Measurement Conundrums

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Organizations striving for operational excellence measure performance differently. Over the past 25 years, their measurement systems have borrowed extensively from award criteria such as Baldrige and Shingo, plus a host of certification criteria. However, performance measures tied to reward systems reveal what managers continue to hold important. Since "what gets measured gets done" — or at least gets attention — old performance measures preclude full development of lean systems and a learning work culture. Process measurements present conundrums, but not the impasses presented by the clash between process and financial measurements.

Any modern company swims in performance measurements for everything from earnings per share to the usage of work gloves. Some may even measure the working culture. But not all measurements are equal. Those that leaders emphasize reveal their real priorities. Measurements are somewhat contradictory if leaders intend them to balance performance attributes thought to be contradictory, like quality, cost, and leadtimes. That assumption sets up an organization for internal conflict.

A system of performance measurement is inseparable from organizational leadership. It symbolizes leaders' beliefs and competence. Without them being aware of it, leaders' metrics may be counterproductive for charting a company's future course, or giving anyone useful feedback on how to improve performance while on its present course.

From the view of top management, developing or modifying a performance measurement system presents several challenges:

- Structuring performance measures consistent with physical operations and needs of customers
- Measuring predictive activity, not just results
- Deciding on a "vital few" overall performance measures that will unify effort
- Deciding who monitors performance measures and how frequently.

A common example of vague, inconsistent measurement is "ship on time," which can be interpreted as: ship when originally promised, ship when the customer actually wanted, or arrival when the customer wanted. And if shipping by a

In Brief

Well-known is that financial controls inhibit lean operations and kaizen improvement. This article cites examples showing why. It also illustrates why key lean indicators should be chosen and used with care. The smartest lean indictors are precursors of process improvement: Whether people are making progress learning how to regularly make process improvements.

kanban system, does "ship on time" mean never letting the customer run out? In addition, how data is actually captured is important. An item shown as "shipped" may not have left the premises. Systems have actually reported an order as shipped when it transferred from production to shipping — to a dock. And are orders shown as "shipped" complete, or shipped partial with follow up? Without knowing the process, and how data is actually captured and calculated, "ship on time" numbers are nearly meaningless.

Usually inadequate measurement systems just muddle operations or improvement efforts, but occasionally they have had more serious consequences. An example is Ford/Firestone and the Explorer rollovers. Data from tire stores indicated a customer return rate on faulty tires of 3 ppm — six-sigma level quality. However, tires on totally demolished vehicles don't go back to a tire store — and no other system sounded an alarm. Having the media and attorneys ring your alarm is an unpleasant experience.

But the biggest bugaboos of continuous improvement are financial controls. Managers fear simplifying them. Financial institutions and regulators expect them. Scandals bring calls for transparency to protect investors, like Sarbanes-Oxley after Enron, but by leaving audit trails traceable long after the fact. It's like "inspecting quality into a product at the end of the line," with about the same success. The gnarly roots of this have been spreading for decades. A statement in 1972 captures what happened:

"Thus, Ralph S. Saul, President of the American Stock Exchange, commented on the shift from industrial capitalism to financial capitalism, with a change from 'concentration on producing goods and services to an increasing concern with earnings per share, price/earnings ratios, and financial results, almost independent of the process of production and consumption of industrial products and services.' This shift has, as a consequence, seriously influenced or confused goals of corporate management; it has imposed new decision-making on the corporate chief executive. These new attitudes of investors toward the corporation produce executive-suite nightmares."[1]

Inconsistency Breeds Incompetence

Fragmented performance measures do not integrate effort between departments, but generate conflicts between them. Departments looking great by local measurements can create havoc for suppliers and customers by being inconsistent with them. This is also inconsistent with lean thinking, in which total performance by both customers and suppliers is linked through "value stream" operations charged with satisfying the customers served by that value stream. Personal conflict between managers battling each other to meet opposing performance measures inhibits collaboration serving customers — or doing anything else. In addition, metrics intended primarily to control for results often conflict with those primarily intended to guide process improvement.

For example, a common inconsistency undermining lean implementation is retaining financial controls on labor cost. Process kaizen often frees up workers, but dismissing them afterward would kill worker enthusiasm for kaizen. But if they are still there, idle, the cost of labor hasn't changed, and the labor standard hasn't changed. Shifting them to indirect classification creates an unfavorable variance in indirect/direct ratio. Financial logic justifies dismissing excess people immediately to show a positive variance. It may even earn someone a bonus. But worst, if operating managers had previously assured workers of job security, then are overruled by finance, this inconsistency is laid bare for all to see. Thereafter, workers are apt to distrust any promise from any manager.

If a company cannot fill the excess capacity released by kaizen, any lean conversion must eventually deal with excess workers. If this becomes necessary, how it is done makes a big difference in workers' acceptance. Workers can understand that

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if there is no foreseeable work, there is no job, but *they* have to come to that conclusion. Union or non-union, regarding workers as variable cost commodities disengages any empathy they might feel for a company's situation. Management must at least try a visible strategy to fill up excess capacity. Unless they completely trust management, workers' enthusiasm for kaizen will be mixed with apprehension.

Another classic conundrum is engineering managers trying to build teamwork with suppliers developing new products while purchasing managers are rewarded on purchase price variance. This motivates purchasing managers to squeeze out price reductions "for the record." They don't oppose design collaboration to reduce cost. They're reluctant to share any gains from this with suppliers, lest they take a hit in their bonus. If in addition, a cash manager (or CFO) is rewarded for maximizing current assets, it creates an incentive to delay paying suppliers. Then from the suppliers' view, if partnerships mean only lower margins and higher receivables, they are understandably leery of them.

Applied to sales, short-term financial incentives may be even more damaging to lean manufacturing. For example, to boost quarter-end financials, a manufacturer of power tools gave significant quarter-end discounts to customers. Sixty percent of the company's orders arrived in the last two weeks of a quarter. This boom-bust order pattern made heijunka level scheduling impossible. Quite frankly, they had "trained" customer purchasing agents to order four times a year.

Both the power tool company's sales agents and its CFO got a short-term result they wanted. So did any customer purchasing agent rewarded by purchase price variance, but operations of the power tool company were a mess. At the end of each quarter, production virtually shut down while all manufacturing personnel went to the distribution center to ship product. After they returned to production at the beginning of the next quarter, it took two weeks to refill the pipeline.

This erratic ordering pattern forced suppliers to produce to erratic forecasts in big batches with long leadtimes. Supplier delivery performance was poor. Penalty and air-freight costs were excessive. Frustrated workers threatened to form a union because of excessive forced overtime at the end of each quarter, and because their annual Christmas vacation was usually curtailed by shipping goods to meet the revenue target. Operations within customer companies probably weren't helped either.

But once trapped in this pattern, the power tool company feared dropping the sales discounts lest customers stop ordering without them. Aligning an entire company with lean thinking takes courage as well as time.

Viral Infections

Performance measurements that are so irrelevant that they cause people to take the wrong action are worse than none. Using them is like spreading a viral infection.

An actual example of this is from a standard costing system applied to a crankshaft family having an annual volume of approximately one million. They were made in about 40 variations. The highest-volume variation was about 67 percent of annual volume. The cost of machining the highest volume variation was compared with one of the lower volume variations (less than three percent of annual volume) using the same standard costing and data collection system used throughout the company.

The "high runner" was a straight PTO (power take-off) shaft with a keyway; simple and straightforward to manufacture, and typical of this model family. Most variations differed only in diameter and length of the PTO shaft, and size and length of keyway.

But the "low runner" was unique: a PTO shaft with a second diameter and a pinion gear added. These required extra operations: turning the second diameter, the groove, and the pinion diameter; hardening the pinion diameter; and shaping the teeth for the pinion gear.

But the standard costing system

showed the "pinion" crankshaft, with extra operations, to be less costly to manufacture than the "straight-keyed" one. Although this cost model made no sense given the physical process visible to anyone, its distortions were never investigated. Instead, management spread this virus throughout the company. It used these costs for a wide variety of business decisions. And it used them monthly to berate factory managers and supervisors, who sat, numb, calloused to inane histrionics.

While this example is extreme, viral infection by unbelievable performance measures is widespread. When the disease is severe, it prompts cynical quips like that Groucho Marx classic, "Who are you going to believe; me or your own eyes?"

How Measuring Results Stunts Learning

A persistent viral load of results-focused performance measures kills lean learning cultures in infancy. The disease looks like this:

During the annual meeting for salaried employees, the company's chief operating officer politely and professionally chided employees for slackness because annual results were well below its publicly announced earnings forecast. However, the prior year had seen near-record earnings, celebrated by much praise and large bonus checks given out at a party at the city's public zoo. The hourly folks had received bonus checks as well.

Resignation showed in the faces of veteran employees. They had endured this disconnect many times before. Only results matter — not your innovations, your improvements, or your *efforts*. Process improvement this year had topped last year, so why should their effort be great last year (keep it up!), but unacceptable this year:

1) The COO's bonus was also based on results.
2) Revenue/cost changes were beyond their control (weather had slowed sales, and steel costs were up).
3) Blind focus on results ignores the disconnect between operating proficiency and transactional performance (excellent operations can sell output below cost).

Typically, only a few people affect transactional performance, while everybody affects operating proficiency, and collective improvement potential is underestimated. Smart leaders contain this disease before it goes into a death spiral, but carrying a viral load of results-centered measurement subjects the organization to reinfection at any time.

Worst, obsession with results-focused performance measurement even precludes process learning. For example, a manufacturer of cast metal parts used machine efficiency as the lone operational surrogate of financial results. As the CFO put it, "to maximize investment, we must keep machines running at all costs." The consequences escaped him: Machines running "flat out" piled up inventory; turns were less than 2X with high obsolescence costs. With no preventive maintenance, machines broke down. Emergency maintenance ran rampant. Long batch runs presented neither incentive nor opportunity to reduce setup times. Machines ran at only two speeds, on and off. Neither machines nor workers could flex with changes in market volume or mix. Since no performance measures detected anything the CFO wasn't looking for, management was deluded into thinking that they were doing the best they could, given their shiftless workforce.

This performance measurement system offered no clues to improve processes and kept people too busy to study clues if they had them. Workers did not need to hear the CFO state his belief. Only a hardy soul would risk telling him anything. From top floor to shop floor, this system created the opposite of a learning environment. Workers shrugged off the waste they saw. "If management doesn't care, why should we?"

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Process Learning Measurements

The best daily operating performance measures are close to the action. Well-done process visibility prompts much correction and improvement by those on the scene. Costs are irrelevant to knowing whether I'm ahead or behind, and whether key process parameters are in control — including adherence to standard work.

Anyone, including workers, who has learned to sort out processes and recognize the seven wastes can devise lean performance measures for their processes: lead-time, delay time, inventory, scrap, space, movement, energy use, and so on. If management wants to "roll these up" into an aggregate picture of a plant, several plants, or total company activity, they have to be comparable. But processes mix like apricots and bananas, so one can try comparing percentages of improvement, but those mix like apples and oranges too. Picking "low hanging" fruit typically yields more than later straining into upper branches.

Records of work methods are for later reference on what's worked and what hasn't near the scene. Everybody should be able to see this, contribute to it, and use it. It's a living database for process improvement, built into the regular improvement process.

Senior managers should see indicators that help them integrate and improve this system itself; firefighting is not their job. Detecting process problems remotely through data takes too long and detail is inevitably lost. Leaders' unifying process measurements for a mature lean plant are usually limited to a few basics: safety, customer quality, delivery, and maybe lead-times or scrap. What they should really monitor are indicators of the development of people. (And the time to review unit costs is during product design, when most of them are set. Any process waste removed thereafter is a bonus.)

Even at a general business level, revising strategy requires seeing beyond the fog of the financials. To obtain better results, we must learn to do something different. Serve customers or potential customers differently. Anticipate how customer needs will change and what might improve their performance. (Product design programs or kaizens with customers are marvelous learning opportunities.)

Lean as a Learning Methodology

All of us begin to learn lean manufacturing as a set of techniques. These let us "know" how to streamline physical operations. Some folks put problem-solving techniques in their lean tool kit; some classify them as something else. This is almost irrelevant to selecting a set of tools that mesh with each other for a specific process application, adapting them as necessary. Some techniques are learning tools; some help people see problems; some help them solve them. In time, persistent leaders figure out that they are really creating a process learning structure and coaching people to use it. And it applies anywhere work is done, not just shop floors. Their creation should stimulate everyone to learn much quicker, and much more effectively. Doing this remodels the organization into a learning work culture, and regular process improvement is an outcome. That is essentially how Toyota "creates" TPS (now called the "Thinking Production Process").

Toyota Measures the Learning Process

When judging the progress of a plant, Toyota does not emphasize plant process performance. They look at indicators of the progress people are making learning to improve processes and solve problems. That's predictive of potential process performance. A few such indicators are: cross-training status, participation in quality circles; number of projects they completed; number of suggestions made and implemented; and number of changes in standard work (process improvements).

The number of changes in standard works bears explanation. Toyota always pegs a process improvement to the last standard for the same work. Never improve a process from what you see happening now. Improve upon the standard established by

the last round of improvement. To prevent adherence to standard work slipping, part of designing a work method includes visibility calling attention to deviations from it. Without doing this, one may only be making the same improvements many times over.

Production is the clearest example of this, but it applies everywhere. Engineering, for example, might track training on design by the department standards, and the number of A-3s added to various technical data banks — knowledge ready for designing new vehicles. A learning system can be devised for almost any kind of organizational work.

The basic objective of improving a learning process is simple: Create more obvious clues to the sources of problems faster. Seeing and solving problems with fewer false starts is an extension of fail-safe quality, correcting process deviations before they cause a defect. Alone or in organizations, people learn quicker by doing, and when immersed in a system that stimulates thinking and problem solving rather than start, stop, and re-learn.

This kind of thinking is not totally unknown to short-term oriented stock analysts. They regularly check companies' pipelines of new products as an indicator of future earnings. But they are unlikely to know about lean learning systems, or developing technology before designing product with it, or the power of developing employees to improve a lot of "little things." So why are financial controls such a nemesis of lean learning systems?

Overcoming Our Legacy

Instinctive financial control is fearful to dispel, but it is necessary, as Tom Johnson explains: "A key reason why American companies fail to emulate Toyota's long-term financial results is their belief that managers can use financial targets as 'levers' to control those results."[2]

Unfortunately, financial controls are too abstract. Often the controllers are not just "flying on instruments, but flying blind." Analysts miss too much that is important. The feedback is too slow and too clueless. A recent study bleakly concluded that in over 70 percent of all cases, business combinations that mathematical models had predicted to be successful had failed to meet their financial objectives.[3] We have to do much better. We need performance measures that support learning systems for everyone.

However, the gulf continues to widen between transactional business systems and those needed for intensive operational learning. So different is the mentality of these two cultures that shedding detailed financial controls has become like diluting concentrated acid with water — nearly explosive. To do it, one has to first overcome fear; then be careful. Kaizen the legal interpretations of such controls to eliminate the "imaginary waste" added because some timid soul feared any imaginable audit or investigation.

It's tempting to resolve our conundrums by measuring everything in dollars. However, even without any gross distortion, painting everything green hides a lot and makes it all look the same. And managing by the numbers seems easier than leadership creating a learning culture, "the real lean." So look at the progress people are making learning to improve processes. It's crude, but better to approximate something predictive of later results than to measure stale cost results with illusory precision. Judging performance requires knowing the people, the processes, and their state of development — hard to do if you are remote from them.

Effective performance measures are simply feedback information loops that enhance our performance. If they don't convey anything actionable, ever, they are waste. Effective performance measures let us take corrective action, or let us compare and contrast options to make more thoughtful decisions than would be possible without them. Although performance measures are preferably kept simple, interpreting them requires training and experience. Organizations must develop all their people to use them.

Choosing the best performance measures requires understanding processes, how to set up a learning system, and how people will use the measures to further

their learning. That is, performance measures help structure a learning system. Structuring a learning system enables creation of a strong learning culture. And it isn't just Toyota that can do that.

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3. Stenzel, Catherine and Joe, 2004, *CFO Survival Guide: Plotting the Course to Financial Leadership*, John Wiley & Sons, Inc., Hoboken, NJ, p. 7.