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Balanced Safety Performance Measurement Systems: First Steps or Fine

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Introduction

Just a decade ago, safety performance measurement was pretty much a "frontier topic." However, in this relatively short period of time, it has exploded into a quasi-specialty that is well known to most safety professionals. In fact, this area of safety management has even developed its own cadre of terminology. The terminology in safety performance measurement has largely been adopted from other areas of business management, and the two terms most commonly used to broadly categorize safety performance measures— leading and lagging—are no exceptions. While this categorization of measures has proven extremely useful in moving safety performance measurement beyond the frontier stage, it has also sparked controversy. Recent publications in multiple safety journals show that many commentators and respected safety professionals have strong, negative opinions regarding leading safety performance measures, especially with the lack of consistency and clarity in defining them.[1] In contrast, there are some organizations that are so discontented and frustrated by the performance plateau that over-reliance on lagging measures (i.e., incident rates, loss ratios, incident costs, etc.) produce that they express a strong desire to totally abandon lagging measures. Upon closer look, however, many of the negative opinions concerning leading, are not solely concerned with semantics, they are rooted in discontent with how organizations have started treating "leading measures" as a panacea for solving most all safety and health challenges. And, as stated earlier, those over-zealous proponents of leading measures appear to be moved by frustration with a lop-sided reliance on lagging indicators. After close examination of the literature on this subject, and evaluating what many companies with well-developed, successful safety performance measurement systems have done, it is clear that a balance in leading and lagging measures must exist in order for safety performance measurement systems to be effective.

Balance in safety performance measurement systems must be maintained in many different aspects. Broadly speaking, balance between leading and lagging measures in general must exist; however, balance in methodologies and the types of measures within these categories must also be present. For example, within a particular measurement area such as behavioral observations, both outcome and activity metrics can be derived. However, the amount of emphasis that the

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[1] Manuele, F.A. "Lagging & Leading Indicators: Do they add value to the practice of safety?" *Professional Safety*. Dec. 2009: 28-33.

outcome measure receives over the result measure (and vice versa) is a matter of balance that must be considered on an organization-by-organization basis (Petersen 19-25). This paper will provide a general examination of maintaining proper balance in the broad categories of measurement as well as how those individual measures and metrics are derived. Maintaining balance in every aspect of safety performance measurement is imperative to organizations that are just getting started with developing a safety performance measurement system or those that are fine-tuning an existing system.

To be most effective, safety metrics need to be balanced, using strategies based on various organizational goals, systems and cultures. For example, a balanced approach could include the design of leading measures that strike a balance between short-term performance and longer term, safety culture development objectives. Another important safety measurement balance lies between a focus on reducing high frequency of injuries and addressing the lower potential for high severity injuries. Further concepts for balancing measures include the ideal mix of activity/process versus results measures, the anticipated costs versus value added, a balanced integration of safety metrics within an organization's existing programs, and balancing the optimal number of safety metrics the organization can realistically focus upon at any point in time.

Defining Key Terms

Before progressing further, it is appropriate that a brief discussion regarding the terminology that the authors use be provided because no definitive rule on terminology exists as it applies to safety performance measurement. Through years of research and working with various companies, it has proven helpful to differentiate between the terms measure and metric, as well as the terms leading and lagging indicators.

For the purposes of this article, it is helpful to think of *measure* as being analogous to "length" and the term *metric* being analogous with "inches" or "centimeters," or any other unit of measure for length. Applied in a safety context, this analogy may be expresses as such: behavior observation is a measure, and "percent at risk behavior" or "# of observations conducted to goal" are metrics. Here we see a safety performance measure, behavioral observation, coupled with two of its relative outcome and result metrics. Even though the authors do not warranty this particular usage of the terms *measure* and *metric* as determinative for the safety profession, it has proven helpful and efficacious to make this distinction in the terms.

Maybe more troublesome than distinguishing measure and metric is defining the terms leading and lagging measures. While the scope of this paper will not permit an exhaustive look at the history and usage of the terms leading and lagging in other areas of business, it suffices to say that a precise, parallel application of these terms to safety management is difficult and quite possibly impractical. Furthermore, attempting to completely reconcile usage of the terms leading and lagging in safety with other areas of economics and business is a fruitless exercise in semantics that does little to advance the profession. There are certainly areas in safety management where a measure that is labeled a "leading measure" will derive from an event that has occurred in the past. This is problematic for some, as they prefer to have leading measures be strictly related to future events or be purely predictive. This disparity in term usage is often illustrated with measures tied to accident investigation efforts. Some feel that because accidents

are past tense, measures deriving from them are not forward-looking, and thus are precluded from being labeled as "leading."

To help deal with the confusion surrounding the terms leading and lagging, it is advisable for the safety professional to keep in mind that the objective of safety measurement systems is to measure ***performance***, not to deliver a fool-proof prediction of the future. Those measures that give an organization a direct indication of the quality or sufficiency of a particular hazard control are, in most cases, *leading* measures. Those measures that speak to an organization's experience regarding the ultimate objectives of safety (preventing injuries and loss) are generally considered *lagging* indicators. To explain this distinction, an automobile engine's temperature gauge provides a helpful illustration. The temperature gauge provides the driver with an indication of how well the engine's cooling system is performing at the present time. If the temperature gauge starts indicating a temperature beyond normal operating parameters, it informs the driver that a problem may have developed that will ultimately lead to engine damage. This gauge allows the driver to intervene before an engine overheats and produces loss. Similarly, leading measures tell the safety professional how well hazard controls are performing to prevent injury and loss. Thus, leading measures can hopefully allow for intervention before injuries or loss is sustained. So, for the purposes of this paper, this convention of terminology is used.

To summarize this discussion on terminology, there are no definitive, bright-line definitions with the terms used in safety performance measurement. Some safety professionals find it difficult to deal with this lack of clear-cut definitions for terms (not to mention the lack of extreme statistical precision with some measures), and therefore throw out the safety measurement baby with the bathwater. Organizations should concern themselves with developing measures that reveal how well hazard controls are performing (leading measures) and then properly balance them with lagging indicators, instead of becoming consumed with semantics.

Balance Is Relative

One of the most important tenets, when developing a successful safety performance measurement system, is to ensure that it is customized for a particular organization and its various locations to the greatest extent possible (Petersen 1-2, 83-105). To properly balance the scales of safety performance measurement, the amount of leading measures on one scale pan will frequently be much more numerous than the amount lagging measures on the other. Some companies have found that focusing 85% of their performance measurement on leading measures to be proper, while other have found success with less leading measure focus (Bevington). The authors' experiences in conducting and analyzing case studies, as well as the subject literature, show that measures must be selected and refined on a case-by-case basis, fully considering the people, systems and environmental factors of each company. To this end, developing the proper balance with leading and lagging measures, as well as the proper balance with results and outcome measures, is always relative to each organization. Therefore, it is only helpful to discuss key considerations in developing balance rather than provide a precise formula.

Overriding Principles

The effective design of a well-balanced safety performance measurement system is both an art and a science. Ideally, safety measures will be customized, comprehensive and contemplative of mixing of lagging indicators (accomplishments, results, outcomes) and leading indicators (behaviors, processes and activities). The ANSI Z10 standard encourages this mix of safety measures. Part 6.1, "Monitoring, Measurement and Assessment" from ANSI Z10 Standard for Occupational Health and Safety Management Systems, includes the following statement from the right-hand column ("should" or recommendations column):

> E6.1 – The purpose of these processes is to help evaluate the performance of the management system by measuring its effectiveness in controlling and reducing risk. Organizations should develop predictive or "leading" performance measures or indicators. The organization can use these measures to identify and correct problems and identify opportunities for risk reduction before injuries or illnesses occur. The leading indicators can be used in combination with carefully collected injury and illness rates to measure performance. Some examples of indicators of potential problem areas are human factors risks, near-miss incidents, and non-conformances found during inspections. (ANSI Z10, p. 18)
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> E6.1C – These (injury and illness) rates, however, should rarely be the sole or primary tool to evaluate performance of an OHSMS [Occupational Health & Safety Management System], for several reasons. Primarily, these rates measure the very injuries, illnesses and material losses that a management system is trying to prevent. When injury indicators are the only measure, there may be significant pressure for organizations to "manage the numbers" rather than improve or manage the process. (ANSI Z10, p. 19)

In determining specific measures and metrics, consideration may be given to the mix of leading indicators versus trailing indicators. For example, should the mix be 50/50 or favor one kind of indicator over the other? The authors recommend a mix that favors leading measures, such as 80/20 (80% of your measures are leading measures) or even greater. The reason for this is when a company does a good job of focusing on what they are doing for safety, the trailing indicators will automatically reflect the safety accomplishments and demonstrate a reduction in injury rates, workers' comp costs, and other lagging, outcome measures. Safety professionals add value to their organizations by identifying the specific metrics that enhance their site safety culture.

Determining the best metrics and the best mix for a specific site or organization is both an art and a science. Fred Manuele notes, in *Advanced Safety Management*, that when measuring risk assessment systems, "The fact is risk assessment process is as much art as science" (Manuele 165). Safety professionals can use powerful tools such as Manuele's Risk Score Formula, but must keep in mind that the numerical scoring system is derived from subjective assessments of the risk levels. It is not straight science; there is art and an element of subjectivity as well. The caveat Manuele notes more than once, "Numerical risk scores carry an image of precision that

can influence decision making and priority setting. In reality …they should not be the sole or absolute determinant" (Manuele 182).

Ten Steps to a Comprehensive and Balanced Design of Safety Measures

As a product of the collective research and case studies, the authors have established ten steps to developing safety performance measurement systems. While balance is a key consideration in all of the ten steps, it is more imperative, and the strategies are more clearly illustrated, in steps one, 2, 4, and 10. Following is a summary of each of the ten steps with special emphasis on how balance plays a major role in the aforementioned, particular steps.

1. Prioritize and Customize Measures

This step requires organizations to review data in order to determine trends and opportunities for leading measures to impact performance. Also, organizations should include a review of those hazards that may not have contributed to injury or loss trends but have the potential to produce serious injury, death or other catastrophic consequences (commonly referred to as FATCATS). Hazard controls designed to remedy injury trends and prevent FATCATS are frequently the priorities for measurement. Measuring these priorities must always be customized

The balance in this step is to ensure the organization's focus is on the measures that most impact performance. Pareto's principle is a useful guide in establishing the 20% of variables that influence 80% of the outcomes. Organizations can conduct a Pareto analysis to determine the most relevant measures that will actually impact safety performance.

2. Determine Level of Organization to Measure

Each measure in an organization usually has an owner, or particular party to which it pertains. Levels of the organization differ in every company based upon their structure and dynamics (i.e., union vs. nonunion environments) (Petersen 28-32). Relevant safety measures can be established for people to clearly understand their responsibilities in safety, and to be held accountable for those responsibilities. To accomplish this goal, measures must be designed to address the various levels and cross section of employees

Micro-measures tend to largely be associated with safety activities; however, certain outcome measures, such as percent of at-risk behaviors, can be considered micro-measures. Many times, macro-measures will encompass more of the lagging indicators and apply to a wider scope of employees and/or processes. Typically, micro-measures (i.e., behaviors, PPE compliance percentages, etc.) are more prevalent at the line employee level, while macro-measures are more prevalent at the upper levels of the organizational chart (i.e., plant managers, vice-presidents, CEOs, etc.) (Petersen 83-84).

Those organizational levels that encompass line supervision and middle management present the zone of measurement where obtaining the right balance of leading and lagging measures, as well as micro- and macro-measures, is a more tedious process. Factors such as an organization's nature of business, infrastructure, types of hazard controls, relative size, and degree of sophistication in safety management systems, are just some of the variables that will dictate the proper mix of micro- and macro-measures at each of the levels. Generally, balance for

the middle managers will involve at least a slightly greater amount of focus on lagging indicators and macro-measures than what is seen in the measures assigned to the line supervisors. However, as it has been emphatically said, the proper balance in the arena of measurement is a circumstantial matter that must be customized for each organization, and if possible, the units within the organization.

3. Verify Controls and Identify Obstacles

This step may one of the most important in the process; however, the concept of balance is not obvious. In step three, various controls that the company has chosen to measure are evaluated to ensure that they are indeed effective at preventing injuries and loss. Effort spent on measuring a control that really doesn't impact safety can cause irreparable harm to a safety performance measurement system. Therefore, before expending efforts to devise a measurement methodology for a control that may fail to actually impact safety performance, safety professionals must employ some of their statistical tools and experiential savvy to ensure measurement of a particular control is not an exercise in futility.

4. Determine a Simple List of Measures

A major reason why many companies fail in their measurement efforts is because they have chosen to measure too many things at once. Data collection systems, manpower resources, communication barriers, and, not surprisingly, energy within the safety department naturally limit the amount of measures that can be adequately prescribed, the amount of metrics that can be calculated and analyzed, and the amount of measurement communication. Step 4 presents a notable pitfall in either developing a new measurement system or refining an existing one. The pitfall of this step is two dimensional in that the determining the number of measures to be taken can be misjudged, and, for the sake of keeping the list simple, some measures can be cut that are essential to maintaining the proper balance. To best ensure that the safety measurement system does not succumb to this pitfall, keeping Steps 1 and 10 in mind are essential. Furthermore, since lagging measures tend to be more finite (except for the many ways the metrics can be analyzed and manipulated), it can be helpful to excise lagging indicators from the short and simple list, so that this step only pertains to leading measures. By keeping the leading measures list short, and rotating measures as appropriate, a better balance can be achieved between safety and other key performance indicators.

5. Identify and Measure Means for Engagement

The most successful safety performance measurement systems all have in common one theme: employee engagement. Employees are sometimes uncertain of the expectations concerning the degree of engagement they are supposed to have in a safety process. This uncertainty sometimes exists because there are differing expectations for engagement in the production process, compared to expectations for engagement in safety processes. Unfortunately, engagement in safety can compete with engagement in production and employees may feel as though they have to choose between the two. By specifying clear and direct ways employees can contribute to safety, and perhaps giving choices for employees on how they can best contribute, employees can balance engagement for safe production. It is important that the formal measure for safety does not specify some form of safe behavior, while the informal expectation is that production is accomplished at all costs.

6. Develop Methods and Tools

Step 6 is largely involved with developing the measurement system logistics and methodology. Here, tools such as checklists, scorecards, databases, intranets, and so on, are developed for collecting, entering and analyzing data from measures. For balance and alignment with organizational systems, safety measurement tools should be designed to match existing measurement tools already used at the organization. For example, if balanced scorecards are used, then that method should be extended to safety. Other examples of safety measurement tools include audits, surveys, and dashboards.

7. Develop Delivery Strategies

Feedback for safety performance may be delivered in various manners. The feedback may be verbal, written, or in the form of posted graphs. For optimal balance and effect, it is recommended that all of the various forms of delivery be used, and used frequently, such as weekly, for maximum impact. Of critical importance in this step is having a clear understanding of the audiences' abilities to interpret the delivered information. Issues such as literacy, eyesight, and technological competence (i.e., if data is tracked and / or communicated through computerized means) are fundamental, yet frequently overlooked failure points to those safety measurement systems in the developmental stage and those in the refinement stage.

8. Set Performance Goals

It is crucial to establish goals that are balanced between what is challenging and what is realistic or achievable. Furthermore, process safety goals should be balanced between ways that employees can promote safety and the safe behavior that is expected as part of the job. Step 8 is not complex and really embraces the S (smart) M (measurable) A (achievable) R (realistic) T (timely) model.

9. Monitor Safety Progress

Ideally, safety data will demonstrate a positive correlation between increased process measures (what you are doing for safety) and increased safety performance. If hazard controls are appropriate and properly designed, then reduced injuries, the ultimate safety objective, should be realized. Keep in mind what was established earlier in this paper; the objective a safety measurement system is to gauge the performance of technically competent hazard controls. If success is not achieved with performance, or if injury trends continue to rise, adjustments with either the measurement system and/or hazard controls should be made.

10. Adjust and Modify for Continuous Improvement

If your organization already practices continuous improvement (CI), mesh your safety process with CI to continuously improve it as well. Geller recommends a DO IT process for behavioral safety; as applied to safety measures, it would involve a loop of: (1) define the behaviors to measure; (2) observe to collect the data for the behaviors; (3) intervene to improve or make the behavior safe; and (4) test the impact of the intervention. Successful safety performance measurement efforts appear to have mimicked, albeit possibly subconsciously, Geller's process. Many times the adjustments made through this step will simply be to improve balance; however, there are situations where adjustments to address a particular deficiency can impact balance within a system in negative manner. Therefore, balance must be evaluated pre- and post-adjustment to ensure the efficacy of the measurement system.

Conclusion

Disagreement on semantic issues with safety performance measurement is actually secondary to the philosophical conflicts involving emphasis organizations place on either leading or lagging measures. Lack of balance is at the heart of many conflicts and failures in safety performance measurement. A proper balance must be maintained between leading and lagging measures, as well as activity, outcome, micro- and macro-measures. Within a ten-step process to develop or fine tune leading measures systems, balance is a focal point in at least four of the steps.

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