ORACLE

Enable the Disruption-Free Factory with Oracle Smart Operations

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Introduction

Oracle Smart Operations is an initiative that helps companies increase operational performance and improve their workforce's ability to make intelligent and timely execution decisions. Smart Operations recognizes that companies are striving to achieve the disruption-free factory, and that reaching this goal requires a new approach to information sharing. Our approach combines real-time operational data with business data and digital technologies to simplify operations processes, deliver recommendations, and enable automation across supply chains and manufacturing.

In most manufacturing companies, information technology (IT) and operational technology (OT) are disconnected from each other. IT typically consists of the software, hardware, and cloud solutions used to run the business and its various departments, including finance, procurement, sales, marketing, HR, and the supply chain. OT typically includes the systems and machines that run factories and production lines: supervisory control and data acquisition (SCADA) systems, programmable logic controllers (PLCs), robots, sensors, and IoT systems.

As part of our Smart Operations initiative, we seek to bridge the divide between IT and OT. When manufacturing companies can combine data about machines, parts, production lines, raw materials, and finished goods with data from line-of-business systems, they can make their operations much smarter, faster, and smoother. Companies can combine IT and OT to identify and mitigate production bottlenecks, alert managers to potential machine failures, and use sensor data to improve the performance of parts and finished products. Moreover, they can take a significant step toward replacing legacy manufacturing execution systems (MES) and enterprise asset management (EAM) with modern, mobile-friendly software that's easy to use, even for new employees.

Information technology (IT)

Information technology hosts and manages the business master data, perpetual data, and transactions that enterprises use for their business operations. Its focus is on planning, orchestrating, and tracking activities throughout an organization.

Operational technology (OT)

Operational technology monitors and controls physical changes in industrial equipment and other assets. OT can be integrated within single machines or can manage activities across multiple pieces of equipment.

Are you ready for the change in manufacturing?

Many manufacturing organizations have been slow to adopt new IT. For the most part, this hesitation also applies to OT. However, given the economic, competitive, and labor shortage pressures bearing down on manufacturers, the next five years will likely require them to embrace increased automation, radically new product lines and go-to-market approaches.

According to a McKinsey & Company survey of high-ranking manufacturing executives, "Two burning issues are keeping manufacturing leaders awake at night: material and labor constraints caused by rising costs and talent gaps, and a need for improved production visibility through better demand forecasting, inventory processes, manufacturing flexibility, and real-time visibility of the factory floor." [1]

> Smart Operations can provide a unified solution for connectivity, insights, automation, and employee engagement, helping to eliminate the need for separate execution systems.

To combat these challenges, much of the focus has been on planning and end-to-end supply chain visibility. Today, manufacturing organizations are increasingly focused on operations, as they look to build flexibility and visibility while continuing to improve results. Increasing operational agility can help these organizations rapidly adjust production based on changes in supply or demand. In addition, operational performance can benefit substantially from

automation, empowering a new generation of frontline workers in the process. But OT advancements alone aren't enough.

At Oracle, we believe that achieving this combination of execution agility and high operational performance begins with transforming how IT and OT infrastructure are integrated to support operations. IT and OT setups today usually involve dated and convoluted infrastructures. This is a major impediment to building and supporting a "factory of the future" that can meet today's demands and anticipate tomorrow's challenges.

Resolving this issue requires manufacturers to combine and interpret data from IT and OT to deliver timely information, recommendations, and instructions to people and machines. This joint application of business data, operational data, and advanced analytics—known as Smart Operations—is already showing promise on factory floors.

What does Smart Operations look like for manufacturing industries?

Frontline workers make the best decisions they can with the information and analytics they have available. All too often, though, that information is late and incomplete, and employees lack the analytics to interpret it effectively. Similarly, while automation is increasingly common in manufacturing, it tends to be used for specialized tasks set up by individual operators, and thus is not responsive to changing business conditions. In cases where automated operations actually leverage business data to adapt to changing demand or material characteristics, challenges still exist due to the limited information available to what's often a bespoke disconnected solution.

Manufacturers stand to gain considerable competitive advantage by infusing their operations with the right data and insights, at the right time, and at the right place. Providing operational employees with real-time information from the factory floor in context with enterprise-level supply chain details can help them make high-value day-to-day decisions, respond quickly when corrective action is needed, and spur continuous operational improvement. Driving and synchronizing automated equipment with up-to-date supply chain and engineering information can also increase flexibility and even provide a path to lights-out operations for certain functions.

What is Smart Operations?

Smart Operations combines real-time operational data with business data and digital technologies to simplify operations processes, deliver recommendations, and enable automation across supply chain and manufacturing execution. For example, a manufacturing operator receives a message to increase the inspection rate based on a prognostic change in operating pressure, resulting in reduced defects and scrap. Or a maintenance technician receives a recommendation for corrective action based on past repairs and events, reducing wrench time and increasing uptime.

Not only can Smart Operations support day-to-day execution, but it can also promote greater employee engagement. In simplifying operational processes, Smart Operations allows employees to focus on actual value-creation activities, letting managers and line workers take on new and pressing challenges such as increased automation, sustainability, revenue transformation, and flexible production.

Why aren't current manufacturing implementations enough?

In manufacturing, value creation happens on the factory floor where operators and machines come together to transform materials into products to be shipped to customers. But that work must be done within the wider context of enterprise-level business activities, informed by an understanding of sales, shipments, inventory, costs, and more. Contextualized real-time operational data and business data help to drive execution decisions. Despite the adoption of manufacturing execution systems and enterprise asset management, manufacturers often fail to effectively include execution in their enterprise-wide digital threads. The discrete, independently chosen point solutions used by different business groups fail to share information effectively across the organization—limiting, for example, how much actionable, real-time supply chain and product information the production supervisor or operator can access. As a result, IT/OT convergence remains elusive, and each system-to-system gap creates another tear in the digital thread, which ultimately hinders the transformative potential of Smart Operations for manufacturing.

The challenges in establishing a digital thread across IT and OT system layers can also be present within the layers themselves. This can be particularly evident within longstanding incumbent systems, where development work over decades can result in highly customized implementations. Such systems generally struggle to meet the needs of a rapidly evolving business, and in some cases can actively impede an organization's ability to adapt, innovate, and compete.

IT/OT convergence is a hot topic in operations today

There is often poor coordination between operational technology and information technology teams. Frequently, they pursue different directions and partnerships, resulting in little synergy and stifling value creation. For example, manufacturing equipment collects telemetry data via OT that may be stored away for future analysis. But without the real-time business context captured by IT, that data is of limited immediate use for throughput, product quality, and equipment availability. Given the increasing potential to leverage such information with data analytics and AI, this is a critical loss.

What can manufacturers do to bridge the OT/IT gap?

1. Introduce a unified solution that creates a digital thread across the enterprise, including operations such as manufacturing and maintenance.
2. Deploy advanced analytics to give real-time context to factory floor information without the need for specialized data science skills.
3. Eliminate wasteful or low-value manual processes through redesigned process flows and automation.
4. Prioritize a user experience designed to support execution, rather than simply delivering data and feeding the system with results.
5. Establish a single source of truth for frontline workers that provides up-to-date information and analytics—the right data and insights, delivered at the right place and the right time.

Oracle's Smart Operations initiative increases operational performance and facilitates intelligent and timely execution decisions. Building on Oracle's existing capabilities, our plans include the following:

Visibility into manufacturing operations as they happen

From initial design to the factory floor, Oracle Fusion Cloud Supply Chain and Manufacturing (SCM) provides a single digital thread that connects data across different business processes. This enables real-time visibility into manufacturing operations for all stakeholders. The application simplifies real-time data acquisition across a wide range of factory floor equipment and processes via an open collection infrastructure and APIs. This architecture provides the flexibility to work with equipment vendors and device data (IoT) aggregators.

Operational events connected to relevant business context

Too often, OT-sourced time-series data lacks the context of the business transaction that triggers its generation—e.g., a manufacturing order or customer request. That's because the transaction is generated and managed by separate IT systems. Smart Operations for manufacturing preserves this connection using a single data model that dynamically links operational events to relevant business contexts to automatically determine further actions, if any.

Insights and recommendations derived from integrated IT and OT data

The key to unlocking new value from IT and OT convergence is combining information from all aspects and levels within a single data model, then applying continuous analytics and machine learning to proactively generate insights to enhance efficiency and quality. Smart Operations leverages the advanced AI and analytics embedded in Oracle Fusion Applications to deliver actionable insights into quality assurance and control, asset availability, and performance management. Smart Operations can deliver these insights as a natural extension of the user experience, further helping to empower and engage employees.

Closed-loop interactions to improve quality and productivity

By bridging the IT/OT divide, Smart Operations can interoperate in both domains. Changes driven from upstream, such as altered order priorities or production schedules, may be better implemented on the factory floor. Similarly, issues such as failing equipment can be identified quickly and incorporated into upstream planning and maintenance processes. Examples range from simple closed-loop interactions such as turning on a workstation andon light in response to production exceptions, to advanced interactions such as instructing an industrial robot to reconfigure itself for the next work order.

Operator-optimized user experiences

Smart Operations prioritizes capabilities that help the user execute physical tasks with less time and friction spent on non-core activities. Such capabilities include the following:

- Checking for operator certification through integration with Oracle Fusion Cloud Human Capital Management
- Provisioning versioned, detailed, and visual step-by-step operator instructions linked to work orders
- Automating the reporting of resource usage and work-step completion
- Providing access to training material and generative AI–driven recommendations from Oracle Fusion Cloud Knowledge Management
- Connecting users to peer groups for support using industry-standard collaboration tools
- Gamifying training to encourage employee learning, progress tracking, and completion estimation

Operators can access all these capabilities from their workstations via a digital interface purposely designed to provide a friction-free user experience. This enables operators to focus on their manufacturing tasks, while granting quick access to the information they need to efficiently perform those tasks.

Supervisor-optimized user experiences

To make informed decisions as they manage production issues and conduct routine gemba walks, supervisors need on-the-go insights into real-time production status and equipment health. Smart Operations deliver real-time insights such as:

- A bird's-eye view of the factory floor as a whole
- In-context visualization of telemetry data and events collected from shop floor equipment, overlaid with relevant operational information for a 360-degree production update
- Operational context including the overall production schedule, resource availability, quality issues, expediting requirements, and maintenance schedules
- Exception management with real-time visibility into production exceptions and prebuilt workflows to manage common production exceptions
- Transaction reporting that includes automatic reporting of resources and material usage, as well as complete and rejected quantities
- Team collaboration via GenAI-assisted work shift summaries, auto-generated work shift reports, and operator work shift notes
- Prebuilt and customizable metrics for efficiency, performance, and quality

Maintenance technician–optimized user experiences

Automation and real-time insights can help simplify maintenance technician workflows and reduce wrench time. With Smart Operations for maintenance, companies can increase equipment and asset reliability and uptime while reducing overall maintenance costs. Such capabilities include the following:

- Reliable guidance for maintenance work orders and steps for resolution
- AI-assisted work order summaries and reporting of materials and labor
- Mobile workbench and consumer-grade user experiences for increased productivity

Business value of Oracle's Smart Operations initiative

The Oracle Fusion Cloud suite has been recognized by analysts and across industries as a trusted IT solution for product-centric enterprises, including manufacturing organizations (see the 2024 Gartner® Magic Quadrant™ for Cloud ERP for Product-Centric Enterprises).

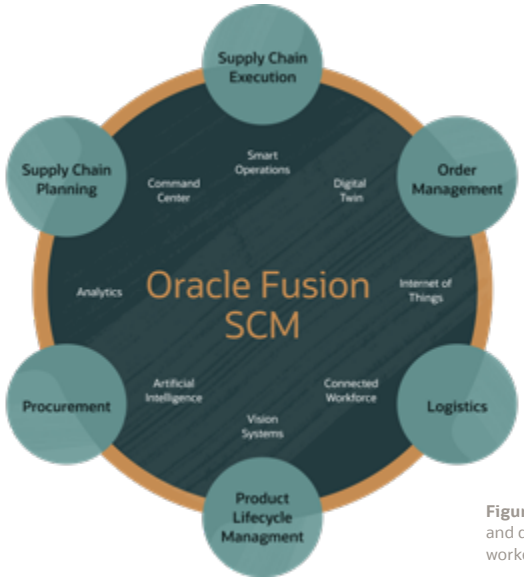

Figure 1. Smart Operations brings mobility and digital technologies to support frontline workers in supply chain execution

With its uniform data model, delivered as a cloud service, the Oracle Fusion Cloud suite (ERP, HCM, SCM, and CX) offers built-in best practices and deep process integration to establish a digital thread across the enterprise. It provides a continuous stream of innovative business solutions that leverage new technology, such as GenAI. The suite incorporates automated best practices throughout, delivering all this through an intuitive user experience that empowers the employee. Companies can access these benefits by moving their legacy IT solutions, including Oracle E-Business Suite and JD Edwards, to Fusion Cloud applications that can help set them up for future success.

Reducing the technology required to run a manufacturing enterprise is a another compelling reason to move off legacy on-premises applications and implement the Fusion Cloud suite.

These capabilities also make the Oracle Fusion Cloud suite an ideal foundation to meet the added requirements of an integrated IT/OT solution and deliver on the promise of Smart Operations.

Smart Operations beyond manufacturing

The concepts behind Smart Operations—a digital thread that connects physical operations with analytics, AI, automation, and employee engagement—have broad applicability outside of manufacturing. For example, the closely related field of maintenance can apply these same capabilities to facilitate predictive maintenance and integrate asset availability more effectively into enterprise processes. Smart Operations ideas can also be applied to healthcare supply chains, where RFID, automated replenishment, and robotic picking can deliver significant labor- and cost-saving benefits while helping improve patient outcomes. Or a power company can use IoT data to gain an exploded view of all the component parts inside a malfunctioning transformer, determine precisely which part is failing, dispatch a repair crew, and even generate a purchase order for replacement parts.

Building on the capabilities described in this paper, manufacturers can take further advantage of new technologies such as generative AI to reduce the administrative burden on production line workers, supervisors, and repair technicians. GenAI can draft incident reports, handover summaries, and other documentation based on the data entered into Oracle Fusion Cloud SCM. Then, instead of typing up each report themselves, employees can quickly review, edit, and sign off on those notes so that accurate information gets passed on to the next worker.

1 Digital twins: The next frontier of factory optimization, McKinsey & Company, 10 January 2024

How Oracle can help

The goal of Smart Operations is to reduce production downtime, increase automation, and optimize performance and profitability. While there will always be problems to troubleshoot and machines to fix, Smart Operations can make these issues much easier to diagnose and quicker to remedy. Here at Oracle, our vision is to help our customers achieve the disruption-free factory by leveraging the power of Oracle Fusion Cloud SCM.

Learn more **Request a demo**

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