EMERGING TECHNOLOGIES ENHANCE LEADING INDICATORS
for Safety & Risk Management
By David Galbraith

Leading indicators provide safety professionals an opportunity to act before an injury or loss by utilizing forward-looking data. The importance of these indicators in safety and risk management cannot be underestimated, and the identification of true leading indicators has been a foundational tenet that continues to evolve with time and data.

Considering that an estimated 90% of the world's data was generated between 2019 and the present (Marr, 2018), an ever-evolving world of digital information is readily available. What does this mean for risk indicators and where will the information emerge from in the future? In combination with existing leading indicators that have driven safety procedures to this point, emerging technologies can take this information to a new level with powerful tools to use in the reduction of incidents and losses.

Traditional Leading Indicators

Recognized leading indicators have improved loss reduction and risk management programs for years. Established, effective leading indicators are important to the successful integration of new digital leading indicators, which help improve existing performance objectives and identify existing unidentified exposures prior to an incident or loss occurrence. Current, time-proven leading indicators include:

•Management commitment. Effective safety commitment from the executive suite or owners is considered critical to successful and effective incident reduction. Without this commitment, programs typically fail to reach their loss reduction goals.

•Responsibility, accountability and authority. Risk management programs must have defined responsibilities. These responsibilities must be assigned to an individual who owns the accountability for the overall performance of the program and holds the authority to affect changes.

•Communication. Frequent, effective communication concerning the program is critical in developing a culture that helps drive an effective program.

•Culture. Empowered employees and leaders throughout the organization who believe in core values and behaviors are essential. These employees and leaders properly prioritize safety against other organizational objectives to drive success without undue risk.

•Training and meetings. Employee training for hazard recognition and

mitigation is critical in the reduction of incidents and losses.

•Near misses. Near-miss information provides the ability to change processes and operations based on incidents that did not result in an accident or injury.

•Regulatory. The active management of regulatory requirements leading to compliance with safety requirements.

Lagging Indicators

Most effective safety organizations also optimize the synergies between time-proven leading indicators and more traditional lagging indicators. Lagging indicators provide a measurement of what has occurred in the past but do not look toward the future. Some common in-use lagging indicators include:

•days away, restricted or transferred

•OSHA fatality rates, recordable rates, citations

•workers' compensation claims

•experience modification rates

Lagging indicators can include many other metrics, but all look at the past, not the future. Key lagging indicators that are used to supplement and enhance leading indicators take many forms.

Existing & Emerging Technology

Emerging technologies have the power to transform the value of leading indicators in the reduction of future incidents and injuries. Many emerging technologies in worker safety throughout the industry provide new varieties of useful and informative leading indicators. These leading indicators come in the form of digital data from sources of existing and emerging technology.

Technology-driven devices capture real-time data (e.g., images, movement, environmental, geosynchronous, biometric), provide haptic warnings and process the information into actionable data. The data are then analyzed via machine learning software and presented on dashboards accessible 24/7 in real time. The technologies use stored data as well as real-time data to develop predictive models.

IOT & Sensor Digital Data

Internet of Things (IOT) sensors are becoming common throughout the working environment. Sensors are placed on PPE and deployed as wearables (e.g., on belts, in shoes, in watches). The sensors obtain movement, environmental, biometric, geospatial and fall data. The data are analyzed using machine learning software and presented on web-based dashboards as well as haptic and alert notifications for wearers and management.

Smartphone Capabilities

Smartphone applications (in conjunction with machine learning software) utilize advanced camera systems, sensors and mobility of workers to develop predictive models in ergonomic analysis and worker fit-for-duty determinations.

Telematics

The use of telematics has grown significantly over the past 5 years. Telematics technology provides critical driver behavior information for coaching opportunities and actions to reduce hazardous conditions that can lead to incidents, particularly with commercial fleet drivers. Forward- and driver-facing in-cab cameras paired with computer vision or machine learning software have enhanced the telematics suite of options and provide insights on driver distractions, alertness and safe following distance to improve the safety of drivers and the public.

Machine Learning & Computer Vision

Evolving computer vision paired with machine learning software provides information and alerts of hazardous exposures in real time. The combination of computer vision and learning software can also identify near-misses in real time with alerts allowing for immediate corrective actions.

Exoskeletons

Passive and nonpassive exoskeletons that augment, reinforce and restore human performance are readily available in

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the marketplace. These exoskeletons are worn by the worker while performing the job and can be equipped with sensors and actuators that generate dashboard data.

Augmented, Virtual Reality Training

Augmented and virtual reality training enable employees to learn in the virtual or augmented world without the risk of injury or illness. Employees can learn how to perform tasks, wear PPE, and operate equipment in the virtual world, allowing for mistakes without the risk of injury or damage.

Fit-for-Duty Testing

Several fit-for-duty technologies are available to determine whether an employee is in the correct mindset prior to performing work. Taking less than a minute at the beginning of a shift, the system can determine whether employees' alertness is acceptable according to their baseline measurements. Another technology will test for alcohol in a simple 30-second test whereby the employee places a hand on a testing device. Both devices provide an alert to the employee and to a web-based dashboard accessed by the employer's designated individuals.

Preparing to Engage With New Data

Paired with existing leading and lagging indicators, these powerful emerging technologies present a distinct opportunity for safety and risk managers to evolve to a more predictive model for reducing injuries and losses. The tools develop historical data and provide real-time data to machine learning software that presents a predictive analysis for preventing future incidents. OSH professionals who must improve their organization's incident and loss reduction results should:

1. Investigate the options.
2. Test new capabilities.
3. Pilot digital technologies.
4. Track leading indicators.

Successful implementation should ultimately lead to a reduction in losses and additional leading indicators to continue to measure and improve the business's safety culture. Safety professionals should be aware that elected technologies do not always match the organization's culture, objectives or budget; in these instances, it is important to learn to "fail fast" and move on to a new technology opportunity.

The digital space is evolving quickly, and new solutions are being introduced almost daily. Data-empowered solutions are continuing to raise safety to a new level. The current fast-paced, data-driven and mobile environment makes these new analytics critical to the continued prevention of incidents and losses. Organizations that do not begin to evolve into the predictive data environment may fall behind those that can predict and eliminate losses before they occur. **PSJ**

References

Marr, B. (2018, May 21). How much data do we create every day? The mind-blowing stats everyone should read. *Forbes*. https://bit.ly/3yyjdiT
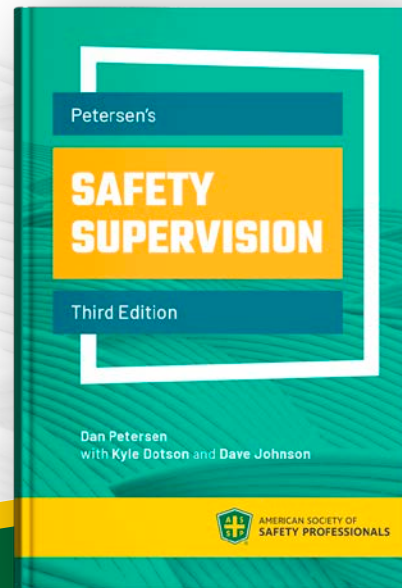
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