WHITEPAPER

Manufacturing Operations Transformation

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Executive summary:

From optimizing plant performance, to elevating business agility, to raising quality and compliance, there are countless reasons to pursue Manufacturing Operations Transformation (MOT). It is the continuation of transformational activities that align manufacturing IT systems across the business to provide both operational and business improvements.

Manufacturers are facing unprecedented challenges which have significantly impacted business results, growth and profitability. Many of these challenges have been amplified by COVID.

This whitepaper discusses the drivers of digital transformation in manufacturing, and how multi-site enterprises can ensure consistent processes, reporting and KPIs that allow for a more agile and resilient supply chain and ultimately unlock the true value of their business.

Business transformation

Back in the nineties there was an influx in ERP implementations, and companies invested in rolling out SAP or other ERP systems to digitize and standardize their business processes. Those companies are now leveraging previous technology investments to redefine how they run their businesses through global transformation initiatives. These initiatives are meant to give businesses the agility they need in their operating processes to be able to adapt to fast changing markets and competitive forces.

Business transformation is closely connected to the digital transformation happening everywhere which is changing both B2B and B2C relationships and related expectations in user experience and services. But with all that, business transformation, like ERP implementations before, often gets stopped at the gates of the plant, which is where the businesses' primary value creation occurs.

All industrial manufacturing companies have started their transformation journey with plant and machine automation and the gains of productivity and process repeatability that brings.

Manufacturing Operations Transformation (MOT)

Plant equipment automation minimizes the amount of manual operations and maximizes the physical throughput. To further improve the utilization of equipment, plant operations have matured into using Information technologies and software applications as the basis for improvement strategies such as replacing paper-based work instructions and data collection.

First generation software and information technology (IT) adoption

The use of IT and software applications, such as manufacturing execution systems (MES) has provided more benefits than increased operational efficiency and reduction of manual processes through core application functionality. Detailed production history data and modern analytics offer additional payback opportunities by providing optimization insights and facilitation of continuous improvement. Visibility into operations and resource status enables better decision making and collaboration between plant and enterprise functions.

The return (ROI) on these plant MES investments has been and continues to be based on improvements to operational efficiency, quality and compliance, both directly impacting bottom line results.

- Operational Efficiency – increased asset performance and plant throughput, faster product changeover, increased productivity

- Increased Quality and Compliance – enforcement of product and process specifications, reduced waste and rework, detailed traceability, indications and management of nonconformance, effective recalls

Manufacturing Operations Management (MOM) and supporting Manufacturing Execution System (MES) software have made great strides in bringing order, but unless they are easy to use and model the real-world dynamics of the plant, they may not be used to their fullest potential. Manufacturing Operations Transformation (MOT) is the continuation (or beginning) of transformation activities that align these manufacturing IT systems across the business to provide both operational and business improvements.

According to the World Economic Forum, the value of digital transformations in the Fourth Industrial Revolution is estimated at $100 trillion in the next 10 years alone, across all sectors, industries and geographies. The manufacturing sector, which has long been a driver of global prosperity and economic growth, is key to this transformation.[1]

Drivers of digital transformation in manufacturing:

- Technological advances in big data and predictive analytics, business process management, mobile applications, and augmented reality are enabling manufacturers to empower operators and decision makers to make sense of operational data.

- Newer platform and integration technologies like cloud, IOT, IIOT, smart and edge devices are driving down the cost of digital transformation in the manufacturing sector.

- Concepts like the digital twin and the digital transformation of work are increasingly becoming the tools to improve operational efficiency and drive the needed business outcomes at manufacturers' plants.

Manufacturing execution systems continue to play a central role in this. As machines become smarter (the "things" in the IIoT), MES unites those machines with connected workers, other connected assets – changing this collection of "smart" machines into a "smart" factory and the role of MES is evolving into a plant's digital twin, a solution that ties together all of the data from across all of the plant's assets and operations.
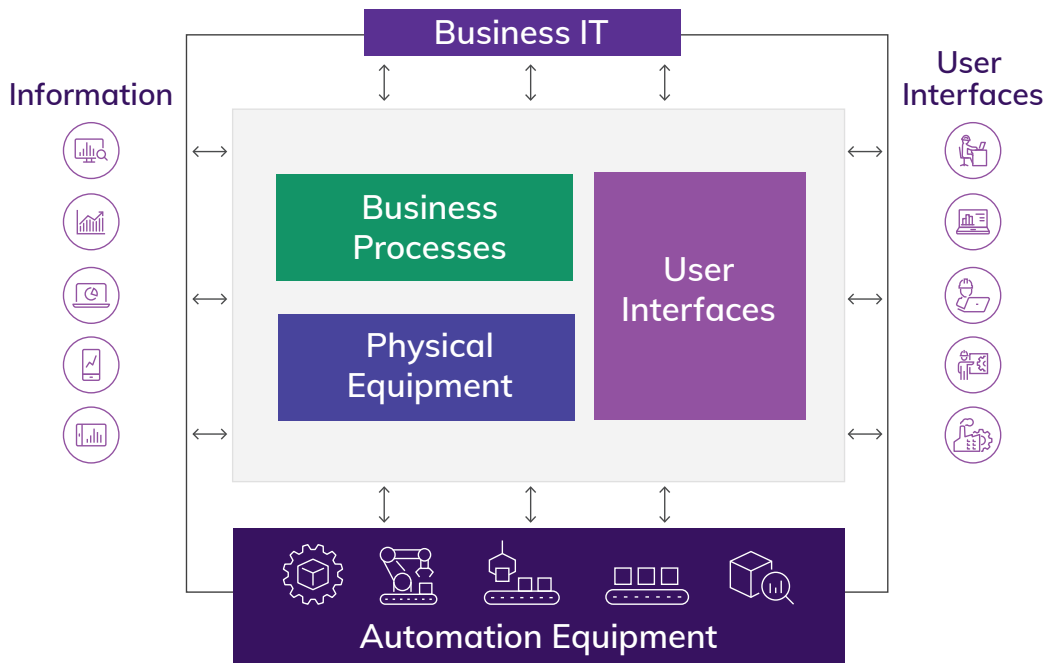
Collaboration across people and systems

A key factor for future manufacturing operations improvements is the effective work process centric collaboration of people and systems in a digital, automated and integrated fashion.

Information from IoT and cloud technologies is more easily accessible for empowering employees to work efficiently, while digital workflow and skills management systems help to guide the new generation through work tasks with instructions, forms for data collection, procedural enforcement and informational context.

The element that can bring people and process together in industrial operations is Business Process Management (BPM) technology integrated with a manufacturing IT platform to connect workers with plant floor processes, data and systems.

The digital transformation of operational processes allows to capture the extensive institutional knowledge and best practices of an aging workforce and empowers the next generation workforce with a digital user experience on workstations and mobile devices. It additionally establishes systematic people and system collaboration and allows to connect workers across functional domains and functions.

Information

Business IT

User Interfaces

Business Processes

User Interfaces

Physical Equipment

**Automation Equipment**

AVΞVA

Multi-site Manufacturing Operations Transformation

Many manufacturing businesses have grown by mergers and acquisitions, becoming large national, multinational or global organizations. These companies are now equipped with multiple production plants across regions for producing the same, or variations of similar products. These plants often represent heterogeneous plant system landscapes and varying practices for similar operational activities and business targets.

These multi-site enterprises are changing to a broader transformative view of manufacturing to respond to the challenges of more dynamic markets and to make use of new significant ROI opportunities that are unique on a business-wide basis:

- Business-wide scorecards and consistent KPIs for transparency in cost, capacity and inventory for profitability and sustainability optimization across the enterprise

- Operational excellence, lean and continuous improvement cultures that need to collaborate and share best practices

- A consistent, documented approach to regulatory compliance to minimize risks

- A connected enterprise for accessibility of information anywhere and anytime, to increase business agility and the ability to innovate faster

- Reduced cost of ownership through manufacturing technology and systems standardization and reducing the number of applications and interfaces across the business
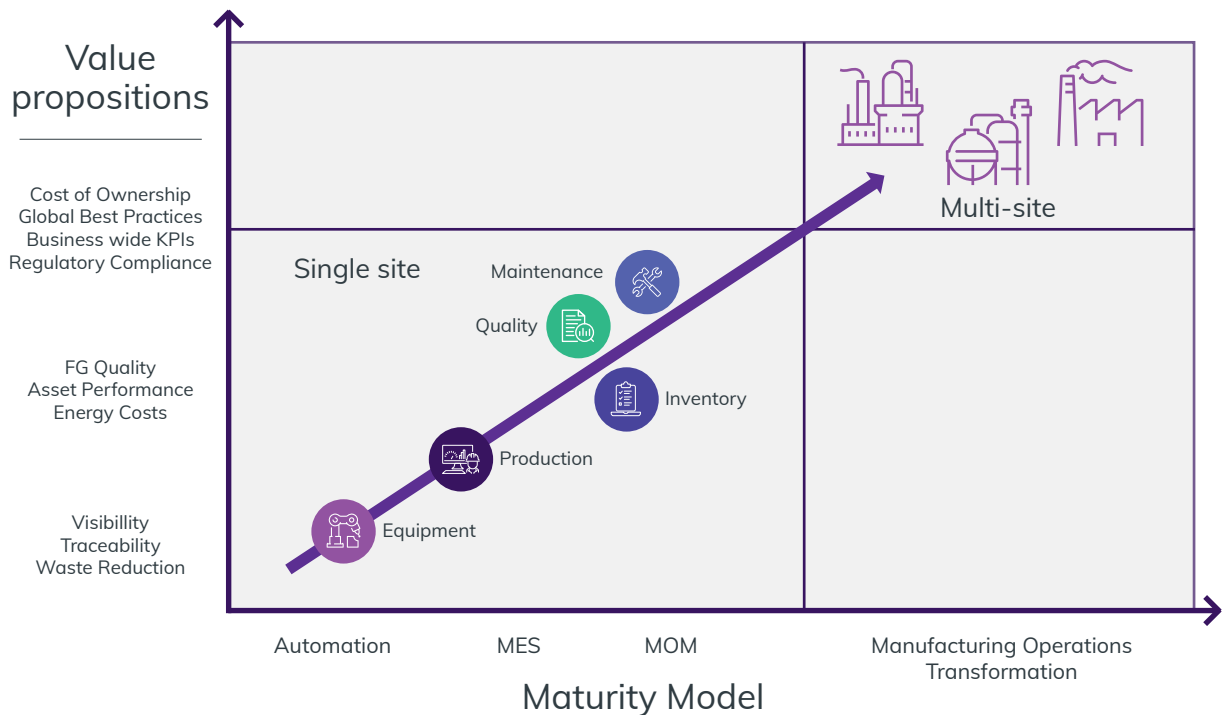
Standardization of processes, reporting and KPIs across a multi-site business

The primary enabler of an effective multi-site Manufacturing Operations Transformation is the enterprise-wide standardization of plant operations and information technologies. Such harmonization is the foundation to integrate, execute, and govern operational processes and related information flow consistently across multiple plants. Standardization of operational processes is possible with the following components:

- A **reusable operations process modeling** approach, which digitally models all operations aspects into a digital twin of the plant and simplifies deployment of standards to equipment, systems and people.

- An **open engineering and runtime platform**, leveraging industrial workflow and Process Management capabilities, hardened for industrial use and designed for the integration of business, manufacturing operations, smart production equipment and IoT data.

- A **broad suite of industrial applications** scaling from plant performance optimization to full manufacturing operations management functionality.

Ensuring consistency across varied plants

The physical attributes and even the level of automation of manufacturing plants in an enterprise may vary, but what standardization strives for is common and consistent visibility into and interaction with all plant operations for improved business decisions and agility.

A configurable, model-driven approach to operational processes, work procedures and related user interfaces enables reusability of captured best practices and enforces operational procedures as corporate standards which can be quickly implemented and sustained for adopting change in a version-controlled fashion for each plant connected through the manufacturing IT platform.

The role of a manufacturing IT platform is to provide adaptability to local plant nuances and a plant asset model which applications can use to blend human and automated activity in the execution of standardized processes and business rules. The platform adapts to individual local physical equipment and automation, while maintaining the standard process and information models towards the enterprise.

This ultimately enables manufacturing industries to make operational improvements and digitally transform operations consistently across multiple sites, with adaptability to the site-specific nuances abstracted in a digital plant information model.
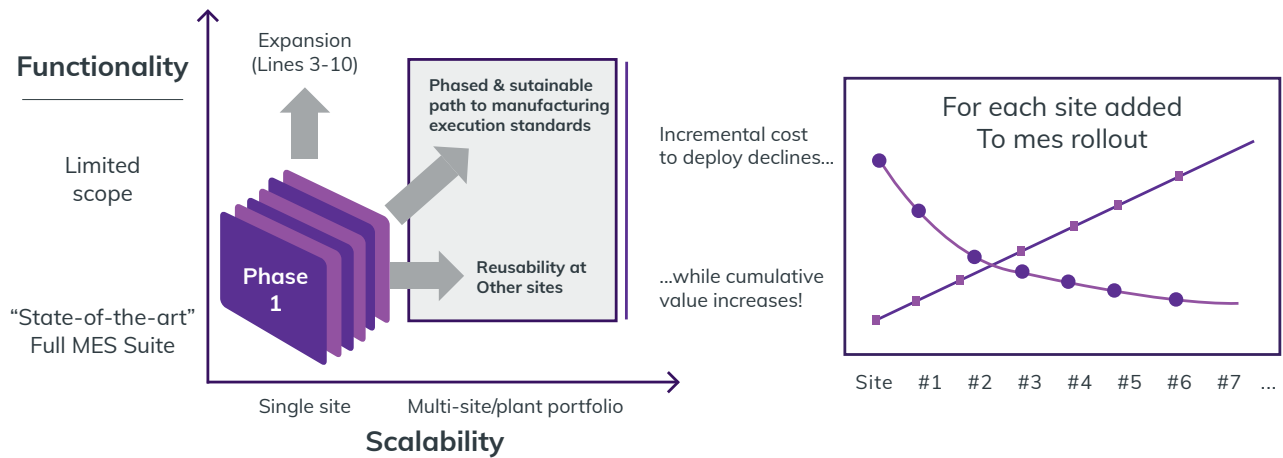
Get started

How to get started on your Manufacturing Operations Transformation journey

Multi-site digital and operational transformation harmonize entire manufacturing networks and lays the foundation to further optimize the value chain, along with solutions like predictive analytics and prescriptive planning and scheduling.

There are several factors to consider when choosing a partner in your MOT journey. First, you need a trusted solution; finding a provider that offers industry leading technology and domain expertise will improve deployment time and help you get started while minimizing business disruption. This is a journey, so you want to find a company that will provide services to support your transformation.

Connectivity is also key – your solution should have built-in connectivity to existing plant floor systems, devices and equipment automation. It is vital to ensure an easy-to-use, accessible user interface for a work process-based approach to manufacturing operations management. If you are a global manufacturing organization, finding a supplier with global program management, support, and a system integrator network is a must.

To find out how AVEVA's Model Driven MES approach to Multi-Site Manufacturing Operations Management can help transform your business, please visit: aveva.com/en/solutions/operations.[2]

References

1. https://www.weforum.org/agenda/2019/01/3d-printing-fourth-industrial-revolution-sustainable

2. https://www.aveva.com/en/solutions/operations

About the authors

Keith Chambers, Vice President, Operations Execution Software. Keith Chambers is responsible for strategic direction, commercialization and development for AVEVA's operations execution software portfolio globally.
Keith has over 20 years' experience in the automation, software and MES business with a focus on manufacturing operations software in the food and beverage, CPG and life sciences industries.

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