

THE VALUE OF MANUFACTURING VISIBILITY

KNOWING THE NUMBERS HELPS YOU ACHIEVE BUSINESS OBJECTIVES

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Information is critical to manufacturers—indicating how and when goods are being produced and to where products are moving. Timely sharing of information across a company and its supply chain enables organizations to:

- Manage and improve their own operations;
- Synchronize processes with suppliers; and
- Offer better customer service.

Capturing and sharing manufacturing information requires a strategic approach that identifies what should be tracked, with whom to share information, and how to leverage this “manufacturing visibility” into improved operations and business performance.

LACK OF VISIBILITY

Business success today involves far more than manufacturers simply delivering quality products on time. It requires integrated solutions that include service, support, and timely and accurate information, whenever and wherever customers want it, and it demands that manufacturers regularly assess and improve the performance of operations that deliver those solutions. To deliver optimum customer satisfaction and operations performance—and business success—manufacturers must be able to provide products and efficiently capture, access, and share operations data in the right way with the right entities. Manufacturers—along with their customers and suppliers—need “manufacturing visibility.”

Yet many companies fail to capture even basic production data, either manually or electronically, or to make that data available throughout the business. Even fewer organizations use manufacturing information to benchmark competitiveness (or lack thereof), and fewer still share this information throughout the value chain to improve supply-chain effectiveness and improve customer service.

Why the visibility void? Countless information technology applications are available to capture almost any kind of data and feed it to ERP systems. But most manufacturers are challenged in knowing which few numbers really need to be captured—performance measures that directly support business strategy by helping to sustain, control, and improve operations—and they have difficulty establishing processes that enable employees to react to appropriate information in ways that improve productivity and profits.

BASIC NUMBERS

“There are business objectives at the executive level that are rarely tied to specific operational measures on a day-to-day basis,” says Mike Frichol, general manager, manufacturing, with Microsoft Business Solutions. Consequently, many manufacturers cannot assess the full impact of declining performance measures until it’s too late. “That’s where better visibility of the right information is really key to making progress relative to the overall objectives.”

But just what is the right information—the right numbers—manufacturers need to make visible? Individual companies must make that decision based on their unique business objectives (e.g., a company whose reputation is based on innovation will evaluate its operations differently than a firm focused on being a low-cost provider), but there are many performance measures that can and should find their way into corporate-wide systems. The Manufacturing Performance Institute (MPI) finds that successful manufacturers track many of the following measures to determine if they can sustain production activities:

Capacity and availability

What are current production volumes, available manufacturing times for additional output, and the overall capability of production—including people, processes, and machines—to make quality product in a day, week, or month? This fundamental figure of true production capacity for a facility or across a group of plants will help answer fundamental questions: “Do we have enough physical operations capacity to satisfy customer demand? If not, how can we get more out of what we have?”

Customer demand

What is customer demand? In order to confidently schedule operations, plant personnel need to know real-time customer demand by SKU (which includes order changes as they occur), as well as what’s likely to come. Yet demand planning remains a battleground in many companies, as sales and marketing departments generate demand with promotions and price breaks without giving a heads-up to manufacturing. And even when sophisticated applications such as demand-planning software do produce accurate sales forecasts for today or next quarter, can that information be accessed on the plant floor or by suppliers?

Material requirements

Are there enough materials and components to make product? Is it the right amount? Excess inventory eats away at corporate cash flow, yet inside many manufacturing plants it's common to see large amounts of material stored at each cell, line, or department. It's also common for these plants to lose material, necessitating expedited orders and extra shipping costs—even when that material exists at another cell, line, or department in the same plant. Knowing what material is on-site is vital, as is confirming that material has been properly delivered, received, stored, and logged (either through visual parts-assignment practices or RFID methods). Similarly, what are real-time finished goods levels per SKU (finished goods at cells, finished goods in inventories, and products moving to a distribution center), and can sales see that information?

Labor requirements

How much labor goes into the production of one unit of product, how does it vary by SKU, and is there enough labor to accomplish specific production goals for the day or week? Staffing is often a bottleneck, particularly in companies that have yet to get their human resources (HR) practices in order. Who is and is not available today (absent, in training, covering for another job)? Who are their backups? How can the human resources department get workers on-site when needed?

CONTROL AND IMPROVEMENT DATA

While the aforementioned categories help answer the question of "Can we make product?" they give little insight into a plant's ability to profitably make product. Every manufacturer needs visibility into measures that help them control and improve operations:

EHS and compliance

No measures require more control or improvement than environmental, health, and safety (EHS) targets, regardless of how good a given company is today. EHS numbers ensure that the workforce, community, and environment are out of harm's way. While measures such as emission releases and injury and lost workday rates are mandatory for regulatory reporting, it's impossible to act on this data if it isn't broadly shared

throughout an organization. World-class manufacturers also focus on measures that help to improve EHS before a report ever gets filed, such as near misses, absentee trends, employee-satisfaction scores, staff complaints about dangerous conditions, etc.

Quality

Product that is reworked, scrapped, or returned by the customer is a wasted output, chipping away at margins and directly impacting any business objective. While quality information captured at the end of production or from customers can provide a historical perspective (finished-product yields, warranty costs, customer rejects), capturing and sharing quality measures that occur now (in-process yields, scrap and rework by workstation/cell) enable staff to react to quality problems as they occur. These numbers should be tracked as close to real-time as possible at the source, either manually or through automation, with plant personnel empowered to stop production when they see that quality is slipping. Savvy manufacturers understand that it's better to react to real-time data and shut down a line or cell, identify root causes, and implement a sound solution than to track quality only at the end of the line—after producing an hour's (or day's) worth of bad product.

Speed

Organizations need to know the time that it takes to produce goods from start to finish (manufacturing lead time or cycle time) and to satisfy orders from entry to delivery (order-to-ship lead time). In make-to-order settings, production speed indicates how quickly orders can get out the door. To control operations, production time needs to be regularly measured against customer demand, tracking how the pace of production for a given product aligns with customer demand for that product. Toyota and proponents of lean manufacturing call the measure to track this pace "takt time," which is the time available to manufacture product divided by demand for product.¹ For instance, a takt time of one minute indicates that a product must move off final assembly every minute in order to satisfy demand. If operations cannot attain takt time (i.e., product does not come off the line fast enough), reallocation of resources may be needed; conversely, if the plant exceeds takt time (i.e., overproduces), the result is excess inventory, resources that could have been used elsewhere, and possibly wasted output.

¹ *Lean Lexicon*, Lean Enterprise Institute, 2003.

Reliability

Reliability of equipment and processes is a vital indicator of operations efficiency—yet countless plants fail to track this measure, even when aware of chronic equipment problems. In addition to machine availability (as a percentage of scheduled uptime), other measures that provide insights into reliability include average time between equipment failures (indicating machines with more frequent breakdowns) and levels of reactive maintenance (higher numbers point to a need for more preventive or predictive maintenance practices). Reactive maintenance can be particularly costly because it unexpectedly stops production and may result in longer delays as maintenance staff or repair parts are rounded up.

Inventory turns

The frequency with which production can turn over its inventories—raw material and components, work-in-process, finished goods, and total inventory—indicates how efficiently and cost-effectively it uses this inventory. Low turn rates relative to industry benchmarks can point to inefficient purchasing (e.g., excessive purchased materials due to low-cost but high-volume contracts), non-lean production processes (e.g., work in process piling up in front of cells and around lines), scheduling problems and/or unreliable demand data (e.g., making the wrong product, which piles up in finished goods storerooms), poor internal quality (e.g., large amounts of product needing reworked), and poor product-development processes (e.g., large amounts of obsolete inventory).

Value-add time

Few measures are more valuable than those that track value-add time as a percentage of the total manufacturing lead time. Lean manufacturers rely on value-add time as an internal benchmark to broadly gauge production efficiency as well as to pinpoint specific problem areas. Calculating value-add time requires careful observation, timing, and mapping of all activities related to the manufacture of a product—those that add value for the customer and those that don't (waste). It also requires coming to grips with the concept that most production today is waste (even in world-class plants, value-add time may be no more than 15% to 25%). For example, the duration of time a product sits in inventory is waste, as is the time (and resources) it takes to change over a piece of equipment in order to make a different product. In addition to time, many manufacturers will track value-add per employee; although an easier to identify (but less valuable) measure is sales per employee.

Collective measures

Some measures provide a broad image of efficiency by combining availability, reliability, and speed data. Operating equipment efficiency (OEE) is based on a formula that multiplies the quality of product produced by equipment (yield percentage) by the availability of the equipment when needed (machine availability as a percentage of scheduled uptime) by the equipment's run rate as a percentage of its designed rate. MPI has developed a comparable measure, labor operating efficiency (LOE), which assesses human resources and pulls together the availability of workforce (non-absenteeism rate); the staying power and thus manufacturing-knowledge depth of the workforce (annual labor retention rate after voluntary and involuntary exits); and the quality of the workforce as defined by management's ability to empower the workforce to supervise itself and autonomously improve production (percentage of workforce in empowered teams or similar estimate of empowerment). Multiplying OEE, LOE, and capacity leads to another MPI measure of overall plant efficiency (OPE).

Corporate rollups

Many corporate measures, such as those identifying returns—return on investment (ROI), return on invested capital (ROIC)—are critical to executives for gauging the business success of the company, and for communicating performance to investors and analysts. On the shop floor, however, these measures are often abstract concepts rarely translated into tangible operational metrics. ROI and similar measures are only useful in the plant when associated with the submeasures that drive them, and when employees understand the relationship between corporate measures and their own performances.

IDENTIFYING DATA

With so many possible measures, where should a business start? Each company needs to determine what information it needs to hit its strategic objectives, control its operations, drive its improvements, help its suppliers, and satisfy its customers.

Microsoft's Frichol cautions, "Identify not only the right measures, but the right few measures. What tends to happen is that everyone has their own bright idea as to what should be measured." Left unchecked, an abundance of good data leads to meeting room battles

over whose numbers are right and relevant, rather than how to respond to those numbers.

World-class manufacturers select performance measures based on how they support business objectives: Does the data help to solve problems that result in poor performance or enable the company to seize an opportunity for improvement? Ideally, every measure will either stretch the organization toward better performance or be required by customers or for financial reporting or regulatory compliance. Reaching consensus on the right numbers to manage will create a common operations “language,” connecting all facets of the company: operations, sales and marketing, purchasing, logistics, engineering, etc. These measures also can serve as the backbone of a performance management system, cascading corporate strategy to divisional goals to plant targets to departmental targets, and, lastly, to individual performance.

“It’s an organizational challenge,” says Frichol. “How do you define what it is that you want to have visible, that you want to measure, that you agree on, and that you monitor?” Few techniques, he adds, are better at identifying appropriate measures than the lean manufacturing tool of value-stream mapping. Value-stream mapping identifies what’s waste and what is value-add in the customer’s mind. “What is it that you do that really matters to your customers, that the customer is willing to pay for, and that the customer really cares about?” he says. “Identify those things. Focus your attention on doing those things exceptionally well and get rid of all the other stuff that is overhead. And then collect data and extrapolate information relative to those things that matter to your customers.”

SHARING DATA

Identifying and capturing the right data is a gigantic step toward manufacturing visibility, but an organization also needs to define its processes for transforming data into information—and then sharing it. Many tools exist to capture and distribute data, but the manufacturer must make sure that the *right* data is put in front of the *right* parties.

“Most ERP systems have all of the data that you need; however, most ERP systems don’t provide visibility into the information relative to your specific business circumstances,” says Frichol. An important task

during implementation of an ERP system, he adds, is to define how to extract key intelligence from the collected measures rather than inundating all parties with a stream of uninterpreted data. Performance-management issues will dictate how to organize data sharing, but all processes should focus on turning visibility into real-time reaction.

For example, notes Frichol, in many companies the finance department religiously tracks cost variances down to the penny, but “now that you know this, what are you going to do with it?” While variances show that something went wrong, it’s simply historical information—useless in helping operations personnel to examine a real problem in real time. “Things will never go as planned. The objective is to get them to go as close to planned as possible with minimal variability. The challenge is identifying where the variability actually occurs, and then addressing the source of the variability.”

In fact, cost-accounting variances represent symptoms of problems, not problems themselves; and trying to manage variances rarely solves the root cause of problems. Paying too much attention to symptomatic measures also can lead to undesired results. For example, a superficial focus on unmet customer orders, declining revenues, or reduced factory throughput without deeper analysis often leads to knee-jerk reactions such as adding buffers (and costs) in order to reduce the impact of variability.

At the same time, management needs to walk the visibility talk. It cannot track one set of measures but evaluate personnel with different measures. “People on the factory floor at the operational level will measure according to how they are compensated or the way that they are managed or supervised. They obviously want to make the best impression and achieve the best outcome relative to the way their personal performance is measured in the company,” notes Frichol. “Those measures are not necessarily tied to the overall objectives.”

FINDING VALUE

Each group—plant floor, front office, customers, suppliers, etc.—needs to access only the information relative to its needs. Visibility systems should ensure that people find the right information relative to

what matters most to their processes; many systems and users get carried away in extrapolating data from ERP systems. Savvy firms empower staff to get data and make decisions, but apply limits that prevent information overload and overanalysis.

Anyone accessing information needs to understand both what's available and how to use those measures to spur improvement. The same holds true for parties outside the organization; for example, merely informing suppliers that they can check inventory status won't necessarily help them to leverage that information into providing better service. World-class firms make sure that all their partners are trained on the use of key metrics.

It's important to note that not all information needs to loop its way through applications and an ERP system. Although many lean manufacturing methods are supported with information technology systems, in many plant-floor instances visual and manual tools remain most effective. Rapidly changing data can remain at discrete locations, enabling personnel to react in real time. For example, visual queues on a plant floor can trigger inventory movement or identify quality or equipment problems. Other types of information should be posted and communicated in dramatic fashion (e.g., posters, displays, or closed-circuit televisions highlighting key plant indicators or important updates to environmental, safety, and health performance).

Indeed, once the difficult decisions regarding selection of appropriate measures and performance management are spelled out, the technical aspects to getting manufacturing visibility up and running are minor. Given the capabilities of most ERP systems and portal technologies, Frichol says that sharing and reporting can be achieved relatively quickly. With portal technologies, for instance, companies can easily establish separate access protocols for internal and external audiences, doing so in a manner that provides unique information visibility specific to each audience.

Remember, though, that manufacturing visibility is merely a tool to achieve business objectives. Although visibility can gauge the progress of operations—hour to hour, day to day, month to month, quarter to quarter—and eventually move the organization toward future targets, the real work still occurs on the plant floor—and in the minds of employees dedicated to improving that work.

SUMMARY

Manufacturing visibility and its benefits—improved operations and customer service and rising profits—are available only to those organizations that:

- Focus on the right measures—those that enable them to understand how well their processes are functioning, and those that matter most to their customers.
- Capture and share the right information across the supply chain, making sure that both suppliers and customers participate in the visibility process—ensuring optimal value to customers.
- Offer timely access of information to the right people, allowing appropriate employees and partners to manage problems and capitalize on opportunities.

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