



Using leading indicators to measure occupational health and safety performance



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ABSTRACT

A study was conducted to advance the state of knowledge and practice on the topic of using leading indicators to measure occupational health and safety (OHS) performance of organizations. The specific research aims were to (1) describe the extent to which OHS practitioners understand leading indicators; (2) explore organizational practices pertaining to tracking, analyzing, and applying information provided by leading indicators to improve OHS performance; and (3) identify barriers and factors that enable the use of leading indicators. The study design included an expert panel and a quantitative survey to explore the views and experiences of OHS practitioners in relation to leading indicators. The findings suggest several important characteristics (e.g., actionability) that effective leading indicators need to possess and describe modifiable factors (e.g., commitment and technical knowledge of senior executives) that may be correlated with such characteristics. Overall, this study argues for continued effort to improve access to research and practical knowledge among OHS professionals as well as their executive leaders who seek to demonstrate continuous improvement of performance measurement strategies.

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1. Introduction

When organizations elevate occupational health and safety (OHS) to the level of a core organizational value, they must inevitably commit considerable investments in resources to measuring the performance of their OHS programs. The proliferation of OHS management systems that has been observed globally since the 1990s (Robson et al., 2007), has dramatically increased the focus on performance measurement techniques and tools. The vast majority of OHS initiatives are still evaluated relying primarily on lagging metrics, such as fatality and injury rates, despite the growing acceptance of the fact that these failure-focused measures are less useful in helping organizations drive continuous improvement efforts (Hubbard, 2004; Agnew, 2013). Leading indicators, on the other hand, offer promise as an improved gauge of OHS activity by providing early warning signs of potential failure and, thus, enabling organizations to identify and correct deficiencies before they trigger injuries and damage.

The literature regarding leading indicators is a multifarious compilation of thoughts, opinions, case studies, and some empirical research from a variety of industry, academic, government,

and nongovernmental sources. Although a general consensus exists for the use of leading indicators as a measure of OHS performance, simple elements associated with its nature and utility, including a basic definition, remain murky; Reiman and Pietikäinen (2010) report that the concept is “all but clear.”

One component that continues to contribute to the confusion surrounding the issue involves semantics. The signifier *leading* seems to be the most common expression used to describe this particular type of indicator, yet numerous authors embrace additional descriptive terms throughout the literature in order to retain the most relevant qualities of indicators in respect to their own message. Hinze et al. (2013) draw attention to this inconsistency by pointing out that the terms *upstream*, *heading*, *positive*, and *predictive* have been used to describe essentially the same concept. Spear (2010) refers to *process* indicators when describing key performance indicators such as safety audits, behavior-based safety, safety perception surveys, safety training, and corrective action measurements, while both the Organization for Economic Cooperation, 2008 and the Health and Safety Executive in the United Kingdom, 2009 refer to essentially the same metrics as *activities* indicators.

Inevitably, the understanding of leading indicators is often informed by their characteristics. Grabowski et al. (2007) claim that leading indicators can be objective or subjective, and Hinze et al. (2013) describe the difference between passive and active leading indicators. Stough (2012) offers five key components of

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leading indicators, including: simply and closely connected to outcomes, objectively and reliably measurable, interpretable by different groups in the same way, broadly applicable across company operations, and easily and accurately communicated.

An obvious way to define leading indicators is to describe their relationship to lagging, also known as trailing or outcome, indicators. Hopkins (2009) states that in relation to personal safety, the term *lagging* typically refers to injuries and fatalities, whereas for process safety, lagging indicators are direct measures of harm and failure and do not have the ability to provide information about the current state of safety in the workplace. In this sense, leading indicators of personal safety would measure the events leading up to injuries and fatalities, whereas in process safety, they would be precursors to harm and failure, particularly at the systems level. Leading indicators are not so much the opposite of lagging indicators, but are instead a facet of safety likely to be present prior to an undesirable event (Harms-Ringdahl, 2009; Hale, 2009).

Near-miss incidents are one example of metrics that possess both leading and lagging properties and, as such, have raised at least as many questions as they have answered. There seems to be an inherent difficulty in dealing with something that almost occurred. Hinze et al. (2013) explains that this “transitional” metric has been used to take preventive action. At the same time, if nearly avoided injuries are treated as real ones, especially when it comes to mandatory (under)reporting and investigation, their valence may shift from positive to negative. In the absence of a commonly accepted definition or industry standards, Hinze et al. (2013) further argues that OHS practitioners ought to adapt near-misses as leading metrics with the intent of improving organizational safety performance.

Another theme present in many existing definitions of leading indicators is that one of their primary functions is to measure the effectiveness of OHS processes (Hinze et al., 2013), systems (Hohn and Duden, 2009; CCPS, 2008, and organizational performance (Reiman and Pietikäinen, 2010; Reiman and Pietikäinen, 2012). Leading indicators are also designed to flag potential problems early enough for corrective action to be taken (API, 2010) and help uncover weaknesses in the organization's procedures or employee behavior before they have a chance to cause real harm (Janicak, 2010). Some reports even suggest leading indicators' ability to detect the deterioration of OHS management systems (API, 2010, Harms-Ringdahl, 2009). Due to the time-sensitive nature involved in averting this deterioration and, furthermore, injuries or fatalities, it is important for leading indicators to actively monitor the state of OHS (Hopkins, 2009). Reiman and Pietikäinen (2010, 2012) state that the most effective leading indicators are those that monitor the capacity of an organization to perform safely (e.g. testing of systems and equipment, employee hazard awareness) and drive the safety management system to continual improvement (e.g. safety management leadership, contingency planning). Other measurement centric functions often attributed to leading indicators include benchmarking current practices, demonstrating continuous improvement over time (Hohn and Duden, 2009), measuring safety performance against a tolerance level, and calling for action when that level is exceeded (Organization for Economic Cooperation, 2008).

To complicate matters further, the root of the term, *indicator*, is often substituted for *metric*, *measure*, or *index* and used not only to describe activities, but also conditions, or events (Grabowski et al., 2007). This lack of agreement on the basic definitional issues creates a potential source of uncertainty and confusion for users interested in translating some of this conceptual knowledge into practice. OHS practitioners, especially those in formal positions of authority, exert a critical influence over OHS matters, and their knowledge, attitudes, and observations may prove useful in identifying ways to encourage further adoption of leading indicators.

Therefore, the key objectives of this research were to: (1) describe the extent to which OHS practitioners understand leading indicators and their practical applications; (2) explore organizational practices pertaining to tracking, analyzing, and applying information provided by leading indicators to improve OHS performance; and (3) identify barriers and factors that enable the use of leading indicators.

2. Methods

The study began with a panel of industry experts to explore the meaning of the term leading indicator and the relationship between leading and lagging indicators, identify desirable characteristics of leading indicators, and discuss practical applications of information provided by leading indicators regarding OHS performance. The panel was to inform the development of a survey questionnaire to be used in the next phase of the study.

The panel included a total of 17 experts, including 15 practitioners (14 active and one retired) and two researchers. All panelists identified occupational safety and health as their primary area of expertise. Three panelists – two practitioners and one researcher – were employed in the public sector. Fifteen panelists were male and two were female.

The expert panel ran approximately 3 h and was led by a trained facilitator-scribe team. A semi-structured questionnaire was used to present topics for discussion and pose questions to the panel. Discussion topics were pre-determined and formulated based on the most relevant research and trends as determined by a comprehensive literature review on the subject completed prior to the panel discussion. Throughout the discussion, participants were encouraged to share information based on their personal experience in this area and the experience of their organizations. The responses of the panelists were audio recorded to ensure accuracy in data collection, and then transcribed verbatim to aid in the interpretation of findings. The scribe also recorded some of the responses on large flipcharts which were on display for the entire panel throughout the discussion. The transcript and flipchart notes were subjected to content analysis by members of the research team to identify key points and emerging themes.

In the next phase of the study, a survey of company informants was conducted to better understand the use of leading indicators in OHS practice. Surveyed organizations included Campbell Institute Charter Members and Robert W. Campbell Award winners who have been recognized by the National Safety Council in the United States for their success in integrating Environmental, Health and Safety management into business operations.

The survey questionnaire included a series of closed- and open-ended questions on a variety of issues concerning the use of leading indicators in OHS performance measurement. A small group of researchers reviewed the questionnaire prior to administration in order to ensure content validity.

The survey was administered online at surveymonkey.com. Respondents were initially contacted via email and asked to complete the survey within a two-week period in July of 2013. After one week, members of the research team sent out email reminders to encourage non-respondents to complete the survey before the deadline. There were no incentives offered for survey completion.

The survey was sent to 30 individuals. A total of 18 surveys were returned, yielding a total response rate of 60 percent. The survey sample was comprised of companies from the Mining, Construction, Manufacturing, and Professional, Scientific, & Technical Services industries. Company size ranged from 500 to 202,000 employees with a median size of about 12,000. All survey respondents had job titles of manager or higher (e.g., director, senior director, vice president) and reported an average of approximately

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