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Metrics—The Missing Piece in Operations Management Research

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If you were to look back at the last 10 years of research in Operations Management, you would see research done in such areas as Just-in-Time Manufacturing, lead time reduction, supply chain management, and manufacturing strategy. One component that is common to all of these varied lines of research is the use of metrics or measures. When we discuss the impact of JIT on the firm, we talk in terms of the reduction of lead times, costs, and quality problems—all of these involve metrics.

Until recently, both researchers and managers have tended to view metrics in very simplistic terms. When dealing with lead times, we would focus on the actual lead time. We assumed that reductions in lead times should result in reductions in costs. However, the reality is very different. In one Fortune 50 firm that I recently visited, I saw a situation where a vice-president in operations bemoaned the fact that the significant reductions in lead time, setup time, and the improvement in quality were not showing up in the bottom line. This concern about metrics is not limited to the internal operations management system but also extends to the supply chain. Organizations such as the Supply Chain Council are exploring alternative metrics for measuring performance across the supply chain. All of this indicates a reawakening of interest in this area of metrics. It is also marking metrics as an area for future research. In this note, I will examine the concept of research and discuss some of the changes that are causing us to reexamine it. Ultimately, this note is intended to encourage research into this area.

Defining Metrics

The first step in effectively and efficiently using metrics is to define what metrics are. Simply stated, a metric is a verifiable measure stated in either quantitative (e.g., 95% inventory accuracy) or qualitative (e.g., as evaluated by our customers, we are providing above average service) terms. Metrics should be consistent with how the firm delivers value to its customers stated in meaningful terms.

The importance of metrics has been recognized by numerous managers. For example, Tom Malone said, "If you don't keep score, you are only practicing." Emery Powell noted that, "A strategy without metrics is just a wish. And metrics that are not aligned with strategic objectives are a waste of time." Finally, some unknown but very wise manager once said, "Be careful what you measure—you might just get it." That is, by measuring something, you are stating to your employees, managers, stakeholders, and industry analysts that an activity is **important.**

Metrics are important because of the functions that they provide, namely:

Control: Metrics enable superiors to control and evaluate the performance of the people working under them. They also enable employees to control their own equipment and their own performance.

Reporting: This is the most commonly identified function of metrics. We use metrics to report performance to ourselves, our superiors, and external agencies (e.g., Wall Street, the EPA or to a bank).

Communication: This is a critical but overlooked function of a metric. We use metrics to tell people both internally and externally what constitutes value and what the key success factors are. As pointed out previously, people don't understand value, but they understand metrics. As a result, value as implemented at the firm should influence the type of metrics developed.

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Opportunities for Improvement: Metrics identify gaps (between performance and the expectation). Intervention takes place when we have to close undesired gaps. The size of then gap, the nature of the gap (whether it is positive or negative) and the importance of the activity determine the need for management to resolve these gaps.

Expectations: Metrics frame expectations both internally (with our personnel) and externally (with our customers). Metrics help form what the customer expects. For example, if we say that we deliver by 9:30 a.m. next day, we have formed both a metric (i.e., did we meet the 9:30 deadline) and an expectation. We will satisfy our customer if the order arrives by 9:30. We will disappoint otherwise.

Categorizing Metrics

Next, we turn our attention to understand the different types of metrics found in most operations management systems. One way of understanding these differences is to focus on the various categories observed when studying metrics. We focus on two major metrics-related categories: organizational focus, and the extent to which the metrics are predictive.

Organizational Focus. Just as all firms can be viewed from different levels (beginning with the ticket agent or the programmer and ending with the firm as a whole), so too can we have metrics present at different levels. In general, we have at least four different levels of organizational focus for metrics.

We can have ***organizational metrics***, or measures that capture and describe the performance of an organization. This organizational level typically is the corporate level. Performance at this level is typically described in terms of market share, rate of return, or rate of growth.

We can also have ***product metrics***. These metrics are usually stated in such terms as cost per unit, contribution margin per unit, or growth in sales.

Metrics can also be ***functionally*** oriented, in that we can measure the performance of a group such as purchasing or services or manufacturing.

Finally, we can be faced by ***activity/individual metrics***. These are metrics that are specific to a person or to an activity (e.g., how long it takes to make one unit of output at a specific machine). At each level, we have different requirements. As a result, each level requires its own type of metrics (in other words, one size does not fit all).

Predictive vs Outcome Metrics. We must be concerned about the extent to which a metric is predictive (as compared to outcome-based). An ***outcome-based metric*** (also known as an ***output metric***) is one that is generated only after the completion of the activities. Such a measure tells us how we did in the end. In contrast, a ***predictive metric*** (also referred to as a ***process metric***) is one that we can use to help predict our chances of achieving a certain objective or goal. To understand the differences between these types of measures, consider the following example. You are standing in front of your house. It is now 9:00 in the morning. You receive a call from someone very important telling you that you have to be in the office of a client by no later than noon. That client is located some 90 miles away from your house. An outcome-based measure would involve having someone with a stopwatch standing in the client's office. If we arrive at or before noon, we would be marked as being "on time." Otherwise, we would be late. Outcome metrics suffer because they are after the fact. We only know how we did after it is too late to take any corrective action—after the activity is done. Such a measure tends to condemn us to repeating the same mistakes – over and over again.

Predictive metrics take a very different approach. We would start by noting the starting time (9 a.m.), the availability of appropriate resources (a car in good working order, full of gas and ready to go), and the average speed per hour (50 miles per hour). With this information, we can predict that the chances of making the meeting with the client are very, very good.

In many systems, the bulk of metrics are outcome-oriented, rather than predictive. For example, we measure on-time delivery rather than looking at inventory accuracy, setup time, or total time for a specific operation or process to be completed. As a result, the measure system gives the managers little information on which they can predict their chances of meeting their objectives. However, firms such as Texas Instruments are now turning their attention to the development of predictive metrics. They recognize that such measures are far more useful to the users.

Concluding Comments

As we can see from this brief discussion, the rethinking of metrics is opening up new areas for research. We saw one area already. When the VP bemoaned the fact that the operating metrics results were not being reflected in the financial results, that person was focused on the issue of the extent to which there was consistency between the various levels of metrics. By focusing on metrics, we can begin to resolve the paradox that has traditionally frustrated manufacturing—our lack of visibility at the level of the board of directors. Metrics are a topic whose time has come. ■

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