GE VERNOVA

MANUFACTURING OPERATIONAL INTELLIGENCE FOR F&B AND CPG

Using data and analytics to achieve operational insights

BREAKING SILOED MANUFACTURING INFORMATION SYSTEMS

Imagine improving labor efficiencies by 5% or reducing overtime costs by 10%, while validating supplier quality to reduce operational variability, risk, and rework.

Now more than ever, manufacturing leaders are challenged to balance a multitude of competing priorities. This is especially true among those companies in the food, beverage, or consumer goods industries. Raw materials and energy costs are rising; customers increasingly demand just-in-time order fulfillment; and lower-cost competitors are entering the market with lean, direct-to-consumer production capabilities.

Although many manufacturers have invested significantly in automation solutions—HMI/SCADA control networks, MES/MOM and ERP/MRP applications, and database historians—most manufacturing information systems exist as disparate data silos. Production managers must frequently employ a piecemeal combination of spreadsheets and paper reports to derive basic manufacturing performance metrics.

Hand-crafted systems integrations are extremely brittle (e.g., simple process changes can cause critical data flows to fail), and their manually-intensive nature severely limits business agility and scale.

The goal of this paper is to discuss Manufacturing Operational Intelligence (MOI) as an enabling solution for modern manufacturing companies. The sections below identify outcome-driven MOI benefits and identify key requirements of an effective implementation.

ENABLING OPERATIONAL EXCELLENCE

Imagine:

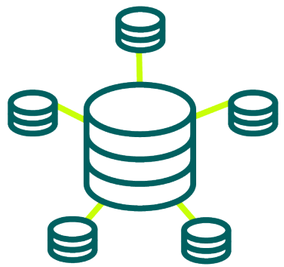
All of your machines and processes working together, with vast amounts of performance data easily feeding into a single integrated dashboard.

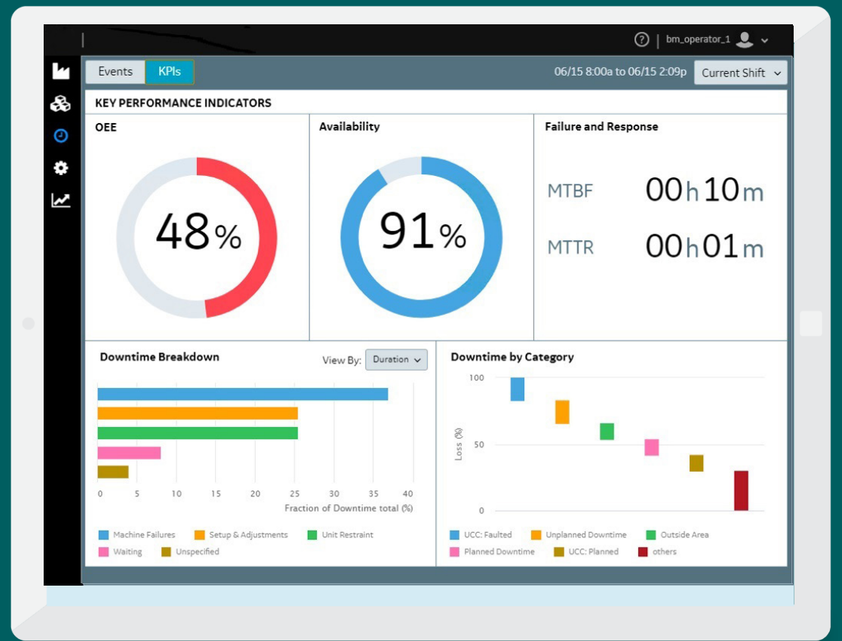
Imagine:

Key performance metrics visible throughout your operations, delivering actionable insights to your plant managers, production supervisors, and operators. These insights can be used to tune equipment and production lines, as well as add visibility into production performance to allow for changes to be made “on the fly,” based upon demand.

Imagine:

Outcomes such as improving labor efficiencies by 5% or reducing overtime costs by 10%.





“If your company isn’t on the path towards using manufacturing performance dashboards, 61% of your competitors will be using them to drive continuous improvements in performance more accurately and rapidly.”

LNS Research

LNS Research, a leading industrial analyst firm, recently found that 21% of companies LNS surveyed are currently using MOI software solutions, and an additional 26% are planning to do so in the next year.** Research shows that MOI adoption is accelerating as companies look to utilize real-time information as a strategic tool to improve business.

KEY MOI BUSINESS OUTCOMES

Although priorities vary among manufacturing leaders, most agree that MOI can have a profound impact on production operations by improving visibility, streamlining decisions, and replacing guesswork with fact-based decisions. Important business outcomes are highlighted below.

Increase labor efficiencies

To optimize workforce productivity, MOI dashboards often visualize operator productivity and downtime metrics. Armed with these critical insights, management can optimize resource allocations based on personnel productivity and identify additional capacity within the existing workforce instead of hiring new labor or allocating overtime.

Reduce downtime costs

MOI enables equipment maintenance to be performed predictively, in many cases dramatically reducing repair and costs associated with unplanned downtime. Maintenance departments can order the replacement parts in advance to get better pricing, and managers can allocate repair personnel at the most cost-effective times—when production demand is lower or when inventory and raw materials are exhausted.

Reduce defects and related costs

By tracking context-rich quality data, MOI allows production managers to identify defect root causes and eliminate costs associated with waste. Improving the focus on quality at every stage of production also reduces warranty costs.

Achieve automation efficiencies

MOI enables the shop floor to go paperless. Typically, plant managers and line supervisors spend an enormous amount of time collecting, analyzing, and reporting downtime information. MOI eliminates human-intensive data collection by capturing and reporting downtime sources automatically—allowing skilled workers to focus on high-value activities.

Increased yield

The net effect of reduced machine downtime, higher productivity of operators, and reduced defects is the achievement of higher production yields with the same resources.

P&G sees time savings and data customization with Proficy MES solution

Procter & Gamble (P&G), an American CPG company, was challenged with technicians having to manually enter data across systems. This lead to a lack of customizable data, which limited the data's contextual value. The company realized there was a strong need for system integration.

P&G looked to GE Vernova and GrayMatter, a GE Vernova partner, to implement the scorecard application, part of the Proficy Manufacturing Execution Systems (MES) suite of solutions, to provide panoramic views of production performance for continuous improvement. Now, operators use tablets to receive critical process data in real-time on the factory floors, without needing to return to a desk for reactive analysis. P&G has also been able to replace manual data interpretation processes with touchscreen technology in team rooms, further enabling customization of data.
P&G has been able to save 45 minutes per shift, per line, per business unit with this technology. This GE Vernova solution has offered operators flexibility to customize data relevant to their specific aspect of the manufacturing process.

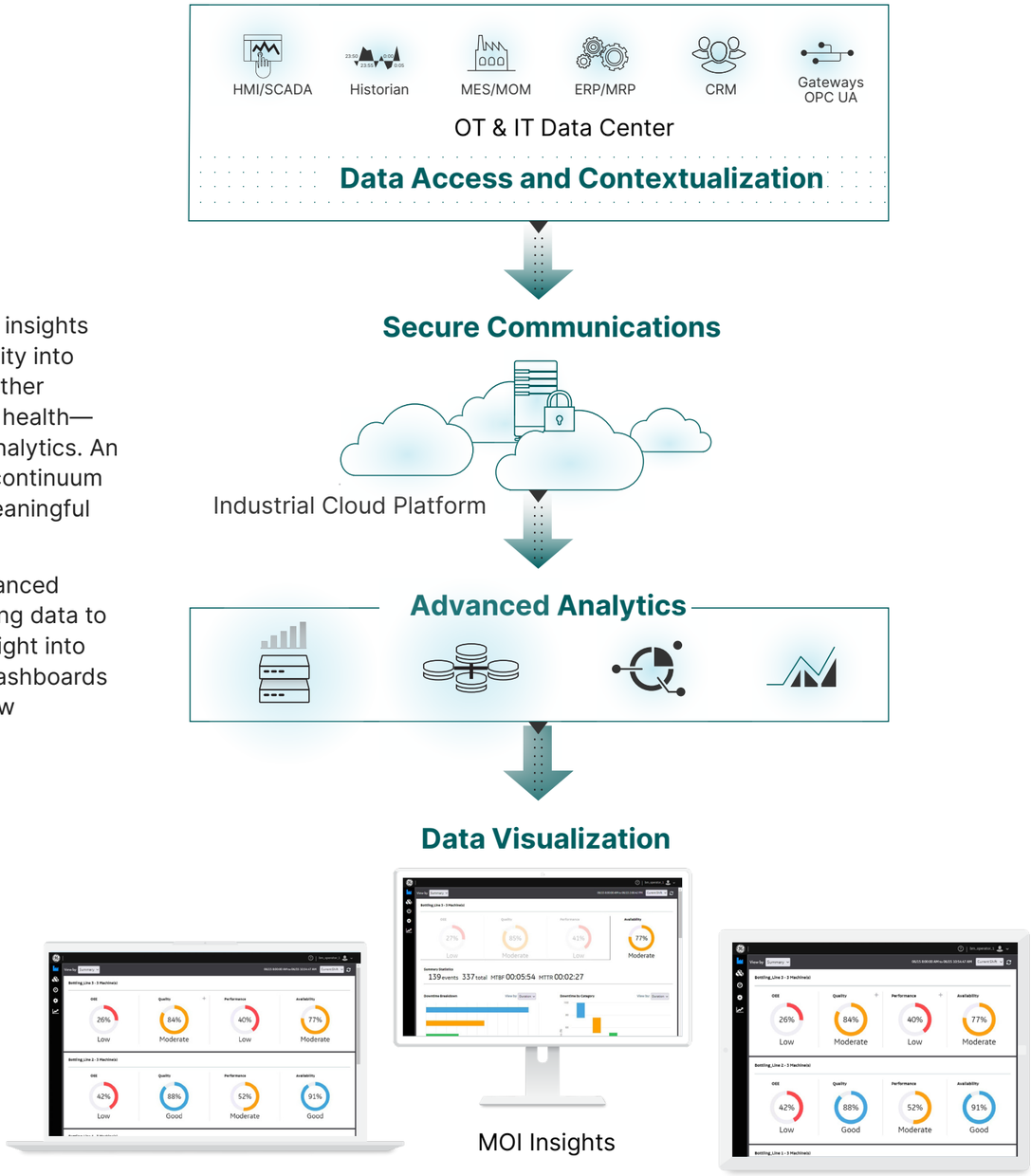
WATCH MORE

MOI TECHNOLOGY FOUNDATION

Although information architectures vary, most manufacturers have systems in place for real-time process control (HMI/SCADA), manufacturing management (MES/MOM), resource planning (ERP/MRP), and customer relationship management (CRM). Many organizations are also implementing historians to hold time-based machine and process data histories. Combined, these systems form the information backbone needed to drive MOI analytics and insights.

Core capabilities of effective MOI infrastructures include:

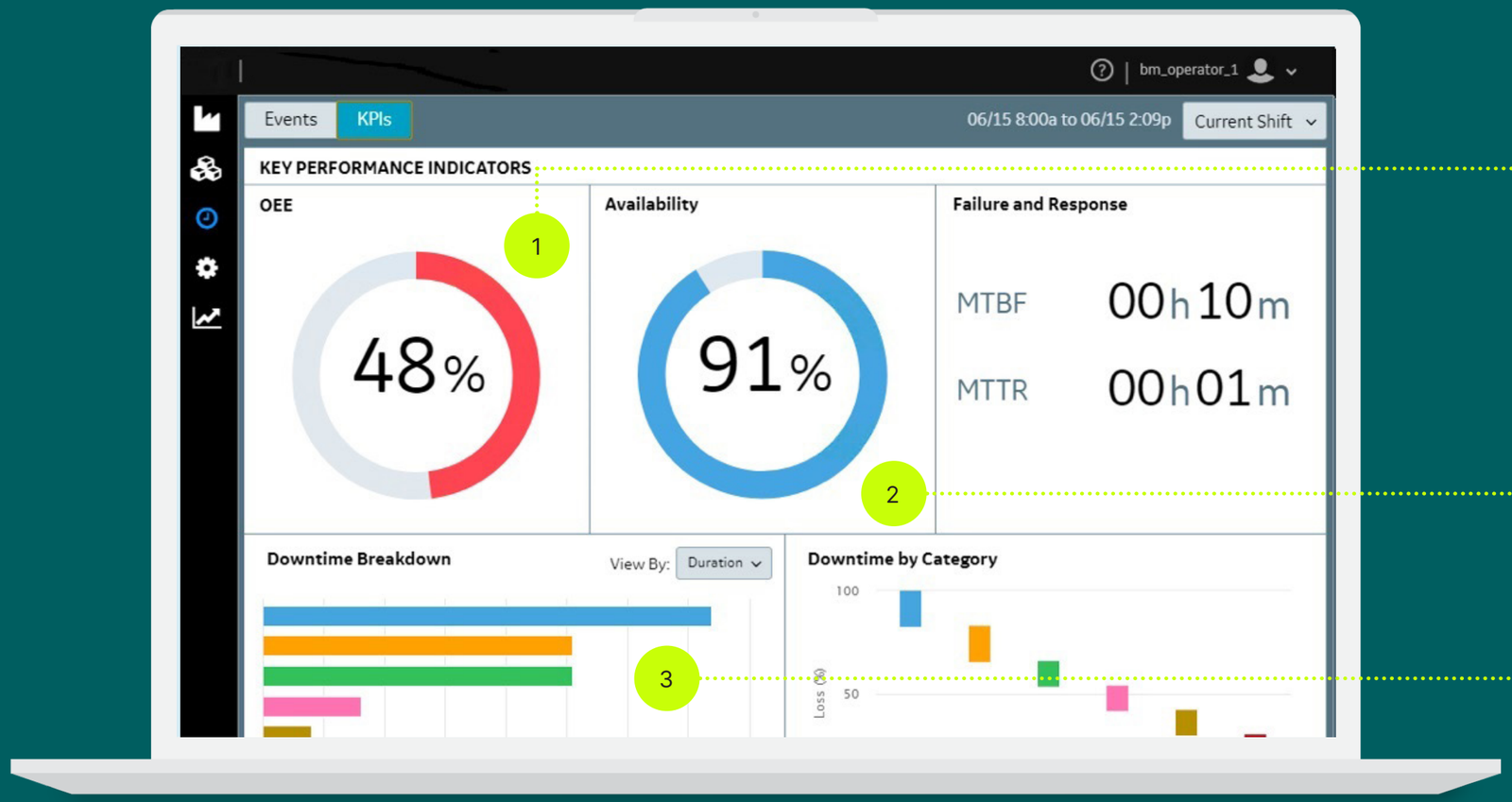
- **Data access and contextualization:** The MOI data access tier must be capable of retrieving and integrating data across critical back-end systems in OT and IT data centers, using whatever APIs and semantics those systems expose (ODBC, OPC UA, REST, etc.).
- **Secure communications:** Regardless of whether an MOI solution is deployed entirely on premise or on an industrial cloud such as GE's Predix* platform, security is paramount. Data must be protected while at rest and in flight, and MOI communications must not expose critical control systems to attack from malicious intruders.
- **Advanced analytics:** Some manufacturing insights can be achieved by simply providing visibility into machine, inventory, and process states. Other insights—e.g., for machine and equipment health—require predictive models and advanced analytics. An effective MOI provides ready access to a continuum of analytic horsepower needed to drive meaningful operating improvements.
- **Data visualization:** Leading MOIs use advanced visualization patterns to bring manufacturing data to life. Users gain immediate visibility and insight into key operating performance metrics, and dashboards are easily customized to accommodate new analytic requirements.



MOI INSIGHTS EXAMPLE

This simple dashboard illustrates useful MOI insights in a dairy plant. Data used in the dashboard is collected from multiple back-end datastores and applications. Analytics are represented simply and visually to make it easy to understand quickly.

MOI gives all team members instant access to defined plant KPIs – across sites – eliminating data clutter, exposing key insights, and improving operational agility.



1 Overall Equipment Effectiveness (OEE) for my shift. The OEE is a combination of Quality, Performance & Availability.

2 Focus on “My equipment” availability for my shift, one of the 3 OEE components.

3 Downtime analysis, by reason and category. The purpose is to identify the key reason for low efficiency and the bad actors.

KEY MOI CAPABILITIES: TOOLS VS. APPLICATIONS

One of the first decisions an MOI implementation team must make is whether to acquire point-level technology tools and build the MOI from scratch or install and configure a unified application. Although a build-from-scratch strategy offers flexibility, it also assumes the implementation team has all of the requisite knowledge and skill to build an MOI application correctly —the first time.

Commercial MOI applications offer significantly shorter-time-to-implementation and reduced project risks—because they are designed to deliver advanced capabilities out of the box. Further, leading applications offer the flexibility to begin with on-premises implementations and expand to secure cloud deployments over time.

Key capabilities of a world-class MOI solution—whether built from scratch or deployed as a commercial application—are summarized here.

- **Aggregation:** Making available data from many sources, mostly shop floor systems, including custom databases, MESs, LIMs, quality systems, and increasingly combined with financial and business data from ERP systems.
- **Contextualization:** Providing a structure—or model—for the data that will help users find what they need. Usually a folder tree utilizing a hierarchy such as the ISA-95 standard.
- **Analysis:** Enabling users to analyze data across sources and especially across production sites. This often includes the ability for true ad-hoc reporting.
- **Visualization:** Providing tools to create visual summaries (often ad-hoc) of the data to alert decision makers and call attention to the most important information of the moment. The most common visualization tool is the dashboard.
- **Propagation:** Automating the transfer of data and transactions from the plant-floor up to enterprise-level systems or vice versa.

A CHECKLIST FOR GETTING STARTED ON THE PATH TO MOI

Although some organizations are staffed to roll their own MOI infrastructures, the discussion above reveals that implementations require a diversity of technical skills – including data integration, security, analytics, and advanced visualization. LNS Research suggests a five-step roadmap for implementing an MOI pilot, and expanding to a larger vision once the pilot has been successfully completed.**

01 Don’t go it alone

Start by building a small, easily manageable cross-functional team that includes members from the impacted areas of manufacturing, production operations, and IT.

02 Clearly define the objectives of an MOI pilot solution

The initial expectations should be set that the first proof of concept will collect, aggregate, and contextualize a certain set of data into new information that can “bring to life” some new or faster performance insights. These new insights need to be associated with one or more current challenges that exist within the manufacturing/production operations.

03 Scope the MOI pilot solution to be small (one to three months)

The pilot project will need to address issues like where and how will automated data collection occur. Will the MOI solution collect data from data historians, through API calls to enterprise applications, through OPC UA gateways? Involve end users (and customers) in the pilot design phase to determine what metrics are most meaningful to provide, and what actions can be taken based on the new information insights.

04 Once successful, expand the pilot to other areas

As the pilot implementation team gains experience and confidence, and the larger organization becomes convinced that MOI can act as a performance visualizer and accelerator, companies are ready to define a long-term vision (one to five years). This vision should be transformative in the way in which your organization can work and collaborate in the future.

05 Accelerate the MOI journey by choosing the right partners

A chosen software vendor should have a technology tool set that can address both the quick project cycles in the short- term pilot, as well as possess the capabilities to scale to the sophistication of a long-term vision.

SUMMARY

Manufacturing leaders are increasingly challenged to balance a multitude of competing priorities—improved customer service levels, reduced costs and cycle times, and build-to-order production capabilities. Although many companies have invested in manufacturing automation systems, most manufacturing data remains locked in disparate data silos.

MOI solutions provide the software infrastructure needed to access and aggregate critical industrial data, thereby providing context for advanced analytics and visualization. Adopters have reported significant gains in productivity and efficiency in comparison to outdated spreadsheet models and paper reports. Importantly, MOI also provides a path for business optimization, as newly automated processes can drive further automation in all adjacent systems.

Organizations can choose to implement hand-crafted MOI solutions by selecting from a variety of available tools and building from scratch. Although a "tools-centric" strategy offers flexibility, it is accompanied by significant costs, risks, and time-to-implementation factors that may not be acceptable.

Many manufacturers are choosing instead to acquire and install a commercial MOI. Commercial applications offer a compelling alternative when time-to-implementation and risk management are driving criteria.

GE Vernova: Solutions and Services for Manufacturing

GE Vernova is a leading provider of technology solutions for manufacturing organizations worldwide. Our Proficy Manufacturing Execution Systems suite is the synthesis of two decades of working with the world's most recognized brands in manufacturing, including our own GE Vernova plants.

In addition to providing world-class manufacturing solutions, GE Vernova offers the flexibility to deploy our software in three different ways: on premises, in the cloud, and in hybrid configurations. We also provide a wide range of professional services—including design and mentoring workshops, implementation Starter Kits, and remote management—to put your digital industrial initiatives on the fast track. Contact us today to learn how we can help you get started on your MOI journey.

***Getting Started with Enterprise Manufacturing Intelligence – LNS Research*

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ABOUT GE VERNOVA'S PROFICY® SOFTWARE & SERVICES

GE Vernova's Proficy® Software & Services empowers teams, illuminating the path to a greener, more profitable future. Our proven industrial software accelerates innovation, enables connected workers, and operationalizes sustainability. We're driving measurable progress for over 20,000 diverse customers around the world.
The Proficy portfolio includes cloud-based and on-prem HMI/SCADA, MES, industrial data management, and analytics. Our software solves the toughest industrial challenges and is used in applications such as discrete, hybrid, and continuous manufacturing; utilities automation; metro transit; and much more. Proficy offers architecture flexibility including single machines, remote substations, and complex, distributed networks that span multiple factories and geographies.

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