Capgemini

Expert Speak

Driving operational performance: Connect industrial objects and people with business processes

In today's digitized business environment, industries across the globe see an opportunity to improve the performance of their production systems. New technologies bring significant changes in the way we orchestrate factory of the future.

Everyone and everything is connected and producing data all the time

Irrespective of their environment, managers, operators, controllers, and even machines and infrastructures are today potentially mobile and connected to an Internet-type network. Robot, tooling, tablet, barcode reader and computer stations can receive or transmit real-time data available on shared spaces and the cloud.

A world of demanding technophiles

In an increasingly technology-driven and competitive world, industry value chain stakeholders don't understand that the response to their needs is constrained or imperfect, leading to delays, delivery errors, or defects. They expect the order information to be available with a single click, allowing them to change an option or a quantity at the last moment.

Dynamic market expectations

Market expectations have aligned naturally with the new ways of consumption and collaboration. Whatever the sectors, the widespread use of digital technologies should make it possible to offer:

- More personalized, diversified products available immediately
- Products consumed as services, on demand and in all places
- Higher quality standards and industry regulations.

THE MANUFACTURING OPERATIONS MANAGEMENT (MOM) OF THE FUTURE: THE SMART MOM

Based on such observations, Capgemini has gathered the business requirements to drive Factory 4.0 and created its vision of Smart MOM by demonstrating how the usual functions of MES or MOM can be amplified and supplemented by digital technologies.

For dynamic synchronization of production and logistics operations

In order to embrace a global approach, supply-chain integration is crucial. Production operations are then viewed as a complex segment of a supply chain that must be synchronized end-to-end and is very responsive to a demand that is increasingly versatile.

"Smart MOM solutions and architectures from Capgemini connect industrial objects and people with business processes."

Patrice Le Franc,
Global Head of Manufacturing Operations Management

* Manufacturing Operations Management

Today, advanced planning (APS) and material requirements tools (MRPs) are no longer limited by computational requirements and give almost instantaneous results leading to reduction or even elimination of frozen periods. However, real-time synchronization of operations is still limited by the notion of batch size, which is often related to the time needed to reconfigure a line between two batches of different products. Advances in robotics or additive manufacturing offer only part of the answer. In order to quickly overcome the reconfiguration constraints of the production assets, the planner must simulate and understand both internal and external flows. Therefore, the systems used for calculating requirements, scheduling and flow simulation need to be perfectly integrated with the production execution systems.

Managing changes in product or processes in "real time"

When changing the product definition during production, it is necessary to quickly evaluate the impact on the production processes and the related assets. The supervisor must know the product composition (M-BOM), detailed processes, necessary assets, and their availability. He or she must validate and extend the required changes in supply, resource allocation, and instructions to machines and operators.

For this reason, seamless communication is required between product and process design systems (PLM) and execution systems (MOM). Alignment of data models is thus essential to ensure digital continuity between systems that are rarely integrated natively.

Drive industrial performance with artificial intelligence (AI)

The rapid amplification of connectivity of people and means of production make it possible to capture large amounts of data that can be analyzed using very powerful AI tools. We are able to anticipate breakdowns or continuously optimize production performance by taking into account the parameters specific to production assets, but also environmental, context-led, or even logistics. The production supervisor has access to dashboards and advanced analytical tools to make the right decisions at the right time.

Control the means of production via specialized applications

While ERP and APS solutions continue to define the "when and how many" and PLM solutions the "what and how-to", the production supervisor has to deal with a growing number of unplanned events, such as changes in demand, product definition and processes, or alerts from AI. Henceforth, he or she must take justified and traceable decisions with complete autonomy. Above all, he has to enforce such decisions by directing the processes.

We know that IIoT* and their platforms are generally not able to execute complex and dependent processes, or to directly control machines or operators. For this reason, production management solutions must use specialized MOM-like or MES-like applications that combine both global business process management capabilities (on a platform) and a local command architecture that is secure and reliable.

Industrial transformation is under way. Whatever the maturity of an organization, it is never too late to leverage digital technologies and progressively embrace Industry 4.0 transformation."

SMART MOM PROVIDES THE SOLUTION

Scalable and interoperable hybrid architectures

The critical need for integrating with supply chain encourages the development of Smart MOM solutions on a cloud platform that makes them scalable and deployable everywhere. The need to securely command local production assets still requires linking such platform with local edge architectures such as OPC UA to guaranty safety and redundancy.

In addition, the interfaces between various Smart MOM applications and corresponding IS/IT ecosystem must be scalable and guarantee near real-time communication. Web services or micro-services architectures are recommended and complete the solution.

Finally, the connectivity needs to be guaranteed either via conventional control systems (MES, SCADA, HISTORIAN, etc.) or with the help of added sensors such as provided by IIoT*.

The win-win opportunity for MES/MOM software vendors

When MES/MOM software vendors successfully migrate their applications to cloud platforms, their solutions will become the backbone of a Smart MOM ecosystem. They will be able to support both specialized solutions and 4.0 technology enablers. Subsequently, such enablers - which too often remain at proof-of-concept state - will find the opportunity to mature as industrialized and even industrial solutions.

Through such synergies, the MES/MOM cloud solutions will become smart and significantly accelerate their return on investment. If not, they will give way to new platforms that will reinvent the MES/MOM features by gradually enriching their Smart MOM apps store.

*Industrial Internet of Things