



Executive Edge 2009

National Safety Council Annual Congress & Expo
26-28 Oct 2009 - Orlando, Florida USA

Executive Edge Session A Leading-Edge Management - Leading Indicators and Risk Management

ABOUT THE EXECUTIVE EDGE

Executive Edge leadership track brings together business executives and top leaders in environmental, health and safety (EHS) management at the National Safety Council's Annual Congress & Expo. Top decision-makers are increasingly discovering that well-integrated EHS management systems create world-class organizations with competitive advantage and business sustainability. The Executive Edge was developed to meaningfully and purposefully engage business leaders and advance EHS in businesses worldwide. With a variety of panel discussions, technical sessions, and hands-on workshops, the 2-1/2 day Executive Edge track provides leaders with tools to lead their company toward world-class performance. Dynamic dialogues, cross-sharing among leaders, and interactive workshops aim to sharpen leadership skills and capture leading evidence-based solutions for successfully integrating EHS into business operations.

EXECUTIVE EDGE RESOURCES 2009

Proceedings for each of the Executive Edge events and topic areas

Economic Resilience

The Executive Forum:
The Role of EHS in an Economic Downturn – How Do We Deal with the Conditions of the Economy Strategically?

Operational Excellence

The Executive Breakfast:
Operational Excellence - EHS as a Competitive Edge

Paired technical sessions and workshops:

Risk Reduction

Leading-Edge Management: Leading Indicators and Risk Management

Leadership

World-Class Leadership: Lead with Safety

System Implementation

Driving EHS Performance: Effective System Implementation

ABOUT THE EXECUTIVE EDGE SESSIONS & WORKSHOPS

As a groundbreaking new part of the Executive Edge track, the Executive Edge Technical Sessions & Workshops were developed to provide key insights into critical EHS topics: Risk reduction, leadership, and system implementation. Sessions feature practical and theoretical presentations followed by a Question & Answer session designed to allow leadership at all levels a chance to directly engage with speakers and their peers. Following these sessions, paired interactive Workshops drill deeper into crucial EHS leadership topics and seek to capture learning that participants can actively and effectively take back to their own organizations.

Note: EHS, SH&E, and HS&E are used as variant acronyms for "environmental, health and safety"

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INTRODUCTION



Peter Bridle
HSE Director
Noble Corporation

Introduction

Bridle: Good afternoon and welcome to the first of the Executive Edge sessions. In a change to the scheduled program, I will be replacing Rick Kroon as the moderator of this event. Mr. Kroon was unfortunately unable to make it at the eleventh hour. My name is Peter Bridle. I am the HSE Director with Noble Drilling. Noble is one of the world's largest offshore drilling contractors. We own and operate a fleet of approximately 65 offshore drilling rigs in the four corners of the globe. We were winners of the Robert W. Campbell Award in 2004. Like many companies, we're very proud of the culture we've built, but we are faced with many challenges to get to an injury-free environment.

We talk a lot about working safely. The first step is to figure out exactly what we mean by that. As safety professionals, we often measure quantities of injuries, and then break those down further into classifications such as lost time injuries, recordable injuries, and first aid injuries. If we want to make an improvement and have a positive impact on those numbers, we have to get to the causes. In years gone by, we have said that things such as a failure to follow rules and procedures, workers using the wrong equipment for a job, or even the positions of people were the root causes of injuries. That may have worked 10 or 15 years ago. Contemporary thinking says that it's not the endpoint. It's the starting point. The more you drill down and the deeper you go to get to the root causes of peoples' actions, the more you generate a mass of data. It's a bit like the roots of a tree. The more roots you get a hold of, the more you realize that they're connected to others. You begin to realize that what appeared to be a simple problem on the surface is, underneath, quite complex. To sift through all the data and ensure that we don't lose the plot, we have to find a good way of seeing the wood from the trees.

Today, we'll hear from our two presenters first, then take questions one at a time at the end. Our first speaker began his career by earning a

degree from the U.S. Military Academy at West Point. He went on to gain an MBA from the University of Houston. Following numerous responsibilities over a long and varied career at ExxonMobil, Glenn Murray now provides oversight on the effective function of the company's entire global HSE network. This includes the effective assessment of the Operations Integrity Management System and ensuring that the entire organization learns from its serious incidents, known as High-Value Incidents or HLVI. When you investigate incidents, you end up with a lot of data. How do you know which data to focus on and which not to focus on? This leads you to proactive performance indicators. This is what our first speaker is going to talk about today. Without further ado, I'd like to introduce Glenn Murray.

Speaker Presentations

Murray: Thank you. Good afternoon. It's a pleasure to be here this afternoon among so many people who share my passion for safety. I hope you will find that the presentations today complement one another. Our intent is to build on one another's stories. I will be focusing on defining leading metrics and the role they play in risk management. I'll be the "low-tech" side of the story. Joe will talk about practice. Once you get all that data, how do you turn it into useable information, predictive metrics, and trends? He'll get into some of the tools used to put those metrics into play.

Agenda and Terminology

You've no doubt heard a great deal about the value of integrated management systems for the effective management of safety, security, health and the environment (SSH&E). You'll hear more about this throughout the Executive Edge leadership track. I am among those who firmly believe that SSH&E risk can only be managed through such systems. For management systems to be effective and to facilitate continuous improvement, no matter what their scope, there must be measurement. You've probably heard this maxim before: 'If you can't measure it, you



Glenn A. Murray
Safety Programs Manager
Exxon Mobil Corporation

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can't manage it." How well are processes and tools being executed, and how well are those processes and tools meeting your goals and objectives? The former refers to leading, or process-oriented metrics. The latter refers to lagging, or results-oriented, metrics. You cannot judge the effectiveness of any management system without understanding both kinds of performance metrics - without knowing the results as well as the process. We'll visit that idea a little bit more later. My talk today will focus primarily on what leading metrics are and how they can provide useful insights into managing safety, security, health, and environmental risk.

First, I'd like to give you a quick run-down on our agenda. I'll begin with a brief discussion of some key terms, so that we'll all be on the same page. Then I'll introduce you to the concept of the Risk Management continuum, followed by a short discussion of some of the key leading indicators associated with each step along that continuum. Near the end of that discussion, we'll spend a few minutes on something that I refer to as 'risk tolerance.' I'll wrap-up with some review comments. I still remember my English Composition days, when my professor would stress that the best way to

manage a talk or to organize a paper is to, "tell them what you're going to tell them, then tell them, and then tell them what you told them." That still works today, so that's my plan for this afternoon.

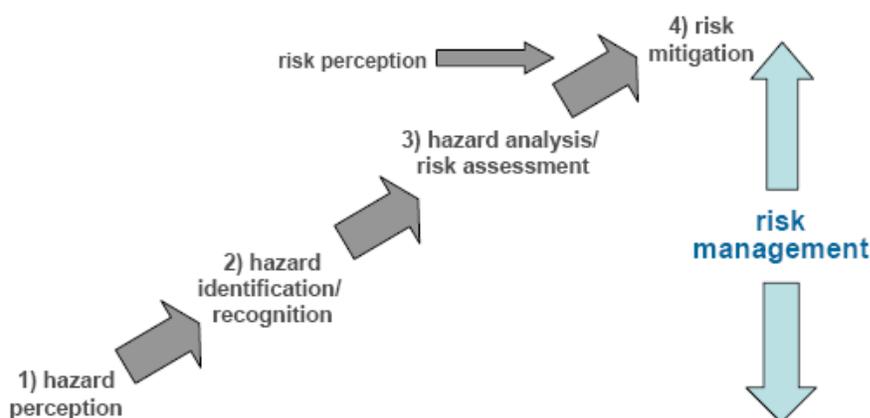
Often, people use the terms "hazard" and "risk" interchangeably. For the purposes of my talk today, they are certainly related, but they are quite different. A "hazard" is simply a potential source of harm, generally associated with a condition, a behavior, or both. On the other hand, a "risk" is quite different. Risk represents the intersection or function of the likelihood of an unwanted incident occurring and the severity of its potential consequences. For example, working on an elevated platform or at heights poses a hazard, or a potential source of harm. The likelihood, however, of someone falling from that height while they are working, coupled with the seriousness of the potential consequences of such a fall, is the risk associated with the hazard of working at heights. That's the difference between hazard and risk. Try to keep this in mind as we talk through the risk management continuum.

I talked a little earlier about leading versus lagging indicators. I may be preaching to the choir, but it's an important concept. Lagging

"You cannot judge the effectiveness of any management system without understanding ...the results as well as the processes."

- Glenn Murray
ExxonMobil

risk management



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“It’s important to remember...that the trick is to strike the right balance in order to understand the whole picture.”

**- Glenn Murray
ExxonMobil**

indicators are the metrics with which most of us are most familiar, such as the number of injuries, injury rates, and so forth. As we know, lagging indicators do not tell the whole story. In my experience, we often tend to focus too much on lagging indicators at the expense of leading indicators. That means that in the safety business, we measure our success by counting our failures. It can be likened to driving while looking in the rear-view mirror. As we know, that can be difficult. Leading indicators, on the other hand, provide information about the effectiveness and the quality of the tools and processes in place that lead to those results, or the lagging performance. They tend to be activity or process-oriented. Leading indicators include things like the number of safety meetings, the quality of those safety meetings, or the level of management participation in safety meetings. Leading indicators should be actionable. In other words, the indicators should drive behavior. If they don't drive behavior, we shouldn't be measuring them. They should drive the right kinds of behaviors. We don't want to measure for the sake of measuring. If we can't do something about or with the metric, we shouldn't be measuring it. Finally, leading indicators should be predictive in some way, generally in a positive direction. Meaning that, if you do more of 'A' or you do a better job at 'A,' you'll get better results. It's important to remember that you need to have the right balance of leading and lagging indicators. The trick is to strike the right balance in order to understand the whole picture.

Enough about terminology. Hopefully these definitions will help to keep us on the same page as we talk through the rest of the material.

The Risk Management Continuum

Risk Management as a whole can be thought about in terms of a continuum, or a series of steps, as opposed to a singular activity. Each step is as important as the one before it, and each step builds on the previous one. The following discussion will progress through each

one of those steps. In each case I will illustrate the concept, provide supporting tools, processes, and procedures associated with that step in the continuum, and then provide some example leading indicators that can provide useful insights into each one of the steps along the continuum of the risk management process.

Let's talk first about *hazard perception*, with an emphasis on the word *perception*. Hazard perception can be thought of as the ability to perceive or sense that the condition, situation, or scenario presents a hazard. Can the workers see it? Hear it? Feel it? Are there conditions in the workplace, worker factors, or human factors, such as lighting, vibration, noise, or other distractions that are influencing the degree to which an individual or a work team can actually perceive the hazard? The question is, do you perceive it in the first place? Can you hear it? Can you feel it?

Some of the supporting tools in place to help address this aspect of the continuum include training to raise awareness about human factors and ergonomic issues, so that workers and supervisors can recognize the kinds of human factors issues that we're talking about. Other tools include design standards and engineering solutions that can build human factor issues into control panels and facilities to reduce the likelihood of human factor mistakes or errors. Finally, operating, maintenance, and inspection procedures can have human factors concepts built-in. What are some of the indicators that can provide hints and indications regarding the effectiveness of these tools and processes? One might be human factors training. How well are you conducting that training? Are you conducting training versus your schedule? How effective is that training? What is the status of your ongoing process to update your procedures or design standards so that human factors are being built in to those procedures and design standards?

We'll move next to *hazard identification and recognition*, which often is the step that people

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hazard analysis/risk assessment

description

- ability to assign the appropriate level of risk to a recognized hazard/scenario

supporting tools, processes & procedures

- risk assessment training
- job safety analysis, task hazard analysis
- process hazard analysis (PHA), hazard and operability review (HAZOP)

potential leading indicators

- risk assessment training completed vs. scheduled; effectiveness of training
- conduct of risk assessment activities vs. plan; quality of risk assessment processes

		Probability				
		A	B	C	D	E
Consequence	I					
	II					
	III					
	IV					

leap to first. We've *perceived* the hazard, but does it register as a hazard? Hazard identification and recognition can be thought of as the ability to identify or recognize the condition or situation as a hazard. You can sense it, but does it register in your mind as a hazard?

What are some of the tools, processes, and procedures that can support this part of the risk management continuum? Again, training is one such tool. This can include hazard awareness and identification training, to help individuals recognize hazards as such. Job-specific and skills training can help workers understand what hazards and risks are associated with their process or job. Short- service worker programs or mentoring programs are another tool. In many of our operations, we have found that employees or contractors who are new to the business or to the site are less likely, or perhaps less equipped, to recognize hazards in their workplace. Developing short- service worker programs or mentoring programs can be helpful. Of course, there are a number of tools in place to help workers identify and discover hazards.

These include work observations, JSAs, JHAs, hazard hunts, and the myriad of tools that many of you are familiar with.

There are a number of leading indicators that can map directly to these kinds of processes and tools. Again, we look back to training. Are we conducting the kind of training that we planned? Is the training on schedule and on track? How effective is that training? Is it registering in the minds of people who are receiving it? Are we on schedule with our risk assessments? Have we conducted all of the JHAs or JSAs that we scheduled for this year? What is the quality of those JSAs? Again, all of these can be metrics. They are things that you can measure to get a better handle on how well these tools, processes, and activities are being carried out.

The next step on the continuum is *risk management*. We've *perceived* the hazard. We've *recognized* it as a hazard. Now we actually need to go to the step of *assessing the risk* associated with that hazard. Remember our definition from before. A 'hazard' is the presence of a potentially harmful condition or

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**- Glenn Murray
ExxonMobil**

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“Risk tolerance is a reality. What is important is that we acknowledge that we have a tolerance for risk...and that we understand how to make the safe choice.”

**- Glenn Murray
ExxonMobil**

behavior, but 'risk' is the intersection of the probability of something happening and the potential consequences of that event. Many of us have risk matrices with which we work. In essence, the risk assessment process is finding a scenario or situation on that matrix. The bottom line is that risk *assessment* is about the ability of a worker or a work team to assess the appropriate level of risk given the information and scenario they're facing.

Many processes and tools are in place with regard to risk assessment. We conduct risk assessment training. Whether you're a participant on a HAZOP team or leading that team, you need training. There is expert-level training and participant-level training. It's important that this training is conducted and effective. There are also the tools themselves, such as JHAs, JSAs, and HAZOPs.

What are some of the potential predictors that can judge the effectiveness of these tools? I'll come back to training again. How effective is the training? Are the right people getting trained? Were all the people on the HAZOP team trained? How effective was the training? Is our risk assessment activity on schedule? Typically, a facility will have a number of risk assessments that it will schedule throughout the year. Is that schedule on track? What's the quality of those risk assessments? What are the quality of the findings and results?

We've *perceived* the hazard, we've *recognized* it as a hazard, and we've *analyzed* the risk. Now it's time to behave or act, and we reach the risk *mitigation* step. The last step in the risk management process involves actually choosing to mitigate the risk. It involves taking action to avoid or eliminate the hazard, reduce the seriousness of the potential consequences, or to lower the probability of the consequence occurring, or all of the above. Risk mitigation ultimately comes down to a choice or a decision. It is a conscious behavior. It involves a person or persons processing information and acting based on that information. There are, however,

important factors that can influence how people process risk information. That brings us to my next key topic, which is *risk perception*.

Risk Perception and Tolerance

Many things, including our experiences and knowledge, influence our perceptions of risk. In order for us to make the safe decision or the safe choice, we need to understand the factors that shape our individual risk perceptions. Another term commonly used in this context is "risk tolerance," which is the level of risk that we individually, or as a team, believe to be acceptable. Risk tolerance is not a 'bad' thing. Risk tolerance is a reality. What is important is that we acknowledge that we all have tolerance for risk, that we recognize the factors that influence our tolerance for risk, and that we understand how to make the safe choice.

What are some of the factors that help shape our tolerance for risk and that influence the risk mitigation decisions we make hundreds if not thousands of times every day? There are a number of factors that tend to *raise* one's tolerance for risk, including overestimating our individual or our team's capabilities and experience. Familiarity with an act, situation or scenario, or a feeling of control, can also raise risk tolerance. Think about driving a car. It's something that you do almost automatically. We all have very high risk tolerance when it comes to driving. We believe that we are 'in control' when we're behind the wheel of a car. There are also some factors that tend to *lower* our risk tolerance. One is the perceived seriousness of the consequence. If you believe that taking a certain action will have very serious consequences, you're not as likely to take that action. If you have thoughts that the consequence will be very serious, you're likely to have a lower level of risk tolerance. Personal experience is another factor. If you've performed a task many times before and nothing bad ever happened, that would tend to lower your tolerance for risk.

Thus, the last step on the continuum of risk management is risk *mitigation*. Does the worker or

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the team know how to, and choose to, mitigate the risk? What are some of the tools, processes, and procedures in place associated with risk mitigation? We investigate and conduct root cause analyses for incidents and near-misses. We conduct training related to risk mitigation and incident investigation. Many of us have job observation and behavior-based safety processes in place. Finally, culture surveys or diagnostic tools can be used in order to understand the kinds of behaviors exhibited by workers in the workplace.

Some of the potential leading indicators related to risk mitigation are findings from near-miss and incident investigation, trends in root cause analysis, percent of at-risk versus safe behavior from job observations, and the nature of at-risk behaviors. Cultural diagnostic tools can give you a better sense for the procedural discipline within an organization or the manner in which people follow instructions on a site and comply with site safety rules, such as wearing seatbelts or using hearing protection. All of these are indicators of risk tolerance in the workplace.

Key Topic Review and Conclusion

Throughout the remainder of the Executive Edge Track, which I hope some of you will follow through to its end, you'll hear about the importance of the framework in which these risk management concepts must operate. Let me review some of the key topics. First, SSH&E Risk Management can only be addressed sustainably and successfully through a comprehensive, systematic approach. That systematic approach or structure should include a model that calls for both leading and lagging performance metrics. In that manner, organizations can understand how well they are executing their requirements and meeting their performance objectives. The system must also include thorough and effective follow-up to ensure action items and recommendations are followed-up on and are addressed, and that they work. This must be followed by analysis, evaluation, and sharing to assure that the organization is learning from past

and others' experiences to continuously improve. Lastly, we can never lose sight of the key tenet that line management, not the safety staff, owns and is fully accountable for safety results, as well as the processes in place to achieve them. The minute an organization loses sight of this important concept, they are in trouble. Management systems, follow-up actions, processes, and procedures - in the end - all depend upon effective and flawless execution. And execution is all about leadership. Without effective leadership, the most comprehensive SSH&E management system is not sustainable and will not succeed.

In review, remember that there is a difference between a *hazard* and a *risk*, a hazard being a source or condition of harm and a risk being the intersection of probability of an incident occurring and the potential severity of the consequences associated with that incident. Remember to think of risk management as a continuum. It is a series of steps. Each one is as important as the other, and each one builds on the next. You must have leading indicators in place to evaluate things like activity levels, effectiveness of execution, and quality of work in order for you to fully understand how well you're managing the risk. Those indicators should drive behavior and should predict performance. Understand and acknowledge that risk tolerance exists, and that it factors into the manner in which each of us sees the workplace and addresses risk on an individual and team basis. Keep in mind the critical success factors that we will build upon throughout the remainder of the Executive Edge Leadership Track. You must have an effective integrated SSH&E management system in place. You should have effective follow-up and closure on action items and recommendations. You must measure - and learn from those measurements. Last, but certainly not least, effective leadership must be in place to build a learning culture and to drive the kinds of safety behaviors that will get the results we're all looking for. Thank you.

Bridle: Thank so much Glenn. That was an

“...We can never lose sight of the key tenet that line management, not the safety staff, owns and is fully accountable for safety results.”

**- Glenn Murray
ExxonMobil**

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Joe Stough
President & Founder
Syntex Management
Solutions

excellent presentation. It was a very structured and holistic approach to getting a safer workplace through the use of corrective measures. At Noble, one of the things we struggle with is that we have some well established training programs to help folks better identify and assess hazards, yet all too often, when it comes to that last vital step of risk perception, we have a lot of work to do. People being people, they sometimes do things that they shouldn't. The influences of that are wide and varied. I wish there were a silver bullet, but we still have work to do.

Our next speaker today, Joe Stough, is the founder of Syntex Management Systems. A graduate from the University of California, Joe has successfully grown the business by partnering with companies to better process and interpret their safety data. This includes the establishment of corrective performance metrics. In 2003, Joe received the [Houston Young?] entrepreneur of the year award for technology and IT. Ladies and gentlemen, Joe Stough.

Stough: Thank you and good afternoon. I'm going to follow up on Glenn's presentation. Here are the topics that I'd like to cover. First of all, I'll quickly go over the data behind the leading indicator initiative that we have in place with our customers. As Pete mentioned, we have a partnership with a group of companies. We're working with them to identify leading indicators that can be used to create performance management metrics for management and leadership to use out in the field. I'll go over the data used to find these leading indicators, using the risk management continuum that Glenn spoke about as a backdrop. I'll then talk about the objectives of our leading indicator initiative and go over some key terms and concepts. Then I will give a high level overview of both the research and implementation phases of our program.

The Risk Management Continuum and Data

The purpose or endgame of going after leading indicators is not to appease intellectual curiosity about when the next major accident might occur.

Risk Management → Risk Reduction Processes

Risk Management "Continuum" = the full lifecycle of risk reduction processes

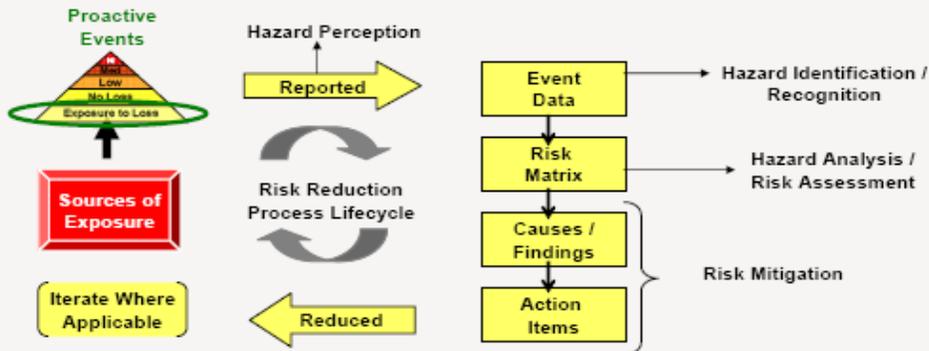


This Presentation:
 (A) Researching data per the full lifecycle
 (B) Implementing leading indicator KPIs

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Data per Full Risk Management Continuum

Researching the data from database software which enables the full risk reduction process lifecycle...



A “mature” risk reduction management approach involves the full lifecycle.

But other less mature events also result in risk reduction. And many of those events are more “frequent” / routine – **resulting in more data for measurement.**

The purpose of going after leading indicators is to identify something that can improve performance or prevent accidents from occurring. Specifically, we’re looking for leading indicators and metrics that can drive management or leadership focus to change behavior and organizational factors that are found to be key to top-tier performance.

We’re looking for a different type of leading indicator. You may have heard people refer to leading indicators in the context of “a leading indicator of the next major bad thing occurring.” The way we’ve structured and analyzed the data has the purpose of finding leading indicators of good performance. We look at what organizations that are consistently performing well are doing differently than everyone else so that we can make those things repeatable. We’re looking for organizational tendencies. Glenn mentioned the “execution of the process” several times in his presentation. We’re looking for differences in the way organizations execute certain types of risk management, or “risk reduction,” processes. We’re looking for the things that the top performers are doing uniquely.

This is the risk management continuum. For the rest of my presentation, I’ll be talking about the risk management continuum in terms of risk reduction processes. As we go through the risk management continuum, I’ll map it to the types of data that we’re drawing from each step. The purpose of the continuum is to systematically and measurably reduce exposure to risk. If you can measurably reduce exposure to risk, over time you should ultimately reduce the consequences of risk, such as injuries, incidents, and spills. In this presentation, we’ll talk about the data that we research for this full lifecycle and how we’re working to implement leading metrics that are discovered through this research.

This slide describes a comprehensive database that collects information from each step of the risk management continuum. At the very beginning, you have hazard perception. Obviously, to preempt the report of a hazard, risk, exposure, or unsafe condition, you have to have the perception. This can be either a formal, structured process or simply the work of perceiving that there is a problem that needs to be reported. At the next level, after a hazard or risk is reported, you have the event data. This is

“We look at what organizations that are consistently performing well are doing differently than everyone else so that we can make those things repeatable.”

**- Joe Stough
Syntax**

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“If you look at this as a cycle, if a major risk or exposure was found to be applicable at a small facility within a large company, it would be applicable in other facilities.”

**- Joe Stough
Syntex**

where you have data from hazard identification and recognition, information about the exposure, and the details and circumstances of the event. From there, we move to hazard analysis and risk assessment. You have the risk assessment matrix to determine the potential likelihood and severity of the risk. What is the level of problem posed by this reported item? The final step of the risk management continuum is risk mitigation, where you have root cause analysis to identify the cause of the issue and what needs to be solved to mitigate or reduce the risk. Then you have action items, actual planning, the assignment of accountability and ownership, and the completion of those actions that, ultimately, reduce the risk. If you look at this as a cycle, if a major risk or exposure was found to be applicable at a small facility within a large company, it would be applicable in other facilities. The next step would be iterating this process to other facilities within that organization to root out that common risk. In the case of a small company, this step might instead be sharing this information across company lines and iterating these issues. We call this full process the risk reduction process lifecycle. The database software application from which we're drawing the data to do our analysis and identify leading indicators is collecting data related to each of these components.

I'll break this down a little bit differently. A mature risk reduction management approach involves formalized processes throughout each step in the risk management continuum. However, there are a lot of routine processes that also provide information and data on organizational behavior and the execution of key processes. I'll talk about a process that is probably a least common denominator among all the organizations in the room today. Everyone has incidents, or you wouldn't be here. You all have injuries at some level. Looking at the incident or near-miss process, I'll talk through the same risk reduction cycle and the

types of data that we're using in our analysis.

Types of Data

At the very beginning is data on reporting. We have the Heinrich triangle. I'm focused on the top end of the triangle. That's from near-misses on up. We have data on the participation of the workforce in reporting incidents and near-misses. These are metrics like the rate of reporting per work hour and the ratio of reporting low-consequence to high-consequence events, which give us an idea of the activity and involvement of the workforce in reporting issues. From there, we have the detailed information about incidents and near-miss events. This is where we learn more about what happened, rather than about the behaviors and activities in the organization and how the event was treated.

Another type of data we get is risk scores. There are organizations that are using a risk matrix on things like near-misses. Some companies have a policy or standard that every event from near-miss on up, whether it had consequences or not, has to have a risk score. That means they have a potential likelihood and a potential severity risk matrix score for each event. Some organizations actually treat the event based on the risk score, rather than the actual consequence. In these cases, the organizational behavior behind a near-miss with a high risk looks just like a lost time injury or a major actual loss event. They'll do a formal investigation and treat it more formally because of the risk score. I'd say that's a more mature case. In most cases you don't see that. We do, however, have that data in some instances. We can study that end of the spectrum and that type of organizational behavior and identify how it correlates to performance. Some organizations we work with do require near-misses on up to have some type of root cause analysis done, even if it's a very simplified root cause analysis. They want some type of causation done on every event. For near-miss events, they may require a simplified form of the root cause methodology they've created and

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rolled out. This gives them the ability to identify where they're having tendencies and equipment design issues versus maintenance and worker knowledge issues. It's gives them a general idea of what the root causes of problems are in the organization.

Another type of data we have is action item data. A specific area of data that's come out in our analysis is data on the involvement of leaders within the workforce and their accountability for actions. This refers to the consistency and timeliness of leadership taking accountability for actions they're assigned downstream of an investigation, audit, or inspection. We're studying the accountability or responsiveness of leaders within an organization in picking up those actions and authorizing them to be done.

Second to last is data on the timeliness of an action to completion. This refers to all of the different types of metrics you can draw from the action items coming out of these events. Specifically, this might include things like percent on time completion of high-priority actions or percent on time completion of actions from medium- to high-risk items. These are examples of the metrics we're getting out of the action

items part of the database.

I've saved one of the more interesting metrics, in terms of statistical correlation, for last. This is data related to "handshakes." Each near-miss or incident event goes through a series of handshakes from the front-line worker who reported the event to the front-line supervisor who picked that up. The supervisor either took it seriously or put it on his or her desk and waited for a few weeks to do something about it. If the supervisor took it seriously and did something about it promptly, it was then handed to a subject matter expert. The subject matter expert then either took it seriously and executed a formal procedure or process or did not. This is data on the timeliness and different conditions surrounding all of these handoffs from the front-line worker to the subject matter expert to the different levels of supervision to the leaders that authorize actions, and even back out to the people who actually execute action. We're studying and trying to identify the unique characteristics of top-performing organizations. There's a lot of data. We were studying millions of records of data and hundreds of data points.

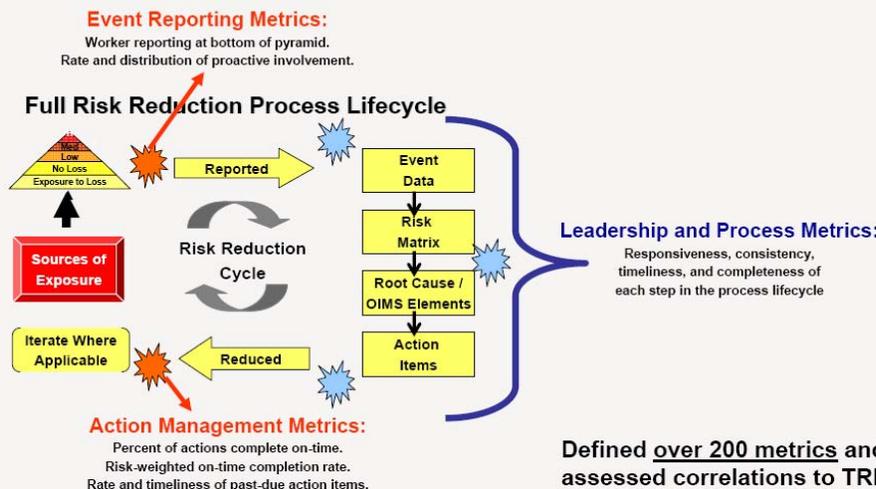
Metric Criteria

"If the intent is to change performance, it has to be something that a manager...can do something about."

- Joe Stough
Syntex

Research: Process-based Metrics per Full Lifecycle

- Objective: Use data and math to find actionable, process-based leading indicators



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“Surveys, assessments, and audits are very valuable. They provide a lot of information. Alone, though, we found that they’re not enough.”

**- Joe Stough
Syntex**

That was the backdrop for the kind of data we’re looking at for identifying leading indicators. If you go back to the original purpose of this initiative, we’re looking for leading indicators that can then be used in the field as management metrics, in reports, and on scorecards. The number one criterion for our metrics is that they have to be actionable. If the intent is to change something in the field that is going to change performance, it has to be something that a manager, upon looking at a score that’s unsatisfactory, can do something about. It has to be practical, so that management can make a change out in the field.

Another criterion is consistency. If you have a continuous improvement measurement process that you want to cut across your whole region or corporation, the calculation and interpretation of those metrics has to be consistent. If you mix apples and oranges, the credibility of those metrics starts to sink. Your buy-in from leaders and managers starts to fade. You have to have consistency. This leads to having a single database that has a single common standard for how these metrics are being calculated. I’ve been going through these criteria. The data and metrics that I’ve been talking about earlier all meet these criteria. This is the filter that we went through.

The next criterion is that metrics must be objective. We’ve found that data from routine activity is a lot more accurate than data solely taken from worker opinions or surveys. Surveys, assessments, and audits are very valuable. They provide a lot of information. Alone, though, we found that they’re not enough. We have a lot of that opinion data as well, but the information that we found to be more consistent and accurate is the objective data that we draw from behaviors in the field. Workers don’t know that we’re drawing those metrics. They don’t know that when they make a report and a front-line supervisor finally responds to that near-miss report 17 days later, a 17-day stamp just got put on that report. There’s been an aggregate

drawn across their organization to measure the responsiveness of front-line supervision. That’s an objective metric from routine activity, as opposed to an opinion. “How responsive are your supervisors?” you might ask someone in that same facility. “Well, they’re very responsive.” We can go check this routine activity measure and see if that’s real.

Metrics must be measurable. If it’s going to be part of a corporate-wide process, then these metrics have to be measurable. This is somewhat the same as consistency, but metrics have to be consistent, objective, and believable on a corporate-wide scale. If you’re going to change behavior out in the field for operations managers and leadership, leadership needs to believe in these metrics. That’s something that we’ve experienced. We’ve worked in this field for 14 years with companies doing the things that I’m talking about today. One of the most critical things we’ve seen is that the operations leaders have to buy into the idea that if they change a characteristic, it’s going to result in something positive for their business. It doesn’t matter how easy or practical the metric is. If they don’t believe it, they’re likely not to do it.

Data and Math

Ideally, this perception or this belief in these metrics is supported by data and math. How do we use data and math to get to these metrics that meet those criteria? Take a look at these three charts. The chart all the way to the right is a histogram that shows some decent variation. In the middle is a histogram that has no variation. I’ll explain how that’s important. The one on the left is a line chart showing a grouping of organizations that have very good average performance. I didn’t put any numbers there, because “very good” is relative to your industry and even within your own business. Everyone has a top 20% and a bottom 20% in their industry and company. The bottom line is that we want to know what the top 20% are doing differently than the bottom 20%. What are they doing differently in terms of actionable,

Implementation: Management KPI Scorecard

- Objective: Apply the most relevant, meaningful leading indicators as Key Performance Indicators (KPIs) for leaders to measure and improve

Managed KPI Scorecard				Executive Analysis ONLY			
	Recordable Rate (Lagging)	Safety Triangle Ratio (as %)	% High Actions On Time	Days to Accept 1st Action	Avg Days to Supv Response	% Incidents with Causes	% Lateness of Late Actions
Site 1	2.50	37%	67%	4.79	2.10	24%	11%
Site 2	3.10	22%	62%	5.25	1.40	17%	41%
Site 3	1.70	83%	95%	17.10	7.50	54%	57%
Site 4	1.30	75%	77%	7.10	4.10	72%	3%
Site 5	0.95	93%	75%	22.00	18.30	46%	21%
Site 6	5.10	5%	34%	5.20	6.10	64%	12%
Corp Mean	2.44	63%	68%	10.24	6.58	45%	24%
1st Quartile	0.51	91%	87%	4.10	1.50	93%	8%
50% Level	1.75	63%	64%	9.70	6.30	71%	31%

- Typically calculated as 12 Month rolling or YTD performance metrics.
- Benchmarks per internal or external (IMPACT customer-wide) scores.

measurable, consistent organizational factors that can then be applied to that bottom 20% so that they can improve their performance? What we're looking for is metrics that have some type of opportunity for improvement on the leading side.

I'll give you an example. I showed a diagram like this line graph to an operations executive. The underlying issue being measured by this diagram was a behavior or a process step that was connected to a corporate standard. When I told him that this diagram was connected to a corporate standard for the frequency at which events that are reported receive at least some level of root cause analysis, he couldn't believe it. He couldn't believe there was anyone near the zero percent side. It was an astonishing discovery, to say the least. He seemed a little aggravated by that. He even questioned it. We spent a little bit of time digging into it until finally he could believe this was real data. These were real behaviors. He finally believed that, to some extent, they were really slacking in this particular part of their standard. I asked him, "How do you feel about your safety performance in your

organization as a whole?" This particular operations executive had a total recordable incident rate of less than .5. It was close to .4. I asked, "How do you feel about your lagging performance?" and he said, "Well, it's good. It's world class." I asked him what he thought it would be if he were to take the variation shown in the diagram and improve upon it, taking this as a symptom of how well the company was executing its management system as a whole. He had opportunity for improvement. This type of variation represents room for improvement. We're only looking for the types of metrics that show this type of variation. We studied all the different metrics in our database that related to how those best performers were doing things differently from the worst so that we could use them as performance metrics.

We wanted to establish a statistically significant data set. We have a data set consisting of millions of records of data. We have data coming from over 130 countries. We're approaching one million users. Our data specifically comes from events like incidents, investigations, observations, inspections, audits,

"This particular operations executive had a total recordable incident rate of less than .5. It was close to .4....He had opportunity for improvement."

**- Joe Stough
Syntex**

SPEAKER PRESENTATIONS

“[A facility specific correlation] may be the case in that one organization, but that’s not enough data to mathematically support a relationship between those two items on a consistent basis.”

**- Joe Stough
Syntax**

assessments, action items, and worker involvement in those activities. I mentioned the handoffs that occur throughout the process. We’re not just getting data on those events. We’re getting data on workers’ interactions with those events in the field, which gives us more information about leadership and culture.

Statistical Findings and Objective

I’m going to talk about some of our statistical findings. We took a sample of 100 organizational units, over 60 of which had observations data associated with them. I’ll talk about some of the results that we found.

I showed you the different types of data we were drawing in our research. I break this down into three categories. First are event reporting metrics. This includes the tendencies of the workforce in communicating events as they occur and perceiving a hazard and actually communicating it. Next are action management metrics. I refer to both event reporting metrics and action management metrics as “event-type” metrics. Management metrics are about how prompt and disciplined leaders are in responding to action items and how prompt the action parties are in getting them done on time. I differentiate those event-based metrics from the third category, process metrics. These metrics measure things like responsiveness, consistency, timeliness, and completeness of each step of the process. These look at the organizational execution of process steps. We found over 200 metrics. We then put those metrics through a very rigorous statistical process to identify correlations with total recordable incident rate.

The ultimate objective, as I mentioned, was to get to the point where we could find some statistical significance behind a set of metrics that could then be used out in the field by managers. The ultimate objective is to get to a management KPI scorecard that can be applied in the field. I’ll quickly go through pieces of this.

A safety triangle ratio is an example of a metric

we came up with. There’s a couple of different ways that we’ve seen this measured. We actually created an index that combines them. One example metric is near-misses as a percent of total incident events. Obviously, you want near-misses as a percent of total incident events to be close to 100%. If it’s closer to 0%, then you have a poor near-miss reporting culture. Maybe that’s interpreted as a poor reporting culture. Another metric is recordable incidents as a percent of total events. This is not just total incident events, but total events, including observations and hazard reports, all the way down to the hazard perception level where any type of unsafe condition is reported. Another example of measuring the safety triangle ratio percentage might include metrics like percent of high actions on time. That metric is almost what it sounds like. It’s the percentage of action items completed on time that were the result of high priority items. These are the high priority things that are happening in the organization. What’s the likelihood that they’re getting done on time? What’s the actual performance of getting those things done on time? The point here is to put a scorecard in front of management in the field that they can use to affect performance. What I haven’t talked about yet is how we found those metrics that have an effect. This gives you a preview. It’s kind of like taking the cake out of the oven before we show you how we baked it. To get to that type of scorecard was the ultimate objective.

Terms and Definitions / Predictability

Quickly, I’ll go over some key terms and definitions. Safety leading indicators are measures that predict safety outcomes and indicate the impact of human, organizational, and other factors on performance. We’re really looking for the impact of organizational behaviors, leadership behaviors, worker behaviors, and organizational tendencies on outcomes and performance in safety. Those are things that, again, we can turn into a measure that can be tracked and managed by leadership. A leading metric is a term I use to differentiate

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from a leading indicator. We defined over 200 leading metrics. Not all of them were leading indicators. They weren't all predictive. They weren't all metrics that turned out to be good indicators of outcome performance. Predictive ability is the ability of a metric to predict a chosen outcome. For those of you familiar with a FICO score, which is the math underneath your credit score, this is something similar. That particular score wouldn't be used in that industry if it weren't predictive of outcomes in providing loans to individuals. That's a good example of a leading indicator. Correlation is a term that describes the relationship between variables and allows us to predict the outcome of another. We're looking for leading indicators that are predictive of safety performance.

To further make this point, I'll give you an example of a misinterpretation of a metric as predictive that we've seen and later validated statistically. How many of you have been at a specific facility and seen a chart that people refer to and say, "We found it. We found a leading indicator. When observations go up, incidents go down." That may be the case in that one organization, but that's not enough data to mathematically support a relationship between these two items on a consistent basis. We need a sample of more than 30 random organizations,

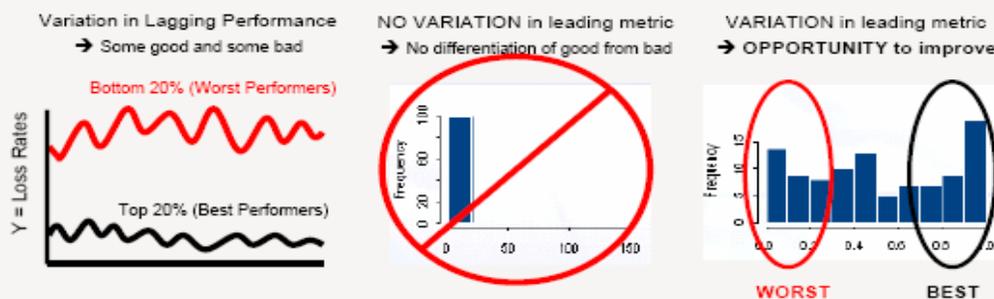
some that have high observation activity, some that have low, some that have high loss rates, and some that have low, to prove that this relationship really is strong and to give a stronger sense that there's causation between conducting more observations and incident rates going down.

Our mathematics and data would contend that there's more going on in an organization when you find that observations are going up and incident rates are going down. It's not just the observations. There are deeper things that are happening. When we study observations alone, we don't find that correlation. We find it all over the map. We do find that observations are a key component of a broader reporting culture metric. I gave you the example of the metric of recordable injuries as a percentage of total events. Observations would be a part of the denominator. If you have more observations and hazard reports, you have a bigger denominator. You get a better score in your reporting culture metric. We did find that observations were a big contributing factor. We also found that reporting culture alone was not enough to predict performance. There are actually some measures that related to leadership, to action, and to completion timeliness that are required to get to a strong, consistent predictor of safety

"...There's more going on in an organization when you find that observations are going up and incident rates are going down. There are deeper things that are happening."

- Joe Stough
Syntax

Key Term: "Meaningful" Metrics



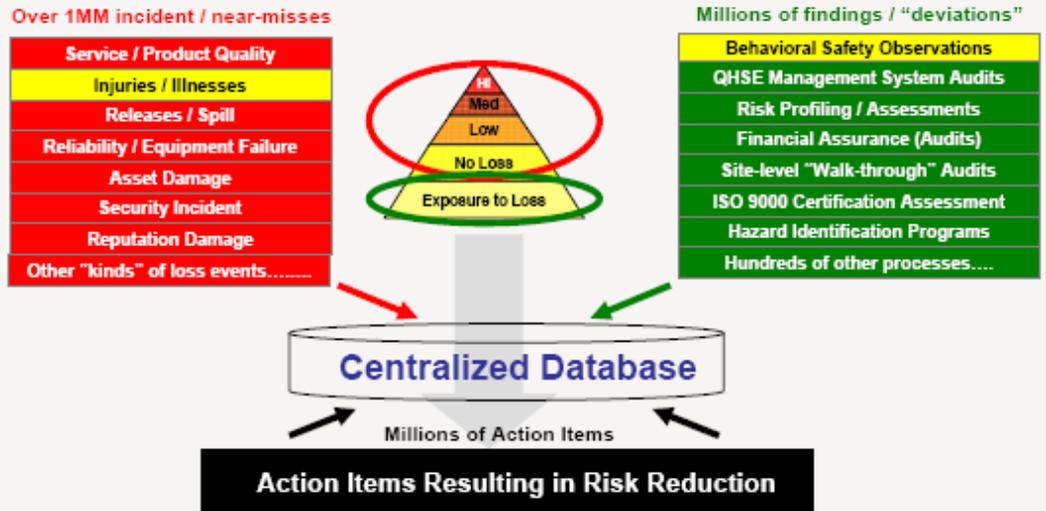
Meaningful leading metrics are "actionable" and help answer the question:

"What are the BEST performers doing differently?"

SPEAKER PRESENTATIONS

Research a Data Set of Risk Reduction Events

Scope: The organization's collection of ALL events that result in risk reduction...



“...A million incidents and near-misses is...not just a million data points. It's a million data points and information on every single individual that was involved in one of those near-misses and incidents.”

- Joe Stough
Syntex

performance. I mentioned earlier we had a sample data set of over 100 sites, with over 60 that had varying observation quantities. We took this and studied it in our data set to see if we could take 60 random organizations, some with high observation quantities, some with low, and find the correlation between observations and incidents. As I said, we didn't. Observation quantity did not predict total recordable incident rate alone. It was part of a broader recording culture metric.

Consistent and Actionable Metrics

I want to transition to talking about the kinds of things that we did more generally to identify what broader set of metrics really does more consistently predict safety outcomes and can be turned into actionable management metrics.

The first piece of that is the research half of our leading indicator initiative. That's where we took the data set and statistical methods to try to identify those metrics. We started with a little over a couple of hundred defined metrics. This is a journey. We've been on the journey of applying statistical methods for the last couple of years. Our data set has gotten big enough

where we felt like we really needed to put statistical methods on top of our data and take advantage of how broad-reaching the types of processes and organizations that we're working with are. It's a journey. We've identified over 200 metrics. I suspect that there are at least twice or three times more than that number that are out there for us to go after over the next couple of years.

Again, the type of data that we're studying is data from events that you think of when you think of the Heinrich Triangle or Safety Pyramid. At the top you have incidents. As you move down, you get to near-misses. You move below that and you get to exposures, audits, assessments, inspections, and observations. In the red circle at the top, you have near-misses and incident events of all types. I've highlighted injuries because that's the core in our data set. Most of our partners' use of our metrics is in the area of injuries. It's also used in quality, environmental, security, and other areas. Safety is the most prevalent. We have over a million incident and near-miss records. One thing to keep in mind with a million incidents and near-misses is that it's not just a million data points.

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It's a million data points and information on every single individual that was involved in one of those near-misses and incidents. This includes how long it took them to complete action items, how consistent organizations were in responding to doing their investigation, a report, or signing or approving action items. Those are all metrics that come out of each one of these incident events. One near-miss or incident actually spawns dozens of different metrics. We have millions of metrics that we're drawing from the incident and near-miss database. Regarding the green circle on the bottom of the safety triangle, at last count we had a little over 400 types of proactive processes like audits, inspections, and observations. I'll give you a few examples. Behavioral safety observation is one proactive process that produces a lot of data really fast. When organizations get engaged in behavioral safety, they have the front line workers submitting observations frequently. All of this information and all of the action items that are spawned from these events are collected in one database. This is consistency as a requirement. If we have this data in one database, all of our calculations are the same across every asset within the companies that are using the common database.

Research Findings

Here are our research findings. I drew this as a picture to tell a story. It actually took myself and my team a couple of months to determine how best to represent what we had found. Once we did it, it seemed like it should have taken five minutes. It seemed pretty obvious. We gathered all the data, gathered over 200 metrics, ran the calculations, extracted the metrics into a data set, ran it through a statistical software application called SASS, and produced the statistical results. I'm a statistician. I met with a statistician who is also working with me. We went over the results and interpreted them. We narrowed the metrics down to a couple of dozen statistically significant metrics. Within those couple of dozen, there were a handful that had

the strongest mathematical correlation effect on the outcome variable we studied, total recordable rate.

The first one, at the very beginning of the cycle, is measuring the tendency of workers to report events. This particular metric is the percentage of near-miss events as a percentage of total incidents. One way you can look at this metric is that it measures worker behavior throughout the workforce. Per the way that this data is being collected and organizations are running their processes, any worker in the field has the mechanism to report a near-miss or an incident. This is a measurement of the whole workforce and their involvement in reporting.

The next measurement is front-line supervisor, and in some cases subject matter expert, responsiveness. The reason I say, "in some cases" is that there are some organizations in which a front-line worker submits a near-miss or incident report and it is automatically routed to someone who is authorized to view the report and say, "Is this real? Is this something we want to treat as an organization?" In some cases, that report gets routed to front-line supervision. In those cases, that's where line management is taking accountability for injuries, spills, and so on. That is probably a better case. In other cases, the report gets routed to a safety representative. In either case, what we're measuring is the time it takes from the point the incident occurs to the point that that front-line supervisor or subject matter expert responds to it and opens the event. Opening the event and making the statement that the organization accepts this as a real event and is going to take accountability to treat it generates a communication back to the reporter. There's a feedback loop to compel reporting culture.

Behind that response is a process. There's a metric that we found in the reporting process that is correlated to safety performance. That is the percent of the time there is either a root-cause analysis or risk matrix included in that report. In other words, this measures the

"...High-performing organizations engage all levels of the workforce in order to reduce risk."

**- Joe Stough
Syntex**

SPEAKER PRESENTATIONS

percent of the time that there is a rigorous subject matter expert process conducted. Some events, such as near-misses, are reported, either promptly or not, and they go straight to action item planning. They might not even go to that. They might skip action item planning. The thing we're looking for is what percent of the time there was another rigorous process step taken behind the report, between the event and the actual action planning.

The next metric we found was another timeliness metric. As we studied this metric more, we interpreted it as a leadership accountability metric. After an accident investigation has root causes and action items identified, how long did it take for a manager who can authorize conducting the action, such as buying equipment or authorizing the resources or training, to accept accountability and say, "We're really going to do these actions." That's when the clock starts for action parties to complete the action. We're looking at one step up from the ordinary action metric of timely completion. We're looking at timeliness of response to an action assignment, which is really looking at that leadership response.

The last metric is the standard action item

completion percentage rate. Of all the actions that are assigned, what percentage of them is getting done in the time that was identified for them? It's not the duration of actions. It's measuring if an action was completed prior to it's planned duration or afterwards? It's measuring the discipline of the organization in solving problems in the timeframe that was allotted.

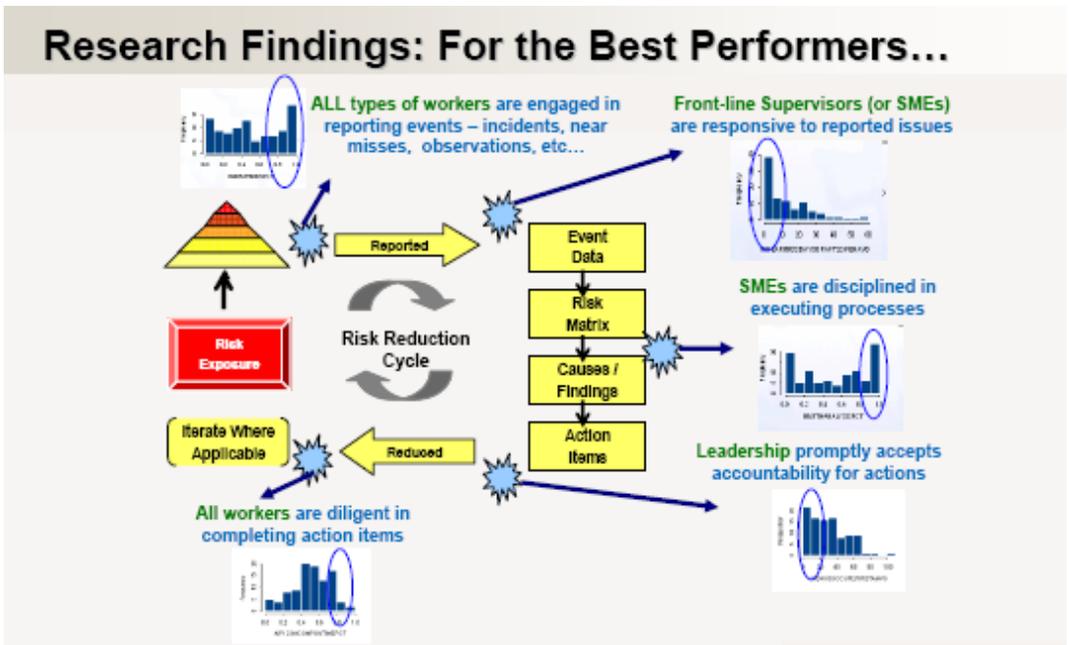
What we found was that these metrics were all a part of a formula that correlated the strongest to total recordable rate. The interpretation is that high-performing organizations engage all levels of the workforce in order to reduce risk. If you look at the different metrics I highlighted in green, you'll see that these metrics relate to just about every facet of the organization, from engineers to subject matter experts to front-line workers to front line supervision and even to leadership in the operation of the business. At the macro level, our interpretation is measuring the organizational effort to reduce risk.

Applying the Findings

I've heard, in going through this whole story with other organizations or at conferences, that it is really not that surprising. When you have a

"When you have a strong reporting culture, disciplined processes, and timely completion of actions, you expect to see that resulting good performance. The difference here is that it's repeatable."

**- Joe Stough
Syntax**



SPEAKER PRESENTATIONS

strong reporting culture, disciplined processes, and timely completion of actions, you expect to see that resulting good performance. The difference here is that it's repeatable. All of this data is drawn from one common repository. We can take the metrics to organizations that don't have top-tier performance and repeat those behaviors to improve their performance.

How do we do that? Let me make a point here that I've branched into one specific approach to creating a scorecard in the field. Some companies like to use the green, yellow, and red traffic light approach. Some don't. Some like to have a basic scoring method with definitions of the metrics and criteria set for performance. I've heard some people say that the traffic light approach compels gaming the system and might have a negative consequence. I like the approach, especially when coming out of the gate, when not many companies have consistent leading metrics that rival lagging recordable rates on their corporate scorecards. Using a red light, green light approach can get the attention of management and get them focused on the right things, right away.

One of the other key points is that we found lots of metrics. You might not be in a position within your company to steward or deeply manage all five of those metrics that I went through that we found had statistical significance. What we recommend, and what we've seen our companies do most successfully, is to take one or two metrics that they feel like managers are ready to buy into and steward or manage those metrics first, and then evolve over time to include additional metrics. Identify the metrics applicable to your company, and then chose a scale. You may choose a scale based on benchmarks. We have a large data set. Eventually, a large number of our companies, as they all get on board, will be benchmarking on a common platform. One alternative is benchmarking across companies. Another, if you have a big company, is to benchmark inside of your own company or at a discrete scale. You

may believe that over 75% completion on medium-priority actions is a must, and over 90% for high-priority actions is a must, so you may create the scale that way.

The point is to put together this scorecard. Lagging metrics, in my experience to date, typically stand alone as the incentive for performance pay and as the metrics that are stewarded at a corporate level and that people are held accountable for. The key is to have a couple of leading metrics that the organization has bought into and is comfortable that they can measure consistently across the corporation sitting alongside those previously powerful lagging metrics. The key is to get those metrics cascaded and managed throughout the organization. Again, these have to be metrics acceptable to management. It has to be kept simple so that it will get done and won't be too overwhelming.

At the same time, another key in practicing the application of these metrics is that you can't take all the metrics that we found to be statistically significant and manage them in the field. You don't want to have a blind spot, however. What we've found is that organizations that are doing the best have formed an executive steering committee, or already have one. In the best cases, this committee is a blend of HSE professionals and operations leadership. Within that committee, the entire scorecard is reviewed on a monthly or bimonthly basis. Not just the management metrics, but everything. Out in the field, they only manage a couple of leading metrics, because that's what's practical and what they're ready to do. Behind the scenes, though, leadership is paying attention to a broader set of metrics that gives them more information about behaviors that may need to be treated. I highlighted one on purpose here that has a lot of red. The steering committee would see this metric as an issue and would possibly consider moving that metric to the managed scorecard for the subsequent year. If they sat there staring at this metric sitting in the red for

"...At a high level, this is about leadership actively leading."

**- Joe Stough
Syntex**

QUESTION & ANSWER SESSION

“It was sort of like playing Battleship...We knew to look for things like that metric.”

- Joe Stough
Syntex

five or six months in a row, then they might promote that to the managed scorecard for the subsequent cycle. The ultimate outcome is to get to that point where it's in management's hands.

Conclusion

In summation, the leading indicators that we have found to have significance and that actually produce better performance are all organizational in nature. They require operations leadership buy-in. How many safety professionals do you know that can really have an effect on a front-line supervisor's response to a safety issue? Front line supervisor, operations supervisor, and leadership responses are likely more driven by direct leadership than by a subject matter expert in safety. To take these types of metrics and manage them out in the field, you really need to have leadership commitment. That's where the steering committee comes in. That is a means of getting consistent leadership involvement and pushing the program as a whole. To summarize everything I've talked about, at a high level, this is about leadership actively leading. We've talked about using our metrics as a measurement of organizational effort to reduce risk. This involves continuously monitoring workforce engagement, supervisor responsiveness, and measurable organizational factors that we've found to have the best effect on safety performance. The result is not just reduced injuries. It does not just affect safety. It affects environmental, security, and the overall operations integrity of the organization. Thank you.

Question & Answer Session

Bridle: Thanks, Joe. I think that we've got some time for some questions. Does anyone want to kickoff the question and answer session?

Audience Member: I wanted to ask Mr. Stough about the statistical credibility and accuracy of TRI on performance.

Stough: Actually, a lot of our partner

organizations have a process identifying that.

Audience Member: Do you accept their interpretation as credible?

Stough: On total recordable incident rate, that's correct.

Audience Member: I had a question about the indicators you're using to measure versus the incident rate. **What statistical calculation or formula did you try to use to determine the correlation between those and the rate of injuries?**

Stough: We used a statistical process for taking our 200 metrics down to a small set of metrics based on just those metrics that have a strong correlation to performance. It's a process called [?] regression. This takes one set or list of variables that you expect may have an effect on your outcome and puts that through a statistical software application called SASS. What it spits back at you is just the short list of variables that have the strongest correlation to the outcome.

Audience Member: Is there a way to compare a set of data to another set of data to see if there's a correlation between those two sets of data?

Stough: There are a lot of different tools for doing that. We used a structured process that we iterated a number of times to limit our variables. I started with 200 and I got 100 variables the first time. I ran it through the engine to come out with a few variables that were $.4r^2$, which is a mode or a median of correlation. We took what we learned from that. It was sort of like playing Battleship. That might be a nice way of thinking about it. We had a metric that was a part of the reduced set of metrics that came out of the statistical engine as being one of significance. We knew to look for things like that metric. So for example, the percent on time of action items was a good one. We knew to think more about action items. An example is that we studied the lateness of late actions. You might have two sites that have 80% on time complete action item rates. Of that late 20%, how late were those late action items? We

QUESTION & ANSWER SESSION

found variations. We found that Site A might have 72% lateness and Site B might have 5%. How do you interpret that? Our interpretation was that Site B had stronger leadership commitment, because late actions typically escalated to leaders. Site B leaders would get involved and took action more promptly than Site A leaders. That's an example of how we took that metric, went back, and went from 100 metrics to 101, up to 200, and we kept doing it over and over until we got the ones you see here.

Audience Member: I take it what you're saying is that those locations, those business units, that had leaders committed more highly had a lower TRI rate. Is that your conclusion?

Stough: Our metrics look at organizational commitment. Not just leadership, but organizational commitment to reducing risk.

Audience Member: Not just commitment, but demonstrated commitment. Is that what this all turns out to be?

Stough: That is a nice, simple interpretation of this. The key is that it's effort, not commitment, because effort is measurable. You can make it repeatable. We found that these metrics that you're interpreting as organizational commitment or organizational effort can be repeated. You can take them to the lower performing half of your organization or industry and expect that their performance will improve as they improve these things.

Audience Member: Joe, at the start, with 200 metrics, did you find a common leading indicator that you saw time and time again that proved worthless?

Stough: I don't have a good answer for that question. It's certainly an interesting question, though.

Bridle: I might add some clarity to that. We were encouraged by a lot of our customers to generate certain numbers of stop observations every day. The perception was that the more observations you have, the safer you'd become. One of our

interpretations that we came to was that there was absolutely zero correlation. If you do some good observations in which you actually hold a good conversation and start to change peoples' attitudes, then that's quite a good metric, and yes, there probably is a correlation. The sheer fact that you're only measuring quantities of card, however, is a dead duck for us. We've found that there's absolutely no correlation between the number of cards and the recordable incident rate.

Audience Member: This is a fundamental change for me. I thought leading indicators were actually developed specifically for each type of mishap that you're finding. For example, for slips, trips, and falls, we'd have to go out and measure how many waxed floors we have or how much water is on them. Reporters would revolt. They're already overwhelmed with reports. **It sounds like what you have found is that you can make these metrics from data that you have already gathered, and that they're similar for all types of mishaps.**

Stough: If you want to measure underlying organizational behavior and processes, as opposed to going after a specific type of issue, yes. However, at the beginning of my presentation I mentioned that the ordinary interpretation of leading indicators is what you just described. There's a specific problem. Here's the problem. What are the natural things that should lead to that problem? Let's measure those things. That's not the type of leading indicator initiative that we've put into place. We're looking for, generally, the organizational behaviors that can be repeated that lead to better performance, can be more active, and can be something someone can measure in the field.

Audience Member: We developed what we call recommendations from each incident that we have a certain number of times. You could measure how long it takes for those to be closed out.

Stough: How many are closed out on time, also.

"If you do good observations in which you actually hold a good conversation and start to change peoples' attitudes, then that's quite a good metric."

**- Peter Bridle
Noble Corporation**

QUESTION & ANSWER SESSION

“For every incident, you enter how many data points? 50? If you’re using the same database, the same data rules, then you can do analysis across all of them.”

**- Glenn Murray
ExxonMobil**

Some measures are measuring how long something takes. Some measures are measuring how long something takes versus how long it should have taken. We have several dozen measures that related to measuring performance around recommendations, just to give you a sense of how many types of metrics we’re calculating.

Audience Member: We had an indicator where a supervisor would go up to an employee and there was not just a report but there would be a dialogue, an exchange back and forth. **That really became an effective observation. It wasn’t just that they were observing but that they were talking to employees.**

Bridle: One of the things we’ve found is that if you’ve got garbage coming in, then the data sets you have are probably null and void. If there’s a way of controlling the data going in, and verifying and justifying its value, it probably has more meaning.

Audience Member: I want to go back to his question for just a moment. I think in your data set, what you have is a single total incident rate per company, right? **Or do you have incident rates tied to sites or a type of event, so that you would have rates for slips or falls so that you could perform an analysis that way?**

Stough: We certainly could. We didn’t do that. Just to be clear, we have rates by site, but we measure things at the organizational level. When I say organizational level it’s really at the lowest level of continuous profit loss management and HSE leadership. For one company like ExxonMobil, for example, there would be thousands of numbers, because they have thousands of sites.

Audience Member: I couldn’t help but notice of your leading indicators, observations and a lot of the things that people normally use as leading indicators weren’t there at all.

Stough: I’m glad you asked that question, because I didn’t want anyone to misinterpret what I said earlier. First of all, one of the things

that we require is consistency of the metrics. One of the problems with using detailed observation process metrics as a leading indicator is that the only way you can really get away with that and have apples to apples at an aggregate level is if everyone uses the same observation process and interprets those metrics in the same way. When we started trimming our metrics down, when we looked at the sites that had observation metrics that do the same thing, our data set got too small. When you look at the amount of variations you really have a statistically insignificant sample. To be fair, we didn’t include studying deeper percent of quality observation-type metrics. Those types of metrics aren’t in those 200 I was talking about. There could be some better correlations in there once we get to that point. Those types of metrics might be in the next 100 to 200 metrics that were in front of us.

Audience Member: To follow up on the question about consistency, when you’re talking about thousands of locations and the input coming back from different locations around the world, how do you balance those? **How do you get consistent input from hundreds of thousands of different sources, different terms and definitions?**

Murray: By using the same database, the same list. These are consistent transparent metrics that are happening in the background. For every incident, you enter how many data points? 50? If you’re using the same database, the same data rules, then you can do analysis across all of them.

Audience Member: The point I’d like to make to his question is that the companies on that list are all using the same qualities, the same definitions. When he was preparing that data across 350 companies, they are all using that same information.

Audience Member: If you’re a company with 10 different sites, and every site has a different way to collect data, and a different set of definitions, you’re cooked.

QUESTION & ANSWER SESSION

Murray: That's the biggest challenge with leading metrics. They're too process-specific.

Audience Member: This is a question just out of curiosity. **Within a corporation, did you happen to notice significant behavioral differences between organizations, in terms of how they collect data?**

Murray: Absolutely. There are different cultures within my own company. Even within geography there are different cultures. Absolutely. Leadership behavior, trends and issues, the kinds of things that Joe points out, will vary across the company. The other challenge with leading metrics is the higher up you get, in my mind, the less value they have. If you're looking at this across the corporation, it's not actionable information. What do I do with that? If I'm looking across the refining organization in the United States, however, then there's some information that I can probably act on. If you roll it up too high, it's all very interesting, but you really can't act on it.

Audience Member: Let me ask you a follow-up question. **Is there an interpreter within your corporate leadership that will look at specific locations that are showing, for example, very high organizational performance? Do they have the ability to say, "Oh yeah, that's how we can transfer this to other locations?"**

Murray: We are not yet at a corporate-wide basis using the research Joe's group is doing. This is literally hot off the presses. It's brand new stuff. We're looking within our own organization as to how we can build these things for our company. So unfortunately, I can't answer that question yet, but I hope the answer will be yes.

Stough: I mentioned leadership steering committee meetings earlier. I've sat on some of the leadership steering committees of our partners that are doing this. I've sat in meetings where conversations like the one you just described where a leading metric reflected an

organizational behavior that was attached to a standard. When they see a lot of variation, they take leaps. You sit in a room with several vice presidents of operations, one of whom is on the wrong side of that histogram, and they have a discussion about why that's occurring. It's very interesting. You see the seeds of organizational change in real time.

Bridle: I think the key here is that if we want different results, we may have to think differently about what we measure. The two presenters today did a fantastic job in giving us a good heads up on that. Well done. That concludes this Executive Edge Session. Thank you.



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**- Glenn Murray
ExxonMobil**