DELMIA

TRANSFORMING MANUFACTURING OPERATIONS MANAGEMENT WITH CLOUD

Strategies for MOM modernization and operational resilience

DASSAULT SYSTEMES

In the evolving realm of Manufacturing Execution Systems (MES) and Manufacturing Operations Management (MOM), a discernible shift is underway. Over the past 12 months, Gartner's interactions with more than 300 clients have revealed a growing interest in the transformative potential of cloud solutions.[1]

This curiosity finds solid ground in Gartner's projections, foretelling a robust 17% compound annual growth rate in the industry cloud platform market, set to reach a formidable $260.9 billion by 2027.[2] Yet, the real intrigue lies in the specifics of MES/MOM, where attention is gravitating towards Software as a Service (SaaS) and Cloud solutions.

A noteworthy revelation from Gartner's recent analyses: more than 30% of MES/MOM inquiries explicitly express a keen interest in SaaS and Cloud solutions. This figure stands not just as a statistic but as a compelling indicator of an industry actively seeking transformative tools. The implication is clear—cloud-based platforms are no longer a mere convenience; they represent a strategic imperative, promising scalability, flexibility, and operational efficiency.

In this eBook, we delve into landscape trends, illuminate the benefits of MOM on the cloud, dissect challenges, and provide actionable steps for organizations to transition to the cloud.

[1] Dennis Smith and Padraig Byrne, "Market Guide for Cloud Management Tooling," Gartner, June 19, 2023.
[2] Gregor Petri, Yefim Natis, Wataru Katsurashima, James Ingham, Andrew Meyer, "Top Strategic Technology Trends for 2024: Industry Cloud Platforms," Gartner, October 16, 2023.
- Reference: "Market Opportunity Map: Industry Cloud Platforms, Worldwide."

OPPORTUNITY DRIVERS WITH CLOUD ADOPTION

Cost Savings

By eliminating the need for extensive on-premises hardware, organizations experience a marked reduction in maintenance costs. The payment model, typically structured as an upfront annual subscription, provides stability and predictability. This financial model circumvents capital expenditure, establishing a resilient and cost-effective structure.

Scalability

The scalability of cloud-based MOM/MES systems stands as a pivotal driver for their increased adoption. These systems exhibit the agility to scale up or down, seamlessly accommodating fluctuating production needs. Such flexibility empowers organizations to respond adeptly to demand variations without necessitating substantial investments in additional infrastructure.

Accessibility

One of the defining features of cloud-based systems is their accessibility from anywhere with an internet connection. This accessibility transcends geographical boundaries, enabling remote monitoring and management of manufacturing processes. Real-time visibility into operations is a strategic advantage in today's interconnected and globalized business landscape.

Integration

Specifically designed to integrate effortlessly with other software applications, such as Enterprise Resource Planning (ERP) systems, cloud-based MOM/MES systems streamline manufacturing processes. This integration capability enhances overall operational efficiency and data coherence across diverse systems.

Disaster Recovery

Cloud-based MOM/MES systems provide reliable data backup and recovery solutions, mitigating the risk of data loss in unforeseen events—ensuring continuous and secure operations. Providers, drawing on extensive architectural expertise, implement multi-tiered backups, encompassing power and internet connectivity. Automated server switchover in the event of a failure ensures immediate issue resolution, transparent to application users. This proactive approach addresses potential disruptions effectively.

Updates and Maintenance

Cloud vendors shoulder the responsibility of software updates and maintenance. This proactive management ensures that organizations consistently benefit from the latest features and improvements without the need for manual efforts. The automatic and seamless integration of updates minimizes disruptions and optimizes system performance.

Environmental Sustainability

Beyond operational advantages, cloud computing aligns with the broader commitment to environmental sustainability. By optimizing resource utilization and energy efficiency, cloud-based MOM/MES systems contribute to reducing an organization's environmental footprint. This is in line with the growing emphasis on corporate social responsibility and sustainable business practices.

OBSTACLES TO CLOUD ADOPTION

1 Connectivity and Latency

In the manufacturing landscape, where real-time data is crucial, a reliable internet connection is critical for successful cloud adoption. Network latency and downtime can disrupt operations, underscoring the indispensable need for a robust network infrastructure.

2 Data Security and Privacy

Despite enhanced security measures from cloud providers, organizations must vigilantly safeguard sensitive data. Implementing strong security measures, including data encryption, and adhering to industry regulations are crucial to prevent potential breaches and unauthorized access. The challenge is in aligning internal security practices with cloud capabilities for a cohesive and resilient security framework.

3 Integration Complexity

Integrating cloud-based MES/MOM with existing on-premises systems and machinery presents a complex puzzle. The seamless flow of data and communication between cloud and on-premises components requires meticulous planning and execution for a successful transition.

4 Data Migration

Moving existing data and processes to the cloud can be challenging. Technical debt, stemming from extensive customization of legacy systems may necessitate adjustments in data formats to align with cloud system requirements. Careful planning, data validation, and potential adaptations are imperative.

5 Downtime and Disruption

The migration process, encompassing testing and deployment, can lead to system downtime. Mitigating disruption is crucial, requiring meticulous planning to ensure that critical processes can continue seamlessly during the transition.

6 Cost Management

While cloud adoption promises cost savings, effective management of cloud expenses is essential. Organizations must closely monitor resource utilization and optimize their cloud spending to prevent unexpected escalations.

7 Vendor Lock-In

Relying on proprietary services of a specific cloud provider can result in vendor lock-in. Organizations can consider implementing open standards and ensuring data portability to facilitate a smoother transition, should it become necessary.

8 Regulatory Compliance

Various industries have distinct regulatory requirements. For example, ensuring compliance with standards such as ISO or FDA guidelines for the pharmaceutical industry is imperative for a seamless and compliant cloud solution.

9 Change Management

Employees may resist changes to their familiar on-premises systems. Successful cloud adoption requires an effective change management strategy, providing comprehensive training and support to the workforce throughout the transition.

10 Data Ownership

Clarifying data ownership and responsibility between the organization and the cloud provider is pivotal. Understanding who controls and accesses the data is crucial for compliance and effective risk management.

Understanding Cloud Service Models

Cloud computing provides diverse services tailored to specific business needs. Here's a quick overview as understanding these models aids organizations in choosing the right cloud service aligning with their operational needs and goals.

SaaS (Software as a Service)		
What it provides	**Management**	**Use case**
Ready-to-use software applications via the internet	Handled by the provider, requiring minimal client-side effort	Ideal for end-users needing hassle-free access to applications

PaaS (Platform as a Service)		
What it provides	**Management**	**Use case**
A development platform with tools and services	Clients handle applications and data, while the provider manages infrastructure	Developers build, deploy, and scale applications without infrastructure concerns

IaaS (Infrastructure as a Service)		
What it provides	**Management**	**Use case**
Virtualized computing resources (servers, storage, networking)	Clients control OS, applications, and data; provider manages infrastructure	Organiziations require scalable infrastructure without physical hardware management

NAVIGATING THE TRANSITION TO CLOUD

Start with a Simple and Gradual Approach
Embark on your cloud journey by focusing on well-understood processes, such as assembly or low-speed tasks like welding. Initiate the transition with a single production line or station, minimizing complexity. In the early stages, prioritize manual data entry and monitoring, deferring complex IIoT or machine integration.

IT/OT Convergence and Site-Level Assessment
As confidence grows, progress toward IT/OT convergence to bridge the gap between IT and OT systems. Simultaneously, conduct a thorough assessment of the current architecture at each industrial site. Understand its uniqueness and safety measures, laying a robust foundation for the transition.

Incorporate Edge Computing and Secure Connectivity
Embrace edge technology, where data is processed closer to the data source, reducing latency and ensuring real-time insights. Extend cloud-based tools to site assets, addressing connectivity challenges using methods like satellite links, private 5G, and dedicated VPNs with end-to-end encryption. This ensures secure and seamless communication between the cloud and on-site assets.

Adopt a Hybrid Cloud Architecture
Implement cloud-based tools at the site level to enhance data operations. Leverage edge computing for local data collection and processing, effectively addressing connectivity issues. Ensure secure data exchange between the cloud and on-premises environments, maximizing the benefits of a hybrid cloud approach. Utilize cloud technology for analytics, data lifecycle management, and the deployment of cloud-based applications.

Leverage Cloud Platforms and Analytics
Harness the power of cloud technology for analytics, machine learning, data lakes, and data lifecycle management. Analyze data to identify patterns and make informed, data-driven decisions. Explore advanced technologies such as generative AI to unlock deeper insights and drive innovation.

Begin with a Proof-of-Concept Stage
Initiate the transition with a practical approach. Identify and quantify the impact of transitioning to cloud-enabled OT. Develop a comprehensive plan encompassing edge computing, adapter deployment, and solution implementation. Pilot use cases and experiments to gain hands-on experience, learning valuable lessons and refining strategies for a successful cloud transition.

Public vs. Private Cloud: Deciding the Right Path

Choosing the Right Fit

Considerations
Organizations must weigh factors like data sensitivity, regulatory compliance, and resource needs

Hybrid approach
Some businesses opt for a hybrid cloud model, combining elements of both public and private clouds for a flexible and tailored solution

A SMOOTH CLOUD TRANSITION WITH DASSAULT SYSTÈMES' 3DEXPERIENCE MOM

A single source of truth

Dassault Systèmes can support multiple models: IaaS and PaaS through configurable MOM modules, and SaaS via the **3D**EXPERIENCE MOM roles. This flexibility enables organizations to make strategic choices at both corporate and plant levels. Larger facilities may opt for IaaS or PaaS, while smaller or remote plants with limited technical resources can leverage the simplicity of SaaS. Regardless of the chosen model, seamless connectivity to the ERP system ensures a unified data hub, establishing a single source of truth for master data and orders.

Starting with the basics

The **3D**EXPERIENCE MOM SaaS solution supports assembly processes and simple fabrication processes like welding with 2 roles — Production Operator and Production Supervisor — via a simple User Interface (UI). It provides 2-way integration with ERP, collecting key traceability data, and providing real-time visibility and monitoring of shop floor activities.

For the production operator, **3D**EXPERIENCE MOM provides them with a list of tasks (work orders) they need to perform. Once a task is selected, the solution:

- **Guides the operator through each step of the task**
- **Identifies necessary materials for the task**
- **Confirms collection of essential genealogy data, such as serial and lot numbers**
- **Directs the operator on tool requirements, including recording tool serial numbers if necessary**
- **Leads the operator through gathering required quality measures, with immediate data feedback against predefined tolerances**
- **Enables operators to create notifications for production supervisors if issues arise**

For the production supervisor, the solution provides access to all existing work orders (typically downloaded from an ERP or planning system) allowing for efficient viewing, editing and creation of orders or tasks. Supervisors also have access to a production monitoring app where they can:

- **Monitor the real-time status of all orders**
- **Assign operators to individual orders or work centers**
- **Adjust order schedules by moving them between resources or changing their timelines**
- **Access all collected actual data, including product details, serial/lot numbers, and quality data**
- **Respond to notifications sent by operators**

As operators and supervisors execute these tasks, the order/operation status is seamlessly communicated to the ERP system, ensuring real-time updates from the shop floor.

Effcient material management

In addition, **3D**EXPERIENCE MOM extends its capabilities to material management with 2 additional roles: Warehouse Supervisor and Warehouse Operator.

For the warehouse supervisor, the solution provides:

- **Comprehensive visibility into all inventory at the facility, down to the bin level—including the ability to filter and sort all data, which enables supervisors to access any necessary details**
- **Management cockpits for all tasks where the supervisor can manage the release of orders to the operators, assign resources to the tasks, and even create additional shipping or receiving orders if needed.**

As with production activities, status changes driven by material activities can be exposed to ERP so the ERP system is kept up to date.

For warehouse operators, this includes:

- **Material receiving based on purchase orders and/or ASN's from the ERP system**
- **Handling all shop floor material activities, such as movements, container splits/merges, quantity adjustments, and material status updates**
- **Shipping based on shipment orders downloaded from the ERP system**

All these transactions are designed to be seamlessly performed on handheld scanners, simplifying tasks for warehouse operators.

Leading the Charge into Cloud Manufacturing

The move to SaaS and Cloud solutions isn't just a trend— it's a game-changer, offering scalability, flexibility, and operational efficiency. Cloud platforms play a pivotal role, fostering collaboration and ensuring real-time insights. Yet, challenges like connectivity and change management highlight the importance of careful planning.

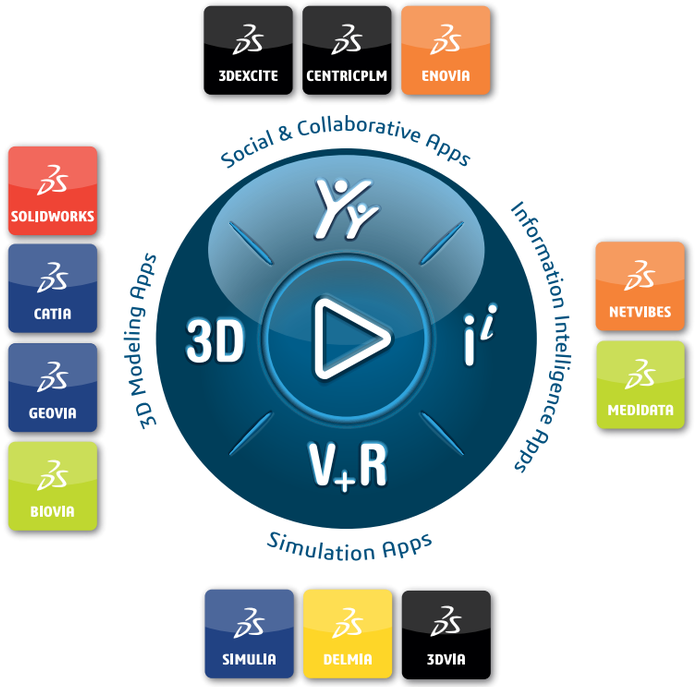
As industries transition, the strategy involves starting with familiar processes, embracing IT/OT convergence, and adopting hybrid cloud architectures. Dassault Systèmes' **3D**EXPERIENCE MOM guides the way, offering a unified platform adaptable to various models. With its low entry cost, scalability, and maintenance-free nature, it not only proves ideal for companies initiating the journey to MES/MOM on Cloud, but also paves the way for seamless growth as the solution evolves with continuous development of new features.

The future holds exciting prospects and marks an era where data drives efficiency, sustainability, and innovation. The cloud isn't just a solution; it's the foundation of an agile, connected, and forward-looking industry.

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

Dassault Systèmes 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 **3D**EXPERIENCE 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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