previously. To enable virtual engineering, the data needs to be properly captured and managed. Not doing so will guarantee failure.

End-user presentations on SPDM drew overflow crowds. A one-day workshop for existing customers of SIMULIA's applications for SPDM was held the day after the main conference. The afternoon featured a healthy exchange between the end users and SIMULIA's development team.

The industry participants have come a long way in learning from previous experiences when new enterprise-level technologies were introduced. Only through open collaboration between end users and solution providers can new technologies be properly introduced to the market, while at the same time enabling the technology to quickly adjust to the much more flexible end-user requirements.

In CIMdata's opinion, with BIOVIA and SIMULIA, Dassault Systèmes displays a compelling vision of how science will enable innovation, and how their 3DEXPERIENCE platform is enabling and delivering many required capabilities. Dassault Systèmes' vision now extends far beyond their roots in CAD, mechanical design, and product data management.

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