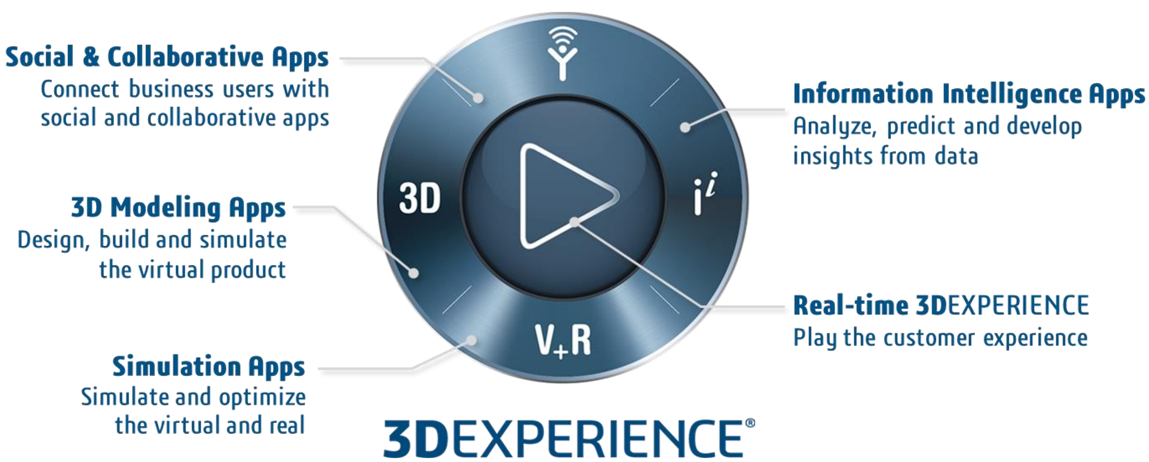
3DEXPERIENCE platform

Consumers today demand experiences that enrich their lives in meaningful ways. *Experience thinking* is a framework for innovation, focusing on engaging consumers with breathtaking experiences that are smarter, intuitive and sustainable. Experience thinking persuades the organization to define the product and related services in the context of the customer usage – a holistic approach to creating value for the customer. Experience thinking encourages companies to consider all aspects of the consumer's experience – only possible when all the players in the innovation process from marketing, sales, design, engineering, manufacturing and the supply chain work collaboratively.

The **3D**EXPERIENCE platform and apps digitalize the customer experience, with capabilities to analyze, design, simulate, engineer and realize experiences. Innovators develop a deep understanding of their customer's operating environment by analyzing social and usage information on the platform with a data-driven approach. The experience is modelled in the context of the operating environment, capturing intelligent interactions between the environment, consumer, product and digital capabilities that harness operational data and provide insightful services. Enterprises then simulate and optimize their offerings encompassing all customer scenarios. During the operating lifecycle, this model is enriched with valuable insights gleaned from the usage data, setting the stage for the next cycle of innovation.



The 3DEXPERIENCE platform digitalizes the customer experience. Dassault Systèmes has re-architected CATIA, DELMIA, SIMULIA and ENOVIA as apps for the platform that interoperate without the need for files, eliminating silos and duplication.

Digital platform for experience innovation

Innovation efficiency is often impeded by multiple hand-offs across disciplines and functions, due to discontinuity in processes and systems, resulting in elongating time-lines and rework. The older generation electronic Product Lifecycle Management (PLM) systems connected the silos together, whereas in a digital platform, the silos are eliminated. The V6 digital architecture, introduced in the year 2008, defined a common data model across CATIA for design, SIMULIA for simulation, DELMIA for manufacturing and ENOVIA for governance applications. For the first time, users could connect online to a single digital definition and collaborate in real-time.

3DEXPERIENCE platform builds on the V6 digital architecture and adds information intelligence, dashboarding and social collaboration capabilities. Businesses now create a private social collaboration environment on the platform and involve employees, partners, suppliers, consumers and other stakeholders as active participants in the innovation process. Leading organizations now adopt a big-data approach to understand all aspects of the customer experience in a data-driven manner and then model and simulate all aspects of the customer experience – virtually perfecting the experience before launching the product to market.

Electronic vs. Digital

In the electronic environment, data is static, typically contained in a file. Electronic systems store files, encapsulate files with meta-data and relate files to one another. Whereas, digital systems manage live data that is manipulated and related to other information in a fine-grain manner.

In the traditional *electronic* approach that PLM systems employ, when designers work on different parts of a product, they copy their design files (check-in) to the PLM server, and other users copy the files from the server to their local machine (check-out). When changing the design, the designer locks the file on the server, changes the local file and copies the file back on to the server, creating a new version. This triggers an action for users to update to a new version. This batch-mode of sharing files leads to rework due to designers working on outdated information, not to mention the additional effort required for downloading and uploading large design files.

In the digital platform, users worked directly online and update their respective designs concurrently, saving time. In the same manner, designers, analysts, process planners and other participants from across the value chain work concurrently as well.

Data-driven customer experience

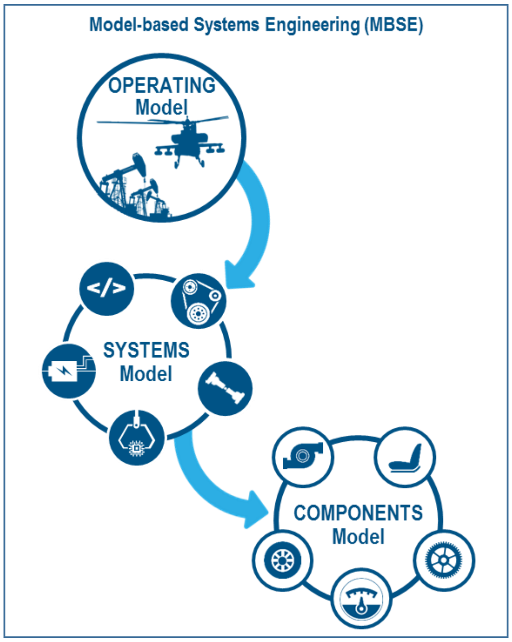
3DEXPERIENCE platform's powerful big-data capabilities make it possible to analyze structured and unstructured data, integrate data from both external and internal sources, and provide dashboards that deliver actionable information to all stakeholders in a secure and auditable manner.

Advanced algorithms process data, find meaningful trends and develop insights. For example, algorithms analyze customer feedback on social networks and provide insights into the factors contributing to the rate of adoption of a product.

Often the data required for decision making is present in disparate systems. For example, when an engineering change to address a major customer concern is contemplated, data relating to the weight, cost, manufacturing and supplier impact might be found in disparate systems. Manually collecting all the data and developing a meaningful analysis is tedious and time consuming. With a big-data approach, data in multiple systems is indexed; meaningful relationships between data is uncovered; and an aggregate view is presented in a dashboard. In short, a *data-driven* decision making capability is established at all levels of the organization.

Model and simulate the customer experience

Traditionally, building many physical prototypes and subjecting them to exhaustive tests was the only way to predict innovation effectiveness. This reliance on prototypes however, has proven to be time consuming and expensive. Moreover, the sophistication and versatility of today's products have made it more difficult to test all possible scenarios, thereby limiting the scope of validation.



Today, modeling and simulation is at the heart of the innovation process. The innovation process typically calls for multiple models of varying degrees of fidelity and a variety of simulation techniques. Early in the process, a low fidelity model is employed to understand the systems interactions and behavior; while later as the product definition matures, higher fidelity models are adopted to guide optimization along often-conflicting functional attributes and cost. Thus a fit, form and functional model of the product from conception to operations is digitalized on the 3DEXPERIENCE platform and simulated against a whole range of customer usage conditions, perfecting the experience virtually.

This model-based approach is not only confined to the development phase; it is employed in all activities across the enterprise. For example, planners define the process model and simulate the assembly operations to meet cycle-time constraints and service engineers define reliability models to guide maintenance planning.

Requirements driven systems engineering (RDSE) and Model-based systems engineering (MBSE)

Dassault Systèmes serves customers in 12 industries and has evolved a comprehensive framework to guide the model-based transformation in discrete industries. The Requirements-Functional-Logical-Physical (RFLP); Model-Scenario-Results (MSR); Product-Process-Resource (PPR) framework unites different disciplines and functions digitally by connecting views of the model across the lifecycle. The RFLP-MSR-PPR framework supports both the traditional requirements driven systems engineering as well as model-based systems engineering methodologies.

The traditional requirements driven systems engineering (RDSE) methodology was developed so that a system could be decomposed into multiple sub-systems and each sub-system could be independently engineered, manufactured and serviced. The emphasis was laid on defining requirement specifications such that the sub-systems and its interactions with other sub-systems were clearly defined. This method emphasized upfront planning, analysis and specification. Hence, the term Requirements Driven Systems Engineering. In practice, it was always very difficult to specify with high level of accuracy upfront and to resist changes to specifications during development. By and large this methodology has been inadequate and has led to delayed programs and last minute surprises; commonly referred to as the *requirements-delay-surprise* factor!

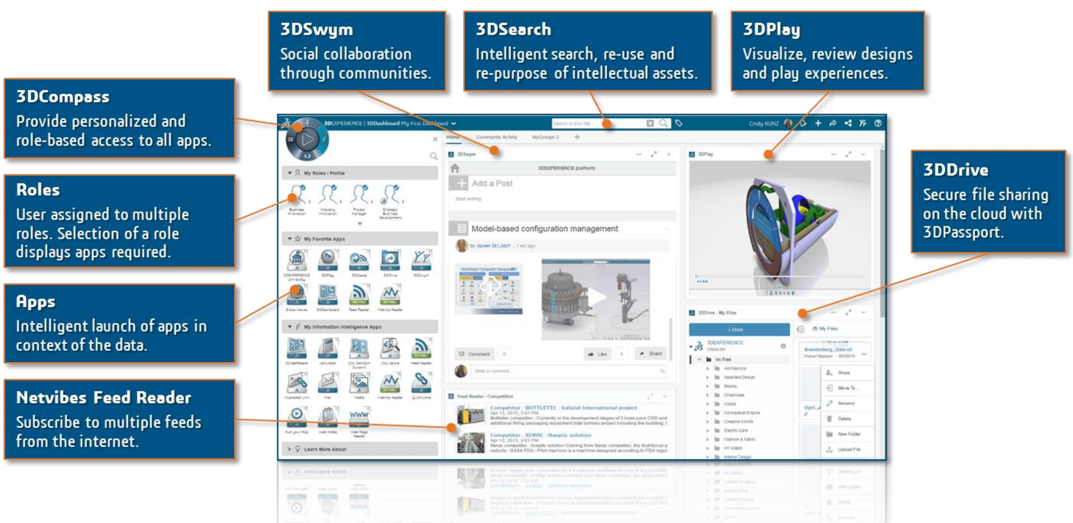
In model-based systems engineering(MBSE), modelling and simulation play a crucial role. An operational model is first developed to understand all usage conditions, including the surrounding environment; then systems models are built and simulated; finally, component models are developed. Change is integral to this methodology and requirements, structure, and behavior are derived and finalized with the help of the models. In short, the *model is the master!*

Virtual + Real

With the virtual models as the master, the physical systems assembled, are just twins of the model. Virtual models are continuously correlated with behavioral data from physical systems during the operating life of the product. The data is used to analyze usage patterns and further enhance the operations experience. Any enhancements required in the operating product is first simulated in the virtual model, fine-tuned and optimized, before incorporating in the real world. The knowledge gained from this virtual + real correlation is also used to enhance the fidelity of the virtual models. In fact, the fidelity of the simulation is significantly enhanced by connecting the virtual model to physical systems, also called, *Hardware in the Loop (HIL)*. Thus the real and virtual worlds reinforce each other – virtual models as the master for the real world, and experiences from the real world enhancing the virtual model.

Common apps and services to connect everyone to the platform

The **3D**EXPERIENCE platform provides the underpinning apps and services that enable the transformation to a digital, data-driven, model-based environment. The common apps and services provide an effective way to connect everyone early in the innovation process. Social collaboration with *3DSwym* is a great way to harness the innovative ideas from everyone. With the *3DDashboard* users monitor the things they care about – follow online trends, be alerted by data feeds, and at the same time monitor enterprise processes and data. Users see everything that's happening, 24/7, all in one dashboard. With *3DDrive* users securely store their documents on the cloud, access them from any device and share them with co-workers and collaborators across the value chain. Users collaborate instantly using *3DMessaging* with immersive visualization of 3D assemblies with *3DPlay*.



In summary, insightful data about the consumer's experience and predictive models are at the heart of an effective innovation process. Adopting a digital platform across all functions involved in the innovation process sets the foundation for an effective data-driven, model-based approach to experience innovation. The **3D**EXPERIENCE platform provides the underpinning capabilities to digitalize *experience thinking*.