UNLEVERAGED DATA IS WAITING TO ADDRESS MANY OF TODAY’S MANUFACTURING CHALLENGES.

Many sectors of manufacturing continue to recover from the economic downturn of a few years ago. Growth, while sluggish, has reappeared — a small but positive sign. Now, the forces of change that have upended and reinvented other industries are felt in full measure across manufacturing.

Rus Records, big data and analytics manufacturing leader at CSC, says global business drivers are pushing manufacturers to operate and compete in new ways. “We’re seeing buyer behavior change in all markets because customers have access to more information and options,” says Records. “Buyers expect higher-quality goods as well as products that have been adapted to suit the specific needs of their markets.” According to Records, new competitors are taking advantage of this disruption and entering established markets — competitors ranging from new data-driven startups to companies in other industries offering tangential products.

In developed countries, manufacturers need to deal with growing regulatory and risk concerns that create more compliance requirements and reporting practices. These measures add to costs that erase regional advantages such as the lower cost of fuel. Emerging countries are facing competitive pressures as well with higher fuel costs and growing labor rates, and they too are becoming more sensitive to environmental issues.

All these forces, acting together, have created a long to-do list. Manufacturers must focus on innovation to operate at the increased pace of the global market and expectations set by the global availability of new and interesting products. At the same time, they must find ways to answer demands for increased profitability to address global cost pressures while improving sustainability.

These forces of change are felt differently in each market. That, Records says, makes it more important than ever for plant and operations managers to have access to accurate and timely information and analytics to manage revenues and costs. “With disruptive market forces and increased demand, we’re leaving a time when manufacturers had to close older plants and postpone modernization programs in order to manage costs. Today, the market is forcing them to modernize, and what they really need out of that modernization is more information and insights to make better decisions.”

In addition to optimizing the performance of plant assets in both developed and emerging markets, manufacturers are seeing a huge opportunity to leverage new data insights to improve product quality, as well as environmental and sustainability practices, providing a much more holistic picture of manufacturing performance. Today, these common themes can be addressed in ways that go beyond the usual definition of modernization. A new opportunity exists to tap vast stores of data that go unused throughout today’s plant — information that can help manufacturers improve margins, boost energy efficiency and sustainability, address regulatory concerns, and increase product quality and reliability.
This paper examines the opportunities this new method of modernization offers and provides a blueprint for manufacturers looking to take advantage of it.

**THE NEW MEANING OF MODERNIZATION**

Modern plant equipment has grown remarkably in sophistication, bristling with sensors that can monitor almost every aspect of machine performance. Nearly every machine produced today can be integrated into a “smart plant.”

Ironically, the data that these machines generate almost never escapes the plant control room. Valuable information is displayed briefly, then lost for future use and almost never used to improve the business bottom line.

“Every manufacturer has an unbelievable amount of data that is never put to use. They are literally drowning in it, and when they begin to gather it, analyze it and tie it to business outcomes, they are amazed by what comes out,” Records says.

In addition to machine data, manufacturers have accumulated valuable data in corporate systems that can be used in new ways. Outside the company walls, information held by supply chain partners and customers can be put to use as well.

Combining that data inside and outside the company walls — information generated by sensors and machines, by company processes and by industry sources — represents a significant change in the definition of modernization. Improving plant operations today means far more than upgrading equipment; it also means changing the way a company sees and analyzes information. Manufacturers that view modernization in this broader context with increased visibility and insights gain an immediate competitive advantage.

Unlike past modernization efforts that returned small gains, the benefits from better information use are extensive and proven. Research by *MIT Sloan Management Review* found that two-thirds of survey respondents reported their companies had gained a competitive advantage by making better use of data and analytics.¹

Leading companies saw improvements in six key functional areas that went well beyond the manufacturing floor:

- **Plant Operations and Production.** Leaders operate at a higher capacity, with operating margins averaging 16 percent higher and unscheduled downtime reduced by 8 percent.
- **Sales and Customer Management.** Leaders keep more high-value customers with more responsive service and greater consistency in quality.
- **Asset Management and Maintenance.** Leaders leverage equipment-condition data and predictive analytics to plan optimal maintenance time, improving overall line efficiency and utilization while reducing unplanned stoppages. One report shows a 36 percent decrease in unplanned downtime.
- **Supply Chain and Inventory.** Manufacturers are more networked than ever. Leaders make use of these extended connections to anticipate the availability of materials and the impact of factors that may influence supply, especially in emerging economies with less stable institutions.
- **Service and Aftermarket.** Leaders use data to develop and offer many new service and aftermarket opportunities, reporting a 10 percent increase in cash flow and inventory reductions ranging from 15 to 50 percent.
- **Financial and Support Services.** Leaders are better able to respond quickly to regulator demands for more information on finances, safety compliance, product ingredients and sources, and more. Manufacturers can also immediately verify the creditworthiness of new customers.
These are just a few examples of the benefits manufacturers are discovering through the improved use of information. But what are the sources of data that can help drive these improvements? How is it created, and why has it gone unused for so long?

MAKING THE MOST OF UNLEVERAGED DATA

Unleveraged data is data that flows into an organization and is never used to its full extent. Accumulated data may go unused because it is lost in an unorganized data management structure, or because no one is aware that it exists. It may go unused because no one understands how to apply it to the business.

Russell Records, a principal in CSC’s manufacturing and diversified big data line, says unleveraged data, like idle equipment on the factory floor, represents both real and opportunity costs: “There are many different sources of unused data in equipment. For example, sensors are located on every piece of plant equipment, as well as smart tags on materials and people moving around the plant. And then there is data captured by sensors in the end products that the manufacturers themselves are building,” Records says.

Some equipment produces data at volumes that can be difficult to imagine, much less capture and use. For example, one consumer products manufacturing company collects 152,000 samples per second from its plant equipment. Other data sources come from the suppliers and equipment data aggregators that provide detailed historical and performance data on plant equipment and materials.

Data that can be applied to manufacturing comes from sources other than equipment. Examples include shared data available from partners, other divisions of the company, or subscription data available from analysts or other data providers. Relevant data sources may include information from government or industry sources.

Useful data also stems from more than these traditional sources. Today, social media data is becoming more relevant as mainstream businesses adopt popular sites for interactions with customers, suppliers, government agencies and researchers.

CONNECTING THE DOTS

That’s a lot of potential data and, on the surface, much of it seems unrelated. That, however, is where opportunity can be found — by using new practices that combine seemingly unrelated information in new ways, that can connect the dots between a manufacturer’s key business processes.

The result is new business insight in many operational areas that would never have been realized before. For example, new links may be found that lead to:

• Optimized sales and operations planning
• Smarter supply chains
• Better predictions of maintenance issues that lead to reduced impact
• A better understanding of supply chain risk with improved chain resiliency
• Improved yield management, monitoring and faster root cause analysis
• Better quality lifecycle analysis
• More insights into customer returns
• Improved handling of warranty and claims costs with reduced fraud
• Improved ability to perform predictive asset management
• Material traceability for forecast and inventory management
• Advanced forecasting and simulation and modeling
• Expanded ability for quantitative analysis
“One aerospace manufacturer we work with produces parts that often require rework because they have to meet very critical tolerances. We found that during manufacture, checks were being made at different stages, but no one had ever connected those together to monitor the process end to end. Smart Manufacturing Operations was created to do just that,” Records says.

“Next, we want to connect that process to data outside the enterprise, whether that’s to key customers or to connections in the supply chain. What we’re creating is a manufacturing line instead of manufacturing stations, and those connections will help us reduce scrap, reduce rework, improve quality, and better manage demand on one side and critical suppliers on the other.”

Considering the potential scope of change involved in this type of modernization, it’s clear that realizing these benefits will include challenges and obstacles. Most of those challenges stem from traditional barriers to change, such as cultural issues or a management team that is resistant to change.

A modern approach to data use may require technical skills that do not reside in the company or fragmented architectures that require time and effort to rationalize. It’s not uncommon to discover many sources of stovepiped data between the IT that supports the business operations and the IT that supports other business processes. One way of dealing with the need to overcome these barriers is to use cloud computing to rapidly stand up the infrastructure and applications to support the modernization of the plant.

In an era of rapid change, persistent barriers such as these lead to a rapid diminishment of capability and resilience. In just the past decade, dozens of established companies — many that were once household names and dominant industry players — have disappeared. They recognized, too late, that their failure to capitalize on the information available to business created a performance gap for their competitors to exploit.

PUTTING THE SOLUTION IN PLACE
Records says today’s approach to modernization addresses a fundamental weakness compared to former improvement efforts such as TQM and Lean initiatives.

“Smart manufacturing operations breaches data barriers inside and outside the company, creating connections that lead to the creation of new business insights. It ties together IT used by operations and IT used by the business in ways that high-level process-improvement programs never touched. This gives manufacturers the immediate insights they need to adapt business processes to change faster than their competitors and provide innovative products and services to customers,” Records says.

“Management by analytics,” a key aspect of smart manufacturing operations, drives decision-making authority down lower in the organization where it can be most effective. Analytics, combined with embedded sensors and machine-to-machine communication technologies, makes possible real-time decision making using dashboards and other easy-to-read tools that help operators and plant managers see the direct impact of the decisions they make.

In short, Smart Manufacturing Operations means competing with more than products and services. It means competing with information.

HOW TO GET THERE
Someday, smart plants may be delivered in a box, but that time hasn’t yet arrived. It requires a concerted effort to combine data sources, identify practical, valuable combinations and link them to improving specific business processes. It takes work to create a continual flow of information from all available sources to feed the analysis engine and provide visualization for decision makers.
“The solutions we build use new technologies such as in-memory appliances, Hadoop clusters, and real-time unstructured data transport tools to ingest incredible volumes of data from a variety of sources. We combine that ability with the advanced analytic models we’ve built to make connections between seemingly unrelated pools of information,” Records says. “We tie those connections to the specific business results we want to achieve and display those in dashboard style reporting that makes it very easy to visualize exactly how plant operations are supporting those business outcomes.

“Our prebuilt modules connect and analyze silos of data across the organization including sales volume, unit production details, equipment performance, maintenance plans and schedules, key customers, energy consumption and greenhouse gas emissions, as well as production and defect rates — all displayed and ‘connected,’” Records says. “As you see volume increasing on a line where maintenance is required, that may push you past your emissions targets, so you redirect some of that production to a different line, or measure the impact of taking that line down for maintenance.”

CSC has been helping companies realize improvements in manufacturing for decades.

“Our groundbreaking work in big data and analytics has resulted in an architecture and approach that can help any manufacturer benefit from smart manufacturing capabilities. Our approach offers advantages that can’t be found together in any other solution,” Records says.

As Records explains, CSC uses two primary approaches to smart manufacturing infrastructure, depending on the outcome it seeks. “When we have a known, high-value outcome to improve, such as managing production in real time or predicting maintenance intervals, we use architectures and products that let us ingest and analyze data on the fly.

“In other situations, you want to scope a wide range of data to look for connections between datasets, but it doesn’t have to happen in real time. That type of approach might load data into a Hadoop cluster running over a cloud-based architecture. That’s a low-cost approach that is most efficient for those types of cases,” Records says.

In a Smart Manufacturing Operations project, Records says it’s important to start with a sharp focus on some specific business objectives: “There are so many opportunities out there that you really need to identify which target makes the most sense to pursue first. Once we identify opportunity in one area, we start there, then gradually expand the dataset and bring in different tools because the job is getting bigger and broader.”

A flexible, adaptable approach is one aspect that makes CSC’s Smart Manufacturing Operations solution unique. With CSC’s more than 50 years of industry experience, other factors stand out as well.

MANUFACTURING-SPECIFIC ACCELERATORS REDUCE COST AND IMPROVE OUTCOMES.

Having worked with manufacturing companies for decades, we never begin with a blank sheet of paper. We’ve combined our manufacturing and business process expertise into accelerators that reduce the time it takes to reach success. Examples of the accelerators we employ include:

• A manufacturing KPI catalog
• Sample implementation plans
• Enterprise Intelligence Maturity model
• Smart Manufacturing Operations processes
• Prebuilt visualizations and dashboards
• Advanced analytical adaptive models
• Reference architectures
• Logical solution architectures
• SAP and Hadoop accelerators
• CSC MachinEdge machine-to-machine integration platform

TECHNOLOGY INDEPENDENCE LETS US SELECT AND BUILD ON THE BEST COMPONENTS.
Every smart manufacturing implementation is different, from the types of machines that require integration to the platforms used for information management in the business. Our solution is technology agnostic, which means that a wholesale platform change is not required to gain smart manufacturing capabilities.

We select the best partners for each application and adapt our solution to help clients make the best use of their existing infrastructure and identify paths to improvement that may better match their existing technology roadmap.

WE PROVIDE UNMATCHED EXPERTISE IN MANUFACTURING AND BIG DATA.
CSC is unique in providing big data and analytics services to global manufacturing clients. As a leader in technology trends that are driving change in business today, we know how to combine our technology-driven solutions with our deep expertise in manufacturing to help any company unlock the potential in its unleveraged data. Our experience with global manufacturing clients has resulted in proven methodologies for iterative and responsive analysis, implementation, and service management services in chemicals, aerospace, automotive, healthcare, agriculture, oil and gas, and natural resources.

TAKING ACTION
Manufacturing is no longer isolated from the waves of change that have reshaped other industries. New customer behaviors, financial and regulatory pressures, environmental concerns, new forms of competition and a host of other challenges are pushing manufacturers to change in many ways.

As a result, modernization means more than swapping out old machines for new ones. It means finding ways to take advantage of information assets that have lain dormant for decades and find connections between sources of data that have never before been connected.

History continues to show us that the challenges facing manufacturers today cannot be solved with point solutions or modest efforts that attempt to make small improvements. A successful solution that can position a manufacturer for the future takes an outcome-focused effort and experienced help.

As a leader in the technologies that underlie the most significant advances in manufacturing productivity today, Records says, CSC is perfectly positioned to help manufacturers realize all the benefits that smart manufacturing offers, from the shop floor to the boardroom.

“Smart Manufacturing Operations is yielding real benefits, right now. This isn't experimental or theoretical. This is real.”

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