

ELEVATING QUALITY, EMPOWERING YOUR VISION

Redefining Aerospace and Defense:
Continuous quality improvement as the enabler for innovation

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Introduction

The ebook "*Elevating Quality, Empowering Your Vision*" delves into Dassault Systèmes' pioneering approach to Total Quality Management (TQM) within the aerospace and defense industry.

It lays out a strategic framework for transitioning from reactive to proactive quality management, underlining the significance of continuous improvement and innovation in maintaining global competitiveness.

Through the integration of advanced technologies and collaborative ecosystems, this guide aims to redefine industry standards by enhancing product quality while driving operational efficiency and customer satisfaction.

Foreword by Executive Leadership

«From **firefighting** quality management on the shop floor towards **continuous quality improvements**...

With the Dassault Systèmes **total quality management** solution on the **3DEXPERIENCE** collaboration platform, we provide the full set of **integrated business processes** based on A&D quality standards to our customers, in order to establish a culture of continuous quality improvement and ensure a **collaborative** environment for quality management is put in place. In addition, quality management is more than just new tools and processes, it is as well about connecting an entire ecosystem in a collaborative manner and **elevate up quality** in everyone mind, as it reaches cross organizations into project management, simulations, digital manufacturing, support and service aftermarket, manufacturing & service operations **and many more.**»

**Enrico SCHARLOCK, Aerospace & Defense Industry
Solution Experience Senior Director**

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CHAPTER 1: THE ESSENCE OF QUALITY IN AEROSPACE AND DEFENSE

An overview of TQM and its critical role in aerospace and defense

TQM plays a pivotal role in aerospace and defense, focusing on continuous quality improvement across all organizational levels. In this highly competitive and regulated sector, TQM ensures that products and services meet or exceed customer expectations, reduce errors, and improve safety and reliability.

Integrating TQM strategies helps companies to enhance their operational efficiency, innovate, and maintain strict compliance with industry standards, thereby safeguarding reputation and ensuring customer loyalty and trust in the long term.

Historical perspective and evolution of quality management at Dassault Systèmes

The historical perspective and evolution of quality management at Dassault Systèmes reflect a journey of innovation and excellence. Initially focusing on delivering advanced aerospace and defense solutions, the company recognized the necessity of integrating quality into every aspect of its operations and products.

Over the years, Dassault Systèmes has transitioned from traditional quality assurance methods to a comprehensive TQM approach.

This evolution underscores a commitment to continuous improvement, leveraging cutting-edge technologies, and fostering a culture that prioritizes quality, ensuring the delivery of superior products and services.

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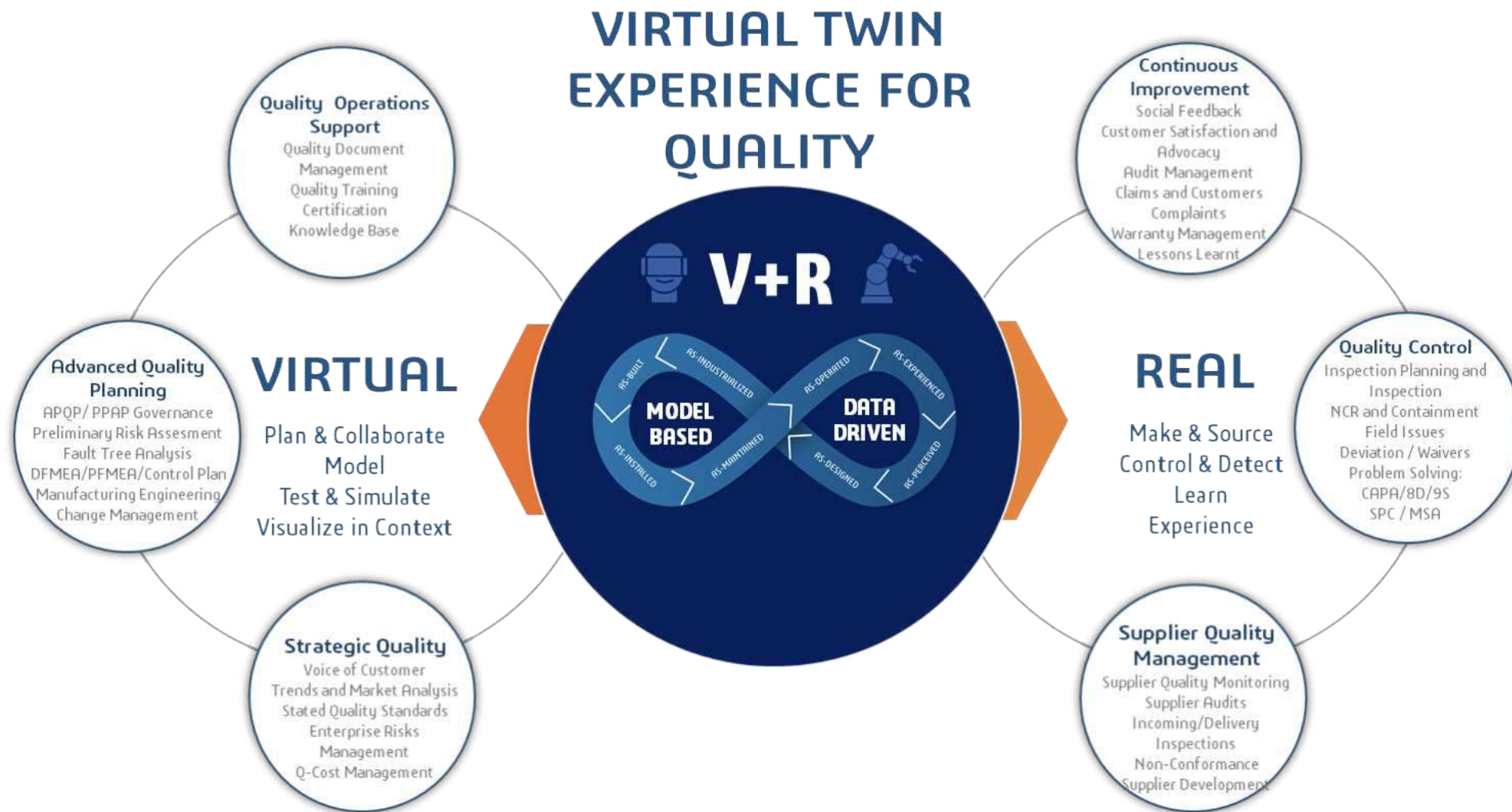
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The claim "Elevating Quality, Empowering Your Vision" in action

"Elevating Quality, Empowering Your Vision" encapsulates Dassault Systèmes' commitment to enhancing the standards of quality across industries while enabling customers to realize their innovative visions.

This philosophy translates into action through comprehensive TQM solutions, integrating advanced technologies and methodologies to improve product and service quality.

It empowers businesses to surpass traditional quality management, fostering a culture of continuous improvement and innovation, aligning operational processes with strategic goals, thus transforming challenges into opportunities for growth and advancement.

Quality Management KPIs

Gain in Efficiency

- ⚡ Reduce risks and build confidence
- Reduce rising costs of defects
- Reduce scheduled aircraft maintenance
- Reduce production downtime and reduce inspection times

Gain in Accuracy

- 🕒 Detect errors earlier
- 🕒 Take better decision earlier
- ✓ Increase product and process controls
- 😊 Improve human working condition
- 😊 Satisfy customers

Drive Innovation

- 💡 Enable innovation in an environment of quality constraints

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CHAPTER 2: THE JOURNEY OF QUALITY TRANSFORMATION

The shift from reactive to proactive quality management

The shift from reactive to proactive quality management marks a fundamental change in organizational mindset and operations. Instead of addressing quality issues as they arise, this approach emphasizes anticipating potential problems and implementing preventative measures.

By integrating predictive analytics, risk assessment, and continuous feedback loops into their processes, organizations can identify and mitigate risks before they impact quality.

This proactive stance not only improves product and service standards but also enhances efficiency, reduces costs, and increases customer satisfaction.

Implementing a culture of continuous improvement and innovation

Implementing a culture of continuous improvement and innovation involves fostering an environment where feedback is encouraged, and every team member is committed to enhancing processes and outcomes. This culture values learning and development, empowering individuals to identify inefficiencies and suggest innovative solutions.

It requires robust systems for tracking progress, celebrating achievements, and iteratively refining approaches based on data-driven insights, thereby embedding continuous improvement and innovation into the fabric of the organization.



The impact of TQM on cost savings, productivity, and customer satisfaction

The implementation of TQM significantly impacts cost savings, productivity, and customer satisfaction. By focusing on quality in every aspect of the organization, companies can reduce waste, lower costs due to errors, and enhance operational efficiency.

This increased productivity leads to faster delivery times and higher quality products or services. Consequently, customer satisfaction improves as clients receive better value, driving loyalty and positive word-of-mouth, essential for competitive business environments.

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CHAPTER 3: TQM AT DASSAULT SYSTÈMES

A seamless integration across ENOVIA, CATIA, DELMIA and NETVIBES fostering a holistic TQM approach specific to aerospace and defense requirements.

Lifecycle Collaboration (ENOVIA)

- **Centralized project management:** ENOVIA facilitates the alignment of product life cycles in aerospace and defense, ensuring coherent and efficient progression from design to decommissioning.
- **Synergistic team collaboration:** ENOVIA fosters a collaborative environment where teams can work together effectively, maintaining quality and ensuring compliance with industry regulations.
- **Integration of lifecycle management:** By incorporating comprehensive lifecycle management, ENOVIA helps sustain innovation and market competitiveness in the aerospace and defense sectors, addressing evolving challenges and opportunities.

Safety Assessment (CATIA)

- **3D model-based** failure mode and effects analysis to detect failure as early as possible starting from the concept phase and fully immersed within the 3D model-based design, limiting cost, time and certification delay.
- **Quality management integration from the design phase:** CATIA allows for an integrated approach to embedding quality standards directly into the design and key characteristics, thus reducing rework needs and improving product compliance.
- **Design optimization for quality and performance:** Utilize CATIA to refine designs to enhance the quality, performance and safety of aerospace and defense products while minimizing development time and costs.
- **Concept safety assessment** empowers engineering organizations with an integrated safety process to secure concept safety and performance targets reach. All possible failure modes and gravity effects of a system will be identified consistently with the architectures, and probability occurrences will be computed by leveraging on libraries of reliability sources.

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Operational Excellence (DELMIA)

- **Advanced simulation:** DELMIA offers advanced simulation tools for aerospace and defense, allowing companies to model, analyze, and optimize manufacturing processes and scenarios, ensuring efficiency and readiness for complex situations.
- **Production line optimization:** DELMIA aids in refining production lines to boost product quality specifically in aerospace and defense, aligning with strict industry standards and customer expectations.
- **Continuous improvement:** DELMIA enables ongoing enhancement of manufacturing practices, tailored to meet the unique demands and challenges of the aerospace and defense sectors, fostering innovation and quality excellence.

Data-Driven Insights (NETVIBES)

- **Real-time data gathering:** NETVIBES enables aerospace and defense industries to collect and analyze data in real time, facilitating immediate understanding and swift action to maintain operational efficiency and quality standards.
- **Predictive analytics:** This feature helps forecast industry-specific challenges, allowing businesses to proactively address potential issues before they escalate, thus safeguarding continuity and performance.
- **Data-driven strategic decision-making:** By leveraging comprehensive analytics, companies can streamline their operations, ensuring decisions are informed by accurate and timely data, enhancing overall strategic planning and execution in aerospace and defense environments.

DASSAULT SYSTÈMES' TOTAL QUALITY MANAGEMENT (TQM) APPROACH



An integrated approach enhancing product quality and operational efficiency through collaborative tools and data-driven insights.

Reaches "first time right" and reduces cycle time by up to 80%.



- ENOVIA: Enhance lifecycle collaboration
- CATIA: Design innovation
- DELMIA: Streamline production
- NETVIBES: Drive data-driven decisions

Supporting data-driven quality for operational excellence



Strengthen TQM with a collaborative ecosystem, uniting employees, suppliers and partners for quality excellence.



Empower TQM with AI, machine learning, and virtual twins for predictive analytics and enhanced manufacturing precision.



Demonstrating TQM's success through significant improvements in cost, productivity and customer satisfaction. 4.3% to 8.6% of total sales is attributed to the cost of quality.



Embracing sustainability, digital transformation and customer-centric solutions for industry advancement.

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The role of digital transformation in elevating TQM

The role of digital transformation in elevating TQM involves integrating advanced digital tools and methodologies into traditional quality management processes.

This transformation enables organizations to collect and analyze data more efficiently, improve communication and collaboration across departments, and streamline operations.

By leveraging digital technologies, companies can gain better insights into their quality management systems, predict potential issues before they arise, and respond more quickly to customer needs and market changes, ultimately leading to improved product quality and customer satisfaction.

Leveraging 3DEXPERIENCE platform for integrated quality management

Leveraging the [3DEXPERIENCE platform](#) for integrated quality management transforms the traditional approach to TQM. It enables an interconnected ecosystem where different stages of product development are linked, from concept to customer.

This ensures that quality is not an afterthought but a foundational element integrated throughout the lifecycle.

By providing a central repository for data, it promotes informed decision-making, fosters preventive strategies, and enables a seamless transition between different phases of quality management, enhancing efficiency and reducing time to market.

Future trends: AI, ML, and virtual twins in quality management

The future of quality management is being shaped by advancements in artificial intelligence (AI), machine learning (ML) and virtual twins.

These technologies offer predictive analytics for identifying potential quality issues before they arise, enabling proactive quality control.

AI and ML facilitate pattern recognition and data analysis, enhancing decision-making processes. Virtual twins, digital replicas of physical products or systems, allow for simulation and testing under various conditions, reducing the need for physical prototypes and enabling continuous improvement in quality management practices.

This integration represents a significant shift towards more dynamic, data-driven quality control mechanisms.

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The importance of collaboration across the value network

Collaboration across the value network involves fostering partnerships and teamwork among all stakeholders within the aerospace and defense ecosystem.

This collaborative network not only enhances quality and innovation but also ensures that all members, including suppliers, are aligned with the same quality standards and objectives.

This unity leads to more efficient problem-solving, faster innovation cycles, and ultimately, superior end products that meet or exceed customer expectations, driving the industry forward in a competitive market.

By breaking down silos and encouraging open communication, organizations can create a resilient, quality-driven ecosystem that supports sustainable growth and innovation.

Strategies for fostering a quality-centric culture within and beyond organizational boundaries

The different strategies to foster a quality-centric culture within and beyond organizational boundaries include:

- Establishing strong leadership commitment to quality,
- Embedding quality values into corporate strategy,
- Promoting open communication and transparency,
- Engaging all employees through training and empowerment,
- Extending quality principles to suppliers and partners,
- Implementing robust quality measurement and feedback systems,
- Fostering an environment of continuous improvement.

These strategies ensure that quality is a shared value, driving collective efforts towards excellence.

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Navigating future challenges in aerospace and defense with TQM

Navigating future challenges in aerospace and defense with TQM involves adopting a forward-thinking approach focused on continuous improvement, risk management, and innovation. By integrating TQM principles, organizations can enhance operational efficiency, adapt to regulatory changes, and meet evolving customer needs.

Emphasizing collaboration, data-driven decision-making, and technological integration - such as AI and digital twins - will equip companies to address future challenges, maintain competitiveness, and achieve sustainable growth in the dynamic aerospace and defense sectors.

Opportunities for further innovation and leadership in quality management

Opportunities for further innovation and leadership in quality management include leveraging emerging technologies like AI and big data analytics for predictive quality insights, implementing sustainable and environmentally friendly manufacturing practices, and fostering a culture of continuous learning and adaptation.

By prioritizing these areas, organizations can not only enhance their quality management processes but also position themselves as leaders in the field, driving the industry forward while meeting the evolving needs and expectations of customers and stakeholders.

Vision for the future: where TQM will take aerospace and defense in the next decade

In the next decade, TQM is expected to revolutionize aerospace and defense by integrating cutting-edge technologies, enhancing supply chain transparency, and fostering a culture of continuous improvement and innovation.

By prioritizing sustainability, resilience, and customer-centric solutions, the sector will not only meet but exceed current standards and expectations, leading to safer, more reliable, and more efficient aerospace and defense solutions.

This evolution will be characterized by increased collaboration, digital transformation, and a commitment to excellence, setting new benchmarks in quality and performance.

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Reflecting on the Journey of Quality Empowerment: "Redefining aerospace and defense: Continuous quality improvement as the enabler for innovation"

Continuous quality improvement is not just a strategy, but a foundational pillar transforming aerospace and defense industries. This journey has redefined the realms of possibility, placing innovation at the heart of quality management. The future beckons with promises of advancements rooted in steadfast dedication to excellence, urging us to maintain the momentum, continually push boundaries, and shape a safer, more efficient world through unwavering commitment to quality.

For more information, visit: <https://www.3ds.com/industries/aerospace-defense>

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Glossary of TQM and Industry Terms

- **TQM (Total Quality Management):** A management approach centered on quality, based on the participation of all members of an organization and aiming at long-term success through customer satisfaction.
- **3DEXPERIENCE platform:** Dassault Systemes' software solution providing companies with a 3D design environment, simulation, information and intelligence software, and an online collaboration platform.
- **Continuous improvement (Kaizen):** A method of regularly improving products, services, or processes through incremental and breakthrough improvements.
- **FMEA (Failure mode and effects analysis):** An analytical methodology used to ensure potential problems have been considered and addressed throughout the product and process development process.
- **CAPA (Corrective and preventive action):** Procedures used by companies to mitigate deficiencies and to improve the strength of the quality management system.
- **Six Sigma:** A set of techniques and tools for process improvement aimed at reducing the probability of defect or error.
- **Lean manufacturing:** A systematic method for waste minimization within a manufacturing system without sacrificing productivity.
- **APQP (Advanced product quality planning):** A framework of procedures and techniques used to develop products in the automotive industry, applicable in various sectors for quality management.
- **Virtual twin experience:** A virtual representation that serves as the real-time digital counterpart of a physical object or process, utilized extensively by Dassault Systemes in our solutions.
- **ISO 9001:** An international standard that specifies criteria for a quality management system (QMS).
- **Quality control:** A process through which a business seeks to ensure that product quality is maintained or improved with either reduced or zero errors.
- **Risk-based thinking:** An approach to decision-making and planning that involves risk assessment and mitigation strategies.
- **Supply chain management:** Handling the entire production flow of goods or services — from raw materials to final products.
- **End-to-end quality management (E2E QM):** A holistic approach to quality management that considers every step of the product life cycle, from initial concept to end-of-life.
- **AI (Artificial intelligence) and ML (Machine learning):** Technologies that provide systems the ability to automatically learn and improve from experience without being explicitly programmed.
- **Stakeholder engagement:** The process by which an organization involves people who may be affected by the decisions it makes or can influence the implementation of its decisions.
- **Process optimization:** The practice of making adjustments or changes to optimize specified set of parameters without violating constraints.
- **Customer satisfaction:** A measure of how products and services supplied by a company meet or surpass customer expectation.
- **Quality metrics:** Standardized methods for measuring various aspects of quality including reliability, efficiency, and performance.
- **Digital continuity:** The consistent digital presence of product or process information across all phases of its lifecycle.

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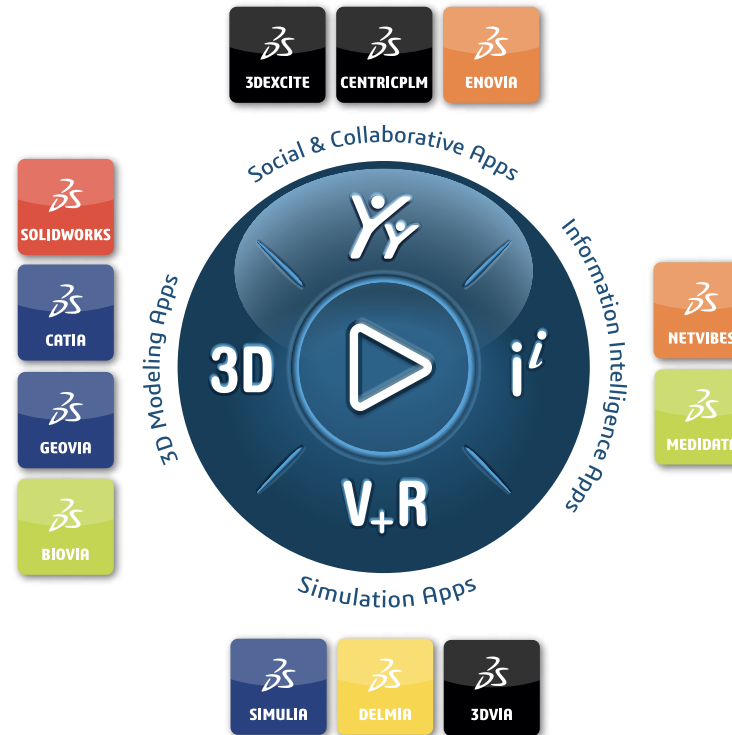
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Our **3DEXPERIENCE**® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our **3DEXPERIENCE** platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all –consumers, patients and citizens.

Dassault Systèmes brings value to more than 300,000 customers of all sizes, in all industries, in more than 150 countries. For more information, visit www.3ds.com.



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