Leading Measures for Safety Performance:
Enhance Your Organization's Culture

Earl Blair, Ed.D., CSP
Indiana University
Bloomington, IN

Abstract

Most people now recognize the importance of developing a strong culture that supports safety. The primary key to developing a strong safety culture is generally considered to be a function of top leadership. However, there are other ways culture can be developed, especially with the visible support of leadership. One of the keys to developing a strong safety culture is to establish and implement safety metrics that influence an organizations' culture and drive safety performance. This article provides some suggestions about the kinds of measures and related approaches to accomplish this goal.

A Common Problem

Safety professionals know there are some good applications for trailing measures, such as trend analysis and evaluating the effectiveness of safety initiatives. The problem many organizations encounter is the measures they utilize do not contribute to the development of the safety culture. The safety culture is unlikely to be positively impacted when trailing indicators are the only measures an organization uses, or when the major focus, such as 80% of the emphasis, is put on trailing indicators.

Leading indicators measure the activities, behaviors and processes, the things people are actually doing for safety, and not simply the safety-related failures typically tracked by trailing measures. To make a distinction about the two aspects of performance, Stolovitch and Keeps define performance as follows: "Performance is a function of both the behavior and accomplishment of a person or a group of people. Performance includes the actions of a person or people and the result of the action or actions" (Stolovitch & Keeps, 8) The measurement of true performance, especially applied to safety, includes a mix of trailing indicators (accomplishments, results, outcomes) and leading indicators (behaviors, processes and activities).

The ANSI Z10 standard encourages this mix of safety measures. Part 6.1 entitled Monitoring, Measurement and Assessment from the 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)

And,

"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)

Strategies for how to best integrate this mix of trailing and leading indicators become an issue when planning for safety performance improvement.

Customize Safety Metrics by Site

First, safety practitioners want to know what are the specific metrics indicated for their organization. This article provides suggestions and examples for practical ideas, and illustrates a few measures that have worked for various organizations in recent years. Since there is no one right set of measurements, the safety metrics that are best for any particular site must be determined on a case by case basis, and customized for the organization based on the current circumstances. Foster Rinefort noted in his dissertation at Texas A&M University that there apparently is no one right set of measurements (Rinefort 1976).

Second, in determining specific metrics, consideration may be given to the mix percentage of leading indicators versus trailing indicators. For example, should the mix be 50/50 or favor one kind of indicator over the other? In my opinion the mix should favor leading indicators, such as 80/20 (80% of your measures are leading indicators) or even a greater percent emphasis on your leading indicators. The reason for this is because 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 outcome measures.

A Useful Strategy:
Establish Measures Designed to Improve Safety Culture

Various experts tend to agree that culture is, or should be, the driver of safety performance: Manuele is emphatic that the "The level of safety performance achieved is dictated by the culture of the organization." Scott Geller notes in his Principles of Safety that "Safety should be driven by the local culture"…and that, "Culture change requires that people understand the principles (of long-term culture change) and know what to do about them." (Geller 5)

In *Advanced Safety Management,* Fred Manuele elaborates on the significance of organizational culture:

"Safety is culture-driven, and management establishes the culture… an organization's culture translates into a *system of expected behavior*…The injury and illness experience that results is a direct reflection of an organization's safety culture…Major improvements in safety will be achieved only if a change in culture takes place – only if major changes occur in the *system of expected behavior.*" (Manuele 82)

To provide meaningful direction, focus your safety measurements to continually improve the safety culture over the long-term. Well-chosen leading indicators contribute to continual improvement of the safety culture in the following ways:

- Leading indicators serve as a catalyst for change
- Meaningful metrics are motivational for both employees and management
- Leading indicators ultimately drive safety performance (activities and outcomes)

Expanding on each point, metrics don't necessarily produce change but when well-chosen, with culture development in mind, they may serve as a catalyst to fuel the changes needed in the organizational culture. This is especially true when established safety metrics provide strong directional focus and specific, expected safety-related responsibilities at all levels.

Employees at all levels can fully "buy into" meaningful safety metrics. Those metrics that encompass direction, elucidate specific responsibilities, and demonstrate a direct connection to reduced injuries tend to be highly motivational. With focus, clarity, and regular measurement of accountability, employees are likely to apply their efforts to the process of improving the safety culture through the application of the established metrics.

Concept: How Can We Know Which Metrics Drive Safety Performance (Outcomes)?

For individual accountability, we know that well-chosen leading measures will drive specific behaviors and activities. Especially if, when those metrics are implemented, individuals are evaluated and rewarded based on those objectives/metrics. To ensure your process metrics are robust:

1. Include them in employee evaluations
2. Include them in management and supervisions' evaluations
3. Ensure the operating line implements and follows up on the metrics

Safety professionals add value to their organizations by identifying the best metrics that enhance the site specific 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,* 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).

Priorities for selecting measures are based on the existent hazards, risk levels and site history, including an in-depth analysis of injuries and near-misses. The areas of the safety culture that might be measured include those things employees, at all levels, consistently do to reduce or eliminate latent and active hazards. Perhaps a better metric might be to track specific things management is doing on an ongoing basis to support the development of a positive safety culture.

Well-Chosen Soft Metrics = Big Impact

Elements of the safety process that have typically been considered subjective or soft, generally offer the greatest return on improving safety performance. The trick is to choose specific aspects of each element that influences the culture, and add numeric ratings for measurement. This observation from James Stewart exemplifies the potential big impact of soft measures: "Management commitment, line ownership, and workforce involvement are the fundamental drivers of safety. These 'soft' factors are supported by comprehensive safety systems and practices…in organizations with excellent safety, these systems and practices are meticulously implemented and continuously improved" (Stewart 2002).

Echoing Stewart's comment, the basic elements of OSHA's Safety & Health Program Management Guidelines are still as relevant as when they were first published in 1989. As you customize your safety metrics, my recommendation is to use these guides to develop detailed metrics that support their high level accomplishment:

1. Management Commitment and Employee Involvement are Complementary
2. Worksite Analysis
3. Hazard Prevention and Control
4. Safety & Health Training
   (OSHA, Safety Management Guidelines for Voluntary Protection Programs, 1989)

The ANSI Z10 standard suggests examples of the leading indicators that an organization can use in their mix of leading and lagging indicators:

"Examples of indicators that demonstrate the effectiveness of the OHSMS [Occupational Health & Safety Management Systems] are the reduction of average exposure levels, the rate and timeliness of completion of corrective actions, the completion of required maintenance, or the completion of required training, and tests of their effectiveness. Indicators should be designed according to the hazards in the workplace." (ANSI Z10 – 2005, p. 18)

Why do Safety Audits Often Fail
as Drivers of Improved Safety Performance?

"Scored audits are tools used to evaluate the effectiveness of a safety management system…audit scores must be correlated to injury rates to be truly predictive, otherwise the audit may be measuring things that are nonproductive." (Petersen 84). Dan Petersen further claimed there is often a negative correlation between safety audits and safety performance. He refers to a study

done by the American Association of Railroads that "showed conclusively that the elements in most packaged (safety audit) programs had no correlation with bottom-line results" (Bailey 1988 in Petersen, 85).

Manuele suggests the principle purpose of the safety audit is to improve the safety culture. He quotes Kase & Weise from their book on *Safety Audits: A Management Tool* as stating: "Success of a safety auditing program can only be measured in terms of the change it effects on the overall culture of the operation…" (Kase & Weise, in Manuele, 362). Perhaps for safety audits to be genuinely useful, they must be well-designed with the purpose of improving safety management systems and the resulting culture, and include meticulous follow-up to address the weaknesses revealed in the audit.

What about Perception Surveys, or Safety Climate Surveys as Measurement Tools?

These surveys provide a snapshot of an organizations' culture and can be a highly useful tool in using measures to drive the safety culture. Well-designed and customized safety perception surveys provide the following benefits to an organization as they are:

- Practical – Address the primary safety issues; even if just perception, the perceptions are real to the people who hold them and must be addressed.
- Predictive – They fulfill the definition of what a leading indicator is supposed to do.
- Prescriptive – The results generally indicate clearly what needs to be done.
- Proactive – Preferable to accident investigation which is obviously reactive.

Safety climate perception surveys can 1) Identify safety trends, 2) Enable an organization to focus on the most problematic areas, 3) Serve as a leading indicator of safety performance, and 4) Establish a baseline for future measurements. A Short-form Seo Safety Climate Scale II developed by Dong-Chul Seo at Indiana University includes the following five dimensions:

1. Supervisor Safety Support
2. Co-worker Safety Support
3. Management Commitment to Safety
4. Employee Participation in Safety-related decision making and activities
5. Employees Safety Competence Level

The Seo Safety Climate Scale (SSCS) has been cross-validated in two studies, is currently used in more than 10 different countries, and can be customized to the specifications of individual organizations. A Spanish version of SSCS II is available. For additional information about the Seo Safety Climate Scale, contact Dr. Seo at Indiana University: seo@indiana.edu .

What to Measure? Measure Your Organizations' Greatest Risks!

A good tool for measuring your risk level, and consequently establishing measurement priorities, is Manuele's Risk Score Formula, a three-dimensional risk matrix. With permission from Fred Manuele, his formula from *Advanced Safety Management* is presented here:

$$RS = (PR + FER) \times SR$$

Whereas:
> **RS = Risk Score**
> **PR = Probability Rating**
> **FER – Frequency of Exposure**
> **SR = Severity Rating**

Risk Score = (Probability Rating + Frequency of Exposure Rating) x Severity Rating

Descriptive words and ratings:

<u>**Probability:**</u>

Frequent (15) – Likely to occur repeatedly
Likely (9) – Likely to occur several times
Occasional (4) – Occurs sporadically
Remote (1) – Not likely to occur, but possible
Improbable (0.5) – So unlikely can assume occurrence will not be experienced

<u>**Frequency of Exposure:**</u>

Often (13) – Continues to occur daily
Occasional (10) – Daily to monthly
Infrequent (7) – Monthly to yearly
Seldom (4) – Less than yearly

<u>**Severity:**</u>

Catastrophic (50) – Fatality, exceeds $2M
Critical (40) – Disabling injury or illness, $500K to $2M
Medium (25) – Minor injury or illness, $50 - $500K
Minimal (10) – No injury or illness, Less than $50K

<u>Risk</u>	<u>Score</u>	<u>Action or Acceptance</u>
High	800+	Operation not Permissible
Serious	500 – 799	High Priority Remedial Action
Moderate	200 – 499	Remedial Actions taken at Appropriate Time
Low	<200	Risk is Acceptable, Remedial Action Discretionary

Application Examples:

Probability	FRE	Severity	Risk Score
1. Frequent (15)	Often (13)	Critical (40)	**(15 + 13) x 40 = 1,120**
2. Likely (9)	Occas. (10)	Catastrophic (40)	**(9 + 10) x 50 = 950**
3. Remote (1)	Seldom (4)	Minimal (10)	**(1 + 4) x 10 = 50**

Manuele provides a couple of caveats when tabulating risk scores:

> "Numerical risk scores carry an image of precision that can influence decision making…in reality, they should not be the sole or absolute determinate.
>
> Numerical risk-scoring systems can serve a real need. Nevertheless, it should be remembered that they consist of numbers arrived at through subjective judgments."
>
> And finally, "Risk assessment is still as much art as science."
>
> (Manuele, 177 – 182)

Measuring safety performance is about developing the safety management system and the related safety culture. The ANSI Z10 Standard is state of the art for safety management systems, and Manuele's book entitled "Advanced Safety Management: Focusing on Z10 and Serious Injury Prevention" is highly recommended as a premier book dealing with this topic. Please refer to "Advanced Safety Management" for additional details on risk formula scoring and ways to reduce serious injuries.

An Example of Leading Measures from the Construction Industry

One of the finest case study examples of using leading measures in construction is from Jack Toellner on the ExxonMobil Development Corporation's Hoover-Diana Project. In this highly hazardous project, both safe system behaviors and employee behaviors were emphasized. There were five specific measures that were evaluated and scored for quality as well as quantity:

1. Safety Meetings
2. Housekeeping
3. Barricade Performance
4. Job Safety Analysis
5. Safety Walks

These proactive metrics included qualitative assessments, not just quantitative tallies of the number of times per month and so on. For example, safety meetings were not simply tallied, but were evaluated for qualitative elements such as starting on time, facilitator competence (someone had to observe), and employee participation. Likewise, the safety walkthroughs were not simply tallied, but became a method for supervisors to talk with the workers about specific safety issues and to follow up on the performance level of the other safety metrics such as housekeeping, JSA, and barricade performance. Toellner emphasized that although the safety walks were initially viewed by some as the "traffic cop" coming through, they were eventually accepted and embraced, and became a way for management to emphasize safety and demonstrate they actually cared about

employees. In a sense, walkthroughs became a way to Actively Care (Geller 12) for safety – the concept of Actively Caring becomes a reality through the implementation and measurement of safety walkthroughs.

The result of applying these measures under this high-hazard operation were 2 million hours of work performed with just one recordable injury. Toellner provides frequent workshops on measurement and improvement of safety performance in the construction industry, and his workshops are especially recommended for those who are interested in measurement in the construction industry.

An Example of Leading Measures from the Manufacturing Industry

One of my favorite case studies from manufacturing was influenced by Anne Bevington, formerly with Coors Brewery in Golden, Colorado. Anne developed a Safety Management Process (SMP) that involved an aggregate score of 100 possible points that measures all aspects of their safety management system.

The SMP is a proactive process that is skewed 85% toward a focus on leading indicators and 15% on trailing indicators of safety. As the Coors site involved a team approach to the work, this was incorporated as part of SMP. The breakdown for measuring the 100 points includes 60 points for individual safety participation, 20 points for team safety participation, 5 points for compliance training (for a total of 85 points related to leading metrics) and 15 points for case incident rates.

There were a number of innovative and ingenious things that Anne did to help ensure success for the SMP. First, since the site used scorecards, employees were also "score-carded" for safety performance. Second, while employees were given a quota for the number of safety activities they were expected to participate in, they were also given a choice on which safety activities they would participate in. Coors considered this to be a key factor in their success with the process.

An abbreviated list of examples of the types of activities for individual safety participation includes the following:

- Observation Cards
- Job Safety Analysis
- JSA Training
- JSA Auditing
- Safety Meetings
- Safety Audits
- Maintenance Walkthroughs
- Pre-Shift Stretching
- IH Sampling Requests/Results
- Ergonomic Assessments

Although compliance training was given simply 5 points or 5% of the total SMP measure, Anne designed it in such a way that compliance training went from approximately 39% of the 2000 employees taking the training to over 99% taking the training after implementation of SMP.

Results of SMP include the Coors Brewery at Golden, Colorado became one of the top safety performing breweries in the United States working one million hours without a lost time injury in July 2004 and again in March 2005. The Safety Management Process has been so successful it has spread throughout the organization and the process is used in the Environmental Management Process also.

Conclusion

The following suggestions are offered to develop most effective safety measures:

1. <u>Customize</u> by site
2. <u>Prioritize</u> by severity, based on risk assessment
3. <u>Simplify</u> by limiting the total number of safety metrics
4. <u>Engage</u> employees heavily in development
5. Use a thoughtfully chosen <u>mix</u> of performance and outcome measures

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