



An Implementation Guide to Leading Indicators



ACTIONABLE
ACHIEVABLE
MEANINGFUL
TRANSPARENT
EXPLAINABLE
VALID
USEFUL
TIMELY

Introduction and Background

The topic of leading indicators for environment, health, and safety has always been of prime interest to members of the Campbell Institute, and it's easy to see why. In contrast to lagging indicators like injury rates and absenteeism, leading indicators can provide organizations with early warning signs of potential events and help organizations be proactive in correcting deficiencies and mitigating risks before they turn into incidents and injuries. Leading indicators thus help safety professionals to look ahead and take action to protect workers from harm.

“Define” stage: deriving a definition for leading indicators and identifying important attributes for effective leading indicators

The Campbell Institute's research on leading indicators began in the spring of 2013 with a survey of EHS professionals to develop a definition of leading indicators, understand the current state of leading indicator use, and identify the barriers and enablers of leading indicator implementation. After discussion, the expert panel of EHS professionals defined leading indicators as:

proactive, preventive, and predictive measures that monitor and provide current information about the effective performance, activities, and processes of an EHS management system that drive the identification and elimination or control of risks in the workplace that can cause incidents and injuries.

In other words, leading indicators provide clues not only to potential future events, but also current information on the state of an organization's safety management system.

The expert panel described robust leading indicators as having the following characteristics: actionable, achievable, meaningful, transparent, explainable, valid, useful, and timely. A leading indicator would rarely possess all eight of these characteristics, but the panel agreed that having a combination of these characteristics aids in the implementation, measurement, and “selling” of leading indicators.

“Align” stage: describing the current state of leading indicators, including the common enablers of and barriers to leading indicator implementation

The survey of EHS professionals revealed some of the main organizational enablers of leading indicator implementation. One enabler is having commitment from the executive team for leading indicator tracking and measurement. Along with this is another enabling factor, which is being able to effectively communicate the predictive value of leading indicators to leadership and the workforce. Having some leading indicators tracked at the corporate level is also an enabling factor, as it fosters support for leading indicators throughout the entire organization, not just at individual sites. Lastly, it helps to have targeted data collection for specific outcomes – for instance, leading indicators that are specific to eliminating hand injuries.

The participants of the survey also identified the major organizational barriers to leading indicator implementation. The first is an inability to develop consistently actionable metrics, that is, finding metrics that consistently and clearly tell an organization how to act on the data generated. A related barrier is the lack of a reliable, consistent relationship with lagging metrics. Leading metrics that once had a strong correlation with injury rates may become less informative over time. Another barrier is a continued C-suite reliance on traditional lagging indicators. Lastly, organizations find it difficult to benchmark leading indicators with other organizations, even within the same industry.



“Refine” stage: producing a list of leading indicators, their definitions, and specific metrics of each leading indicator

The lack of benchmarking of leading indicators was one of the reasons why the Institute continued its research on leading indicators. The Institute wanted to provide a space for discussion and sharing of information of leading indicators for its members and partners. Establishing the definition of leading indicators helped Institute members and partners “speak the same language” when discussing leading indicators. The panel of EHS professionals in the Institute continued defining leading indicators by establishing three broad categories to classify leading indicators:

- **Operations-based leading indicators:**
Indicators that are relevant to the functioning of an organization’s infrastructure (e.g. machinery, processes); potentially site-specific.
- **Systems-based leading indicators:**
Indicators that relate more to the management of an EHS system; can potentially be rolled up from a facility level to a region/business unit or corporate level.
- **Behavior-based leading indicators:**
Indicators that measure the behavior or action of individuals or groups in the workplace; people-to-people interactions related to supervision and management; useful at site level through management level.

In the fall of 2013, the Institute held a facilitated meeting of the Leading Indicators Workgroup (Workgroup) to generate a list of possible leading indicators to benchmark. Fifteen EHS professionals from various Institute member and partner organizations formed three subgroups to create lists of leading indicators for each of the three categories of leading indicators – operations-based, systems-based, and behavior-based. Each subgroup discussed the leading indicators of each list, generating definitions and listing various metrics for each indicator. During these discussions, subgroup members listed the metrics that their organizations were currently measuring or were considering for the future. Through their discussions, the subgroups revised the names of leading indicators, split some indicators into component parts, and/or added more indicators to the original list.

The lists of operations-based, systems-based, and behavior-based leading indicator definitions and metrics were combined into one full matrix of leading indicators, which can be found in full in the white paper, *Practical Guide to Leading Indicators: Metrics, Case Studies & Strategies*. The matrix represents the collective knowledge of leading indicators and associated metrics as practiced or brainstormed by Institute member and partner organizations, and was developed to be a guide for maturing organizations and to help Institute organizations maintain their world-class status.

The *Practical Guide* white paper also includes several case studies to provide more of the background and thought process behind the leading indicators described in the matrix. The narratives from Honeywell and the NASA Safety Center demonstrate that recording and tracking safety observations and incident causal factors through a widely accessible, online system creates more vigilant employees and enables teams to quickly implement preventive and corrective actions. The narrative from USG shows that quantifying operational employees’ participation in site audits creates opportunities for best practice sharing and makes safety everyone’s responsibility. Fluor’s case study demonstrates the importance of leadership engagement to improve site safety operations and promote a positive safety culture. Lastly, the narrative from Cummins shows that a leading indicator program can start small, yet have significant positive results.

“Design” stage: developing and implementing plans to deploy, evaluate, and improve leading indicators

The previous stages of the research on leading indicators brought the Institute to a logical next step. While it was informative to know the types of leading indicators and metrics tracked at world-class organizations like Institute members and partners, many users of the research wanted to know how to actually get started in implementing a leading indicator program. The paper, *Elevating EHS Leading Indicators: From Defining to Designing*, describes the various paths that eight Institute members and partners took in their leading indicator journey and outlines their commonalities and lessons learned along the way.

The interviews with Institute members and partners revealed several common practices and words of wisdom regarding the choosing, tracking, and analyzing of leading indicators. The research participants agreed that one way to decide which leading indicators to track is to look at what an organization is already measuring and leverage those data as predictors of future incidents. Another option is to take the “bottom-up” approach, that is, looking to individual site practices for indicators that can be potentially implemented company-wide.

Several participants mentioned that an organization should not spend too much time pinning down the “perfect” leading indicator, mainly because a universally perfect leading indicator does not exist. Knowing that most leading indicators will have to be adjusted in the future makes it practical to just start somewhere. Akin to “just starting somewhere” is the advice to start simply and small. Beginning with just a few leading indicators allows those in the organization to become accustomed to tracking them without becoming overwhelmed, creating more support for leading indicators in the end.

Research participants also had advice regarding management and employee buy-in and roles and responsibilities. All agreed that obtaining leadership buy-in on leading indicators is essential to their implementation and tracking. Many participants recommended involving multiple departments and functions from the organization in leading indicators, as this elevates the entire company culture around EHS. Besides the safety functions, Institute members and partners made sure to involve human resources, operations, facilities/maintenance, finance, legal, etc. Until these other departments are involved and part of the discussion on leading indicators, many may not realize how their functions can directly or indirectly affect EHS at their organizations.

Several organizations mentioned that in order for leading indicators to be truly effective, they have to be integrated into the overall safety management system and not treated as a separate program. That is, the data and lessons from leading indicators should be used to make improvements to processes and take proactive measures to protect workers and the environment. Tracking leading indicators just for the sake of collecting data won't improve the EHS management system and won't build support for leading indicators across the organization. Additionally, while leading indicators have been established as a critical part of an EHS management system, they still need to be balanced with lagging indicators to measure their success. A renewed focus on leading indicators does not mean that incident rates no longer matter; lagging rates still provide clues to the overall functioning of a safety management system.

The advice from Campbell Institute member and partner organizations were framed by the classic “Plan, Do, Check, Act” model. In the “plan” stage, Institute participants recommend taking inventory of and leveraging existing metrics that an organization may already be tracking. Also important is to develop a solid communication plan around leading indicators – why they are important and how much there is to gain by being proactive about safety. Most importantly, organizations need to obtain the input and support from upper management to effectively implement leading indicators.

In the “do” stage, research participants recommend involving the input of multiple departments and functions. Another recommendation for implementing leading indicators is to start small with a few risk-based leading indicators, then building as data are collected and the organization matures.

For the “check” stage, Institute members and partners suggest running correlations of leading indicators against lagging metrics to evaluate leading indicators' effectiveness. These types of analyses can help determine if an organization's leading indicators are providing meaningful and actionable information. Finally in the “act” stage, participants recommend taking action on the lessons learned, which can mean redefining leading indicators, changing their measurement, or eliminating some indicators altogether. This stage may also mean adding more leading indicators to the existing suite as an organization grows and matures.

Latest stage: benchmarking and ranking leading indicators

The latest stage that the Workgroup took on was a broad benchmarking exercise in which each participant of the workgroup submitted a list of the leading indicator metrics that their organizations were actively tracking in 2018. These lists of leading indicator metrics were collected and categorized by topic to create a comprehensive list of the leading indicator metrics in place at Institute member organizations. Over the next several months, participants of the Leading Indicators Workgroup met to rank and categorize these leading indicator metrics according to *organizational maturity and complexity*, that is, where does an organization have to be in its safety journey in order to implement the leading metric, and how complex of a process it is to track and calculate a given metric.

To help define and give scope to the concept of organizational maturity, the workgroup turned to an established maturity model, the DuPont Bradley Curve™. The four stages of the Bradley Curve identify levels of safety culture maturity, from reactive to interdependent. While originally intended to demonstrate the correlation between organizational culture and safety performance (such as injury rates), the Bradley Curve is also a useful model to give organizations a sense of where they should be to start thinking about the utility of implementing a specific leading indicator metric. The workgroup used the following rubric to categorize the leading metrics of the list:

- **Reactive:** Base level of maturity where people may still believe that incidents and injuries will happen. Leading indicators have not been in place for very long, if at all.
- **Dependent:** Intermediate level of maturity where people view safety as following the rules. Leading indicators are in place to achieve compliance or because of leadership mandate. Injury rates decrease.
- **Independent:** More advanced level of maturity where people take responsibility and believe they can make a difference with their actions. Leading indicators are seen as vital to continuously improving safety performance. Injury rates decrease further.
- **Interdependent:** Most advanced level of maturity where teams take ownership and responsibility for safety culture and believe that zero injuries is attainable. Teams seek out new leading indicators to go beyond compliance.

To define the levels of complexity for each leading indicator metric, workgroup participants considered factors such as the time and effort needed to collect the data for the metric, the risk profile of the organization, and the size of the organization (the larger the organization, the more complex the implementation). The workgroup used the following rubric to categorize the leading metrics of the list:

- **Low:** Minimal time and effort to gather the data to calculate the metric; in fact, the organization may already be collecting the necessary data. Requires minimal coordination among teams to gather data and deploy the information across the organization.
- **Medium:** Moderate time and effort to gather the necessary data. May require more coordination and communication among teams to collect, track, and analyze the information to use across the organization.
- **High:** High amounts of time and effort to gather the necessary data. Requires deep levels of coordination and communication among teams and departments to collect, track, and analyze the information the leading metric provides.

Taking together the two scales, it was the intent of the workgroup to present a comprehensive list of leading indicator metrics to aid organizations in making decisions about which leading metrics they are ready to implement and track, given the levels of organizational maturity and complexity.

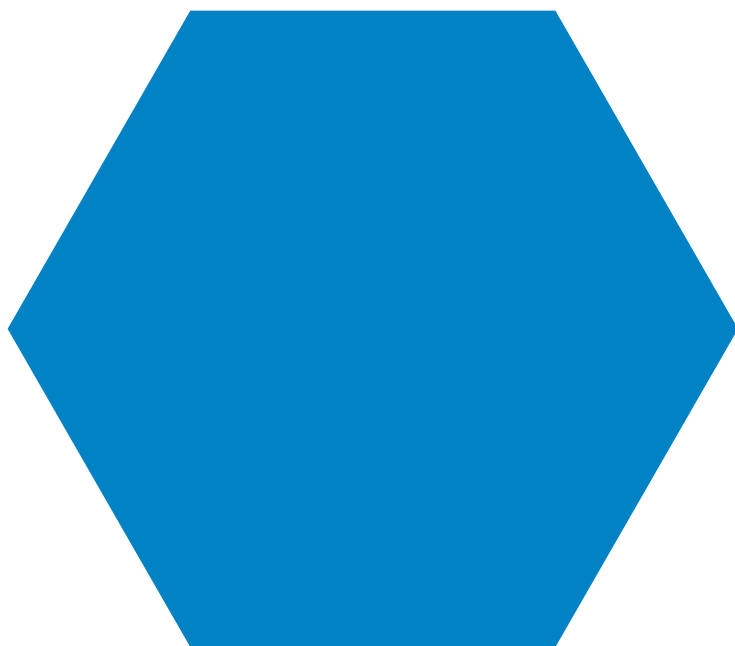
A COMPREHENSIVE LIST OF LEADING INDICATOR METRICS

1. Leading indicator: Hazard reports / unsafe condition reports / proactive observations

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of each coded hazard type per site or per site headcount	Reactive	Medium	Basic information that can be gathered easily.
# of observations per month	Reactive	Low	
Frequency of 100% safe BBS observations	Reactive	Low	
# of employees trained in hazard identification	Reactive	Low	
# of checklists filled out	Reactive	Low	
# of unsafe observations per inspection	Reactive	Low	This is basic information that is typically collected during inspections.
# of inspections	Reactive	Low	
# of unsafe observations reported per employee per time period	Reactive	Low	Calculating the metric is a matter of taking basic information and looking at it in a slightly different way.
# of unsafe observations reported per employee per activity	Reactive	Low	
Ratio of proactive observations to near misses and incidents	Dependent	High	This metric may require more data collection to calculate.
Ratio of safe to unsafe observations	Dependent	Medium	An organization that implements BBS is already at a certain level of maturity. This metric may require more data collection to calculate.
% of employees actively participating in BBS	Dependent	Medium	
% of supervisors meeting observation goals	Dependent	Medium	
# and % of previously unknown or uncategorized hazards discovered	Dependent	High	This metric implies an organization that has been tracking leading indicators for some time; requires the tracking and categorization of hazards.
Ratio of high-risk observations to low-risk observations	Dependent	High	An organization must be at a Higher maturity level to risk-rank observations and go beyond the mere safe/unsafe categorization.
# of comments for unsafe observations that clarified the nature of the hazard	Dependent	Medium	Categorizing the nature of the hazard shows a deeper level of thinking about the observation.
Ratio of peer-to-peer observations to supervisory observations	Dependent	Medium	More peer-to-peer observations suggests more employee involvement/engagement.
Hazard severity of observations	Dependent	Medium	The process of assigning severity or a risk ranking suggests more maturity and complexity.

2. Leading indicator: Personnel trained / system training completed

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# and % of employees trained in Six Sigma	Dependent	Low	The organization needs to be sufficiently advanced to implement programs like Six Sigma or BBS. Counts/ percentages of employees is simple to calculate.
# and % of employees trained in BBS	Dependent	Low	
% of trainings completed	Reactive	Low	
% of new hires who have completed safety orientation training	Reactive	Low	
# of S&H regulatory compliance training hours per employee	Reactive	Low	Regulatory compliance training is basic.
# of certified trainers in safety	Dependent	Low	
Ratio of training hours to work hours per month	Dependent	Low	
Hours spent per time period (e.g. month, quarter, year) on training	Dependent	Low	
# of safety talks and safety training sessions	Reactive	Low	Basic information that can be gathered easily.
# of safety culture and leadership training hours for leaders	Dependent	Low	
# and % of completed training goals (by individual, group, or facility)	Dependent	Low	
# and % of positive post-training evaluations for safety training	Dependent	Low	
# of assessments to determine the type of training needed	Independent	Low	An organization that sets leadership training hours and goals is more mature.
% compliance versus program requirements	Dependent	Medium	
# of incidents with a root cause that includes lack of training	Dependent	Medium	
# of certified trainers in critical safety courses	Dependent	Low	



3. Leading indicator: Completed corrective actions / safety work order resolution

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# and % of completed corrective actions by due date	Reactive	Medium	Basic information that can be gathered easily.
Average time to work order resolution, average time to complete corrective action	Reactive	Medium	
# of open action items in corrective and preventative action database	Reactive	Medium	
# of open issues without a corrective action assigned	Reactive	Medium	
% or ratio of corrective actions according to hazard type (e.g. confined space, fall protection, etc.)	Dependent	Medium	
# of issues flagged at 30 days overdue, 60 days overdue, etc.	Reactive	Medium	It's simple to calculate these numbers in a system.
# of issues with no corrective actions in queue (at 30 days, 60 days, etc.)	Reactive	Medium	
# of divisional targets that have dropped below a set threshold (e.g. 90%-completed rate)	Reactive	Medium	
# of corrective actions prioritized by risk (e.g. High severity, Low severity, life-threatening, etc.)	Dependent	Medium	This is more mature than counting a number, but the definition of risk should be easy to categorize.
% of preventive and corrective actions communicated	Dependent	Medium	An organization is going beyond merely counting corrective actions; making sure they're communicated to a larger group.
# of effective corrective actions verified by managers	Dependent	Medium	This requires more investigation on part of safety manager to verify and evaluate corrective actions.
% or ratio of corrective actions at each level of control (according to hierarchy of controls)	Dependent	Medium	An organization holds more discussions and interpretations about the hierarchy of controls; this requires more maturity and time/resources.

4. Leading indicator: Near misses / close calls reported

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of near misses reported	Reactive	Low	Basic information that can be gathered easily.
# of near miss injuries	Reactive	Low	
(Near miss case count * 200,000)/hours worked	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
# of near misses divided by worked hours	Dependent	Low	

5. Leading indicator: Employee engagement and participation

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
% attendance at safety committee meetings	Reactive	Low	It's simple to calculate these numbers in a system.
% attendance at safety events	Reactive	Low	
# of on-the-job observations from employees	Reactive	Low	
% job turnover	Reactive	Low	
# of grievances submitted	Reactive	Low	
% of employees who complete maximum number of activities to qualify for maximum quarterly safety incentive payout	Dependent	Low	This requires more observation of workers to collect information.
# of off-the-job observations from employees	Dependent	Low	An engaged workforce that submits off-the-job observations may be indicative of a higher-maturity organization.
# of employees personally engaged by supervisors in walkarounds	Dependent	Medium	This requires training of managers to know how to engage employees and what to look for; it is beyond just a safety inspection of an area.
% of coached observations	Dependent	Low	This requires coaching to engage a team member or supervisee.
% of employees documenting observations	Reactive	Low	
# and quality of comments	Dependent	Medium	Looking at the quality of comments requires more of a review, and a rubric for assessing quality of comments.
% of safety meetings led by management	Reactive	Low	This indicates a basic level of safety management.
% of the team/workforce that leads safety meetings	Independent	Low	This indicates higher organizational maturity because team members or employees are taking responsibility for leading the safety meeting.

6. Leading indicator: Leadership engagement

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of employee suggestions implemented by leadership	Independent	Low	This indicates higher organizational maturity because team members or employees are taking responsibility for safety.
# of employees volunteering for initiatives	Independent	Low	
# of managers/supervisors participating in critical design reviews	Dependent	Low	This indicates higher organizational maturity because leaders are taking part in a critical area of safety.
% of positive ratings of managers and supervisors by employees	Dependent	Medium	The organization must have an evaluation tool for leadership by employees.



7. Leading indicator: Risk assessment

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of assessments conducted per plan/target/strategy	Reactive	Low	Basic information that can be gathered easily.
# and % of risks mitigated with control measures put in place	Reactive	Low	
% of routine tasks identified	Reactive	Low	
% of tasks identified	Reactive	Low	
# and % of risk score assessments communicated	Reactive	Low	Basic information that can be gathered and relayed easily.
# and % of assessments reviewed and validated by EHS manager	Reactive	Low	This is a basic step before having control measures put in place.
% of assessments completed per plan/target/strategy	Dependent	Low	Basic information that can be gathered easily, but calculating the percent completed is a more informative statistic.
# of assessments to evaluate potential severity	Independent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
Ratio of levels of risk identified through assessments (high, medium, low)	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization. A low ratio indicates that procedures or checklists need to be updated to identify more risks beforehand.
Ratio of assessments where risk has previously been identified to recordable injuries	Dependent	Low	
# of unplanned or ad-hoc assessments conducted	Dependent	Low	This indicates a more mature organization to look towards proactive assessments or un-mandated assessments.
# and % of SOPs that are scored step-by-step on severity, exposure, and probability	Dependent	Medium	This indicates a higher maturity level because most SOPs are not scored step-by-step.
% of assessments that have been communicated and verified as understood by workforce	Independent	Medium	Developing a process for the verification is complex and indicative of a higher organizational maturity level.
% of assessments that have been updated, reevaluated, and revalidated within a pre-defined time frame	Dependent	Low	An organization is higher in maturity if it is updating and reevaluating assessments.

8. Leading indicator: Risk profiling

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of assessments deemed unacceptable	Reactive	Low	Basic information that can be gathered easily.
# of repeat findings	Reactive	Low	Basic information that can be gathered easily.
# of risks by specific category (e.g. fall protection, confined space, housekeeping, etc.)	Dependent	Low	This is more advanced than counting the risks and not differentiating by activity, but is still basic information that can be gathered easily.
# of incidents with a causal factor related to inadequate risk assessment	Dependent	Medium	Looking for root causes in certain industries can be complex, and can become more complicated by taking into account contributing factors.
# of root causes not previously categorized or identified in risk assessment	Dependent	High	This requires higher levels of data collection to calculate, and requires a feedback loop to include data from assessments.
% of life-threatening risks, Low severity risks, etc.	Independent	Medium	This requires higher maturity to assess for life-threatening risk (i.e. SIF prevention efforts).
% reduction in overall risk score	Independent	Medium	This requires higher maturity to create a trend line for overall risk score, and not just a risk score for a single activity.

BALANCE
LEADING METRICS
WITH TRADITIONAL
LAGGING METRICS
TO MEASURE
THEIR SUCCESS

9. Leading indicator: Communication of safety

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of users on EHS dashboard	Reactive	Low	Basic information that can be gathered easily.
# and frequency of employee meetings	Reactive	Low	
# of tailgates/pre-shift safety talks completed	Reactive	Low	
# of bulletin boards with current/relevant information	Reactive	Low	
# of hits/downloads of specific safety content from website per day	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
# of hits/downloads of specific safety content from social media accounts per day	Dependent	Low	
Frequency of communication (# of updates per month) to stakeholders, employees, and management	Dependent	Low	
% conformance with communication expectations/needs	Dependent	Medium	This is essentially an audit of the safety communication plan to check for compliance.
% of corrective actions completed and communicated	Dependent	Low	An organization is going beyond merely counting corrective actions; making sure they're communicated to a larger group.

10. Leading indicator: EHS management system components

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# and frequency of audits performed	Reactive	Low	Basic information that can be gathered easily.
# of findings (instances of non-conformance)	Reactive	Low	
# of corrective actions	Reactive	Low	
maturity score (% of system component compliance)	Independent	Medium	This is essentially an audit of the safety management system to check for compliance.
# of management system root causes identified by incident investigations	Dependent	Medium	This requires a high level of maturity to identify organizational root causes and failure of administrative controls, standards, or policies.

11. Leading indicator: Leading indicator component evaluation

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
Year-over-year analysis of correlation rates	Independent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
Annual analysis of correlation rate	Independent	Low	
# and % of predictive measures meeting predictive goals	Independent	Medium	This is a check to see how predictive measures are performing against predetermined goals; may involve participation from multiple departments and functions.
# and % of predictive measures meeting performance outcomes	Independent	Medium	

12. Leading indicator: Safety recognition

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of disciplinary actions	Reactive	Low	Basic information that can be gathered easily.
# of incident root causes tied to disciplinary actions	Reactive	Low	
# of safety recognition program nominations	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
# of EHS awards bestowed	Dependent	Low	
% of personal EHS systems goals met	Dependent	Low	
# of recognitions for safe behavior	Dependent	Low	

13. Leading indicator: Change management

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of new trainings for operators	Reactive	Low	Basic information that can be gathered easily.
% of tasks completed	Reactive	Low	
# of facilities running 10% overtime	Reactive	Low	
# of facilities experiencing turnover at a specified threshold	Reactive	Low	
# of significant equipment or process changes occurring	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
# of gaps in management of change review	Dependent	Low	
# of new assessments for changes in processes or equipment	Dependent	Low	

14. Leading indicator: Safety perception survey

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
% of employees polled	Reactive	Low	Basic information that can be gathered easily.
Response rate	Reactive	Low	
% of positive and negative poll results	Reactive	Low	
Frequency (# per year) of perception surveys	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
Employee-management gap analysis	Dependent	Low	This indicates higher organizational maturity because an analysis is conducted to discover the difference in opinion between management and employees.

15. Leading indicator: Machine integrity

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
# of minutes of down time	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
# of unexpected equipment failures	Dependent	Low	
# of scheduled checks completed on time	Dependent	Low	
Frequency of upset condition	Dependent	Low	

16. Leading indicator: Hours of work

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
% of employees working fewer than 35 hours or more than 55 hours	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
% overtime or expense	Dependent	Low	
Average hours worked per employee per month	Dependent	Low	
# of individual workers with overtime hours per month above threshold	Dependent	Low	This is a metric to determine cognitive fatigue exposure.

17. Leading indicator: New to work

Formula for Calculation	Organizational Maturity Level	Complexity Level	Explanation
% of employees new to the company or new to job assignment	Dependent	Low	Basic information that can be gathered easily, but the metric is indicative of a higher-maturity level organization.
% monthly change in new employee headcount	Dependent	Low	

HOW TO BEGIN: LEADING INDICATOR METRICS FOR ORGANIZATIONS LOOKING TO GET STARTED

Through the process of ranking leading indicator metrics in terms of organizational maturity level and complexity level, it is easier for an organization to see which metrics may be good starting points if it is implementing leading indicators for the first time. To see these metrics at a glance, below is a list of those that the workgroup collectively ranked as reactive for organizational maturity and low in complexity, meaning that these metrics should be relatively easy for safety managers to implement and gain buy-in from higher leadership. Recall that the advice from previous white papers was for organizations to look at the numbers that they are already collecting; many of the following are likely already being tracked at organizations with reactive cultures of safety.

Name/Description of Indicator	Formula for Calculation
Hazard reports / Unsafe condition reports / Proactive observations	# of observations per month
	# of employees trained in hazard identification
	# of checklists filled out
	# of unsafe observations per inspection
	# of inspections
Personnel trained / System training completed	% of trainings completed
	% of new hires who have completed safety orientation training
	# of S&H regulatory compliance training hours per employee
	# of safety talks and safety training sessions
Employee engagement and participation	% attendance at safety committee meetings
	% attendance at safety events
	# of on-the-job observations from employees
	% job turnover
Risk assessment	# of assessments conducted per plan/target/strategy
	# and % of risks mitigated with control measures put in place
	% of routine tasks identified
	% of tasks identified
Risk profiling	# of assessments deemed unacceptable
	# of repeat findings
Communication of safety	# and frequency of employee meetings
	# of tailgates/pre-shift safety talks completed
EHS management system component evaluation	# and frequency of audits performed
	# of findings (instances of non-conformance)
	# of corrective actions
Safety recognition	# of disciplinary actions
	# of incident root causes tied to disciplinary actions
Change management	# of new trainings for operators
	% of tasks completed
Safety perception survey	% of employees polled
	Response rate
Near misses / Close calls reported	# of near misses reported
	# of near miss injuries

The workgroup noted that there are some caveats for some metrics related to near misses and behavior based safety observations. For instance, organizations that are at the reactive stage of maturity can expect the number of near misses reported to increase as they seek to instill a culture of open reporting. Organizations that are more mature and have strong reporting and mitigation strategies can expect the number of near misses to decrease over time as work gets safer.

It's a similar case for behavior based safety observations. In reactive organizations, a high number of 100% safe observations may indicate "pencil whipping" in order to meet a quota. In more mature organizations, however, more 100% safe observations means that the work environment is actually safer because of their high quality and rigorous observations.

While many of these numbers may already be collected at organizations, it is not always the case that they are being leveraged and utilized as actual leading indicator metrics. The workgroup has additional advice on how to use metrics to their full leading indicator potential.

Organizations should perform a check of any leading indicator metric by assessing if the data helps to eliminate risk and defects in operations, remembering that this is the ultimate goal of leading indicators. If there is not a reduction in risk or other lagging indicators, this could mean that the chosen leading metrics are not useful to track, or that there is an error in the execution. *Make sure to balance leading metrics with traditional lagging metrics* to measure their success.

Think about the kind of behaviors that the organization wants to drive, considering that even the best-intentioned leading indicator metric can potentially drive the wrong behavior if it is not accompanied with appropriate leadership and communication. *Relate to workers the rationale of tracking a leading metric* so that it does not become a mere data collection exercise. The purposes of improving the safety management system and becoming proactive about preventing injuries should be clearly expressed to all in the organization from the top down.

Speaking of communication, safety teams should also *regularly communicate how the organization is performing* when it comes to both leading and lagging metrics. Have conversations and dialogue with workers and leadership to relate how the metrics correlate with each other, and gather input and suggestions for improvement and maintenance of excellent performance. Being able to demonstrate how leading metrics are fueling improvement in the safety management system will build support for leading indicators across the organization.

Future directions and new horizons for leading indicators

As the Institute members and partners that sit on the Leading Indicators Workgroup continue to move forward with and improve their leading indicators, a future direction for this research is to follow up with these organizations to assess how their leading indicators have grown and changed with added experience and lessons learned. Another future path is to gather success stories from workgroup members regarding some of the specific leading indicator metrics outlined in this report. Doing so could serve as a “selling” tactic for safety professionals at other organizations to convince themselves, their workforce, and their leadership of the need for leading indicators, no matter how rudimentary.

In addition to these future paths, there are some new areas on the horizon to use leading indicators. One area is the intersection of leading indicators with serious injury and fatality (SIF) prevention. In other words, we can focus on how organizations address SIF by mining incident and near miss data, assessing on risk and severity, and focusing on the potential for SIF – all of which can be tracked and leveraged as leading indicators.

Another area is the intersection of leading indicators with neuroscience concepts like visual literacy. As more workers are trained in things like mindfulness and visual literacy for hazard recognition, can organizations start to leverage the delivery of such training as a leading indicator for safety? Does the tracking and retention of knowledge from this training result in improvement in lagging indicators?

Lastly, the Institute could consider how technology like artificial intelligence (AI) and machine learning could be used as leading indicators. Already technology like AI and video vision are being tested to identify unsafe behaviors, which could serve as real-time leading indicator data and alert safety managers if workers are placing themselves in harm’s way. There are even more possibilities for considering how wearables for detection and positioning can be leveraged as leading indicators.

Protecting workers from harm and injury requires a focus on leading indicators so that organizations can monitor conditions, assess their safety management system, and take proactive measures to eliminate incidents. The Campbell Institute is hopeful that the work and insight from the Leading Indicators Workgroup will convince more organizations that leading indicators for EHS is not only worthwhile but necessary for creating safe and sustainable workplaces, and put them on the path towards continuous improvement.

Author: Joy Inouye

Additional Campbell Institute Staff: John Dony, Magaly Flores, Katie Knee, Katherine Smith, Tanya Vandermoon, and Anthony Washburn

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Brad Barrow | Global Safety Competency Lead,
The Chemours Company

David Carr | Senior Director, Safety Health and Security, Ingredion

Guillermo Castillo | Health, Safety, Environment & Sustainability
Director, Components Business Unit,
Cummins, Inc.

Kevin Converse | Director, Safety, United Rentals

Justin Dugas | Director, Safety and Health, USG Corporation

Gregg Ferris | SH&E Coordinator, COR Support, AECOM

Erin Foster | Global EHS Programs Manager, The Mosaic Company

Clifton Gibson | Safety and Environmental Programs Manager,
Exelon Corporation

Mark Harty | Director, Regulatory Compliance,
Corporate Safety Division, United Airlines

Mark Hickey | Vice President and Managing Director,
Health, Safety, Sustainability & Environment, ERM

Steve Lilley | Senior Safety Engineer, NASA Safety Center

Mike Mangan | Vice President, Research and Development, DEKRA

Steven Perkins | Program Director, ERM

Erick Walberth | Director, Safety and Environment, Schneider Electric

Campbell Institute
National Safety Council

thecampbellinstitute.org
campbellinstitute@nsc.org

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