# EVALUATING SAFETY MANAGEMENT EFFECTIVENESS

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MAY 2021

## Prologue

It is late at night aboard a large oil rig almost 50 miles off the coast of Louisiana. The rig's crew is drilling an exploratory oil well deep below the waters of the Gulf of Mexico. On this night, there will be an explosion that will result in one of the costliest and most devastating environmental disasters in human history. Eleven crew members will lose their lives. Nearly five million barrels of oil will spill into the Gulf waters, threatening livelihoods, precious habitats, and even a unique way of life. Billions of dollars will be spent on cleanup efforts. Local economies reliant on the Gulf waters will be ruined. The date is April 20, 2010. The rig is the Deepwater Horizon.

The investigation into the accident determined that the cause could be traced to a series of identifiable mistakes the three companies involved in the drilling made that revealed systematic failures in risk management. It was also determined that the explosion could have been prevented. Existing risk management processes did not adequately identify or address risks created by late changes to well design and procedures, and key decisions appear to have been made in ad hoc fashion without any formal risk analysis or internal expert review.

> MANAGEMENT PAID ATTENTION TO, MEASURED, AND REWARDED PERSONAL SAFETY, WHILE THERE WAS A LACK OF FOCUS ON CONTROLLING SYSTEMIC RISK.

The Deepwater Horizon accident is but one of several cases throughout history that illustrate the perils of ineffective risk management. A robust safety management program allows an organization to formally manage risk through systematic processes. But it is not enough to simply have a formal program; the health of the safety management program and its foundational safety culture must be continually evaluated to ensure that processes and programs are not just in place but are working effectively.[1]

## Safety Management Background

Several industries (e.g., nuclear energy, oil and gas, public transit, healthcare, chemical, infrastructure construction, defense, space, and aviation) and government entities have adopted formal risk management processes as a method to continually improve their levels of safety.

> THE GOAL OF THESE METHODS IS TO PROTECT EACH ORGANIZATION, INCLUDING ITS PROCESSES, PERSONNEL, PRODUCTS, AND SERVICES, FROM UNACCEPTABLE RISK.

This is accomplished through the detection of current and potential hazards and threats, analysis of the resulting risk, and development of mitigation strategies, as needed, to reduce risk

1. Portions of the prologue derived from National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, Report to the President, January 2011, *Deep Water*, *The Gulf Oil Disaster and the Future of Offshore Drilling*

to an acceptable level. A Safety Management System (SMS) is a popular framework to define risk management and its associated processes.

Today, much attention is given to auditing for compliance to applicable SMS minimum requirements, which is necessary to ensure completeness of implementation. However, subsequent evaluations are also necessary to ensure that the SMS is performing effectively, is adequately protecting the organization from unacceptable risk, is effective in practice, and that the safety culture it fosters permeates throughout the entire organization as a part of everyday operations. This paper describes the need to evaluate safety management effectiveness, the benefits possible, and the use of best practices for making improvements.

## Safety Management Best Practices Overview

The MITRE Corporation, through decades of experience in safety management, has gathered best practices in use by organizations across numerous industries and government entities. An effective safety management program establishes a systematic approach to managing safety risk within an organization and its products or services. Aviation organizations, and many others such as the United States (U.S.) Federal Transit Administration (FTA)[2], associate the elements of safety management into an SMS framework with four components: safety management policy, safety risk management (SRM), safety assurance, and safety promotion. The following paragraphs provide a brief overview of each component.



IT IS IMPORTANT THAT A SAFETY MANAGEMENT PROGRAM BEGIN WITH EXECUTIVE LEADERSHIP'S COMMITMENT TO A POLICY PROMOTING SAFETY AS ONE OF THE ORGANIZATION'S TOP PRIORITIES.

The policy should emphasize that safety is a shared responsibility across the organization and that the identification of safety concerns is encouraged and rewarded rather than punished. Such a policy is communicated throughout the organization and shapes the way everyday business is conducted. Safety responsibilities, accountabilities, and authorities for all personnel are defined in the policy.

SRM creates a framework where existing and new safety hazards in the organization's operation or product are identified and reported for risk analysis. An effective risk management program

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2. Federal Transit Administration, 49 CFR Part 673, Subpart C, *Safety Management Systems*

includes a systems analysis that explains the functions and interactions among the hardware, software, people, and environment in which the system operates. "Systems analysis is the primary means of proactively identifying and addressing potential problems before new or revised systems or procedures are put into place."[3] The program also provides analytical tools for assessing the risk and measuring it against what the organization has established is an acceptable level. If the risk is found to be unacceptable, a risk management process puts in place control actions and mitigations to reduce the risk to acceptable levels.

Safety assurance monitors the organizational safety performance against safety objectives and provides for periodic measurement of the effectiveness of SRM controls and mitigations to ensure that their implementation has not introduced new hazards.

The foundation of an effective safety management program is a positive safety culture, which significantly impacts the effectiveness of all program components. "An ideal safety culture is the engine that continues to propel the system towards the goal of maximum safety health."[4] A positive



safety culture is built upon a just culture that is "meant to offer a nonpunitive environment in which individuals can report errors or close calls without fear of reprimand, rebuke, or reprisal, yet it does not offer an environment in which no accountability exists."[5] The safety promotion component fosters the safety culture, provides safety training for all personnel, and communicates safety-related concerns and corrective actions taken.

## Auditing for Compliance to Criteria vs. Evaluating Effectiveness

A safety management program should be initially and continuously reviewed to ensure compliance and effectiveness. The most commonly used method of ensuring compliance is auditing. However, to fully assess whether or not the program is effectively identifying and mitigating risks to an acceptable level, a multi-layered approach, using both audits and evaluations, is necessary.

Auditing is a necessary and vital step in determining an organization's compliance with minimum criteria. It is also a crucial tool in ensuring complete implementation of a safety management program. However, auditing falls short in determining whether or not the program is effective. It is merely an objective snapshot of what criteria are or are not being met at the time of observation. Auditing for compliance alone will not allow for a subjective evaluation of a program and will not guarantee positive outcomes.

Implementing the basic criteria ensures all the elements of a safety management program are in

3. Federal Aviation Administration, Advisory Circular 120-92B, *Safety Management Systems for Aviation Service Providers*
4. *James Reason, Managing the Risks of Organizational Accidents, Ashgate, 1997*
5. Sidney Dekker, *Patient Safety,* CRC Press, 2011

place, but the question remains: Are they being utilized in a manner to effectively identify and mitigate the risks of the organization? Without organizational buy-in, the foundation of an effective program is compromised. This may result in wasted efforts, unproductive meetings, hidden risks, and inadequate risk mitigations. A reporting system that is underutilized may result in inadequate awareness of existing hazards and risks, insufficient data, and inadequate feedback. Incomplete or exclusion of pertinent data may preclude the discovery of existing threats until an adverse event occurs, resulting in reactive rather than proactive risk reduction. The existence of siloed organizational functions and lack of data sharing also may impede discovery of hazards and risk reduction. Meaningful and insightful analysis, efficacious risk mitigation strategies, and assurance that these strategies are effective in reducing risk to an acceptable level are not guaranteed by merely meeting the minimum safety management criteria.

## Benefits of an Effective Safety Management Program

An effective safety management program protects the organization from unacceptable risk and fosters a culture of safety, including a just culture, where concerns and recommendations can be raised by any employee or stakeholder, thus further enhancing, and maturing the program. "Recent research has shown that not having a just culture can be bad for people's: morale; commitment to the organization; job satisfaction; and willingness to do that little extra, to step outside their role."[6]

> AN EFFECTIVE SAFETY MANAGEMENT PROGRAM SHARES RESPONSIBILITIES FOR SAFETY ACROSS THE ENTIRE ORGANIZATION.

Organizations that have implemented an effective safety management program have reported that the benefits include:

- Increased operational performance and efficiency through more consistent operations by finding and treating weaknesses and hazards before they cause problems
- Fewer employee and customer injuries
- Reduction in property damage
- Reduced insurance premiums through better management of risk
- A better understanding of what is really happening in the organization

6. Sidney Dekker, *Just Culture*, Ashgate, 2007

## Evaluating Safety Policy Effectiveness

An effective safety policy is a critical foundation for a successful safety management program and should clearly communicate leadership policies and objectives to all members of the organization. A thorough evaluation of an organization's commitment to safety begins by ensuring that responsibilities, accountabilities, and authorities for all levels are distinctly identified and that adequate resources are provided to effectively implement and execute the program. The following questions are a small sample of what may be used to evaluate safety policy effectiveness:

- Is the policy widely understood and trusted by all levels of management and frontline employees?
- Does management demonstrate commitment to the policy through their actions and words and encourage employees to report safety issues without fear of reprisal?
- Does each department implement the policy in a harmonized manner that can be integrated with all other departments, operational and non-operational?

During periodic evaluations, determining the answers to these types of questions, along with reviewing their associated metrics, ensures that the safety policy is reviewed, and if needed, updated to maintain effectiveness and currency with organizational objectives.

## Evaluating Safety Risk Management Effectiveness

The ultimate success of an organization's safety management program depends heavily on the effectiveness of its SRM program. In evaluating this vital component, it is necessary to look not only at the SRM process, but at its outcomes as well. The following questions are a small sample of what may be used to evaluate safety risk management effectiveness:

- Are risk classifications being properly assigned?
- Is data being effectively used in hazard and risk analysis?
- Do SRM panels consist of the right personnel from diverse backgrounds and technical disciplines?
- Are financial and human resources being properly allocated to ensure the SRM program can meet these objectives?

A thorough evaluation of SRM will determine how effectively risk is being managed as well as what defines success for mitigations. Areas of deficiency can be identified and improved upon, leading to fewer undesired outcomes.

> **" Effective risk management requires the application of different countermeasures targeted at different levels of the system at the same time –** *and all the time.*[7] **"**

7. James Reason, *Managing the Risks of Organizational Accidents*, Ashgate, 1997

## Evaluating Safety Assurance Effectiveness

Safety assurance provides processes for monitoring and measuring organizational performance to give confidence that the safety management program is meeting the organization's safety objectives. Strong Safety Assurance processes will yield information used to determine and maintain the integrity of risk controls. Safety Assurance processes are thus a means of continuously improving the safety performance of the organization, by keeping it on track, correcting it where necessary, and identifying needs for rethinking existing processes. The following questions are a small sample of what may be used to evaluate safety assurance effectiveness:

- Is there robust employee reporting providing meaningful inputs across the organization?
- Are there processes that provide vigilance on ongoing operations and the environment to ensure effectiveness of risk controls and awareness of emerging hazards?
- Are ineffective mitigations reintroduced into SRM?
- Is the organization using information effectively to adjust and change to reduce risk and is there a willingness to commit resources to making changes necessary to reduce risk?
- Does the organization learn from its own failures and from those of allied and similar businesses?
- Does the organization actually use acquired data to feed analysis processes, the results of which yield information that can be acted upon to improve safety?
- Are managers who are responsible for operational processes the ones who are also responsible for assuring that they are performing as intended from a safety, as well as operational, standpoint?

These and many other questions should be used to evaluate Safety Assurance effectiveness.

> The foundation of an effective safety management program is a positive safety culture.

## Evaluating Safety Promotion Effectiveness

When a safety policy has been established and a desired culture is defined, an organization must focus on how to effectively communicate and promote its desired outcomes. Promotional activities are key to gaining employee buy-in at all levels and to ensuring that safety is a core principle of the organization. An effective safety management program must have robust safety promotion processes to ensure the continual alignment of the organization in fulfilling its safety policy and mission. All aspects of safety promotion must be evaluated for effectiveness. The following questions are a small sample of what may be used to evaluate safety promotion effectiveness:

- Are communications tailored to their respective audiences, aiming to reinforce and continually improve the safety culture?
- Is initial and ongoing safety system training provided that addresses and reviews acceptable behaviors and risks?
- Does safety promotion provide insight on the underlying basis for policies and procedures, providing the employee with an understanding of the potential safety threats and how they are being mitigated?
- Is feedback provided to employees in response to their inputs and recommendations?
- Are employees recognized and/or rewarded for contributions to reducing risk and enhancing the operation?

- Do safety culture promotional efforts extend to the organization's supply chain?

Determining the answers to these types of questions, along with reviewing their associated metrics, can assist in determining safety promotion effectiveness and potential areas for improvement.

## Methodology for Conducting Evaluations

Evaluation tools should be utilized across the entire organization, but evaluations can also be performed on individual areas of the organization or specific processes and systems.

> THESE TOOLS SHOULD CONTAIN BEST PRACTICES OBTAINED FROM CROSS-INDUSTRY COLLABORATION FOR EACH SAFETY MANAGEMENT PROGRAM ELEMENT.

They should be designed to systemically and proactively search for weaknesses and gaps in the management system, operational processes/procedures, documentation, culture, etc. Use of the tools should at a minimum include interviews of personnel; examination of processes, documents, and records; and review of inputs, outputs, and results.

Evaluations should always be performed by individuals who are independent from the area under evaluation. They can be conducted by



internal staff or external parties. Evaluations can identify areas for organizational improvement, including sharing industry best practices, program/policy changes, enhancements to training, manual revisions, procedural changes, personnel reorganization, etc. Concrete recommendations for enhancement of the organization's safety management program, if adopted, may ultimately reduce the organization's risk and enhance safety.

## Conclusion

The ultimate goals of effective safety management, which often incorporates an SMS, are to enhance public safety by protecting organizations that supply goods and services from unacceptable risk, to improve the safety culture within organizations, and to encourage employee participation in and promotion of safety practices. Additionally, effective safety management may provide many other benefits, including reduced operating costs through more efficient processes and procedures. To realize these benefits, the health and effectiveness of the program should be continually evaluated. This evaluation must provide a thorough and subjective look at how each of the safety management components is functioning, both individually and as part of the system.

Traditionally, safety management programs are audited to measure compliance with minimum criteria, but an audit does not necessarily provide an adequate gauge of program effectiveness. Complementing an audit with a methodology for evaluating an organization's safety management effectiveness provides a deeper, more complete picture as to the maturity of the safety culture, what processes are working, whether risk is being measurably reduced, and whether or not the organization is going beyond merely meeting minimum safety management criteria.

Recognizing the gap between auditing for compliance and evaluating for effectiveness, the MITRE Corporation possesses safety management evaluation expertise and tools that incorporate all the elements of SMS from the International Civil Aviation Organization and the Federal Aviation Administration. The tools also incorporate best practices developed over several years' worth of safety management experience working with multiple industry and government entities. Should an organization decide to partner with MITRE to perform a safety management evaluation, our personnel will work jointly with their evaluators, provide instruction on the use of the evaluation tool, and tech-transfer the tool for future use within the organization.

For more information about partnering with MITRE to evaluate the effectiveness of your SMS, please contact author Kent Hollinger at kenth@mitre.org.

**The health of the safety management program and its foundational safety culture must be continually evaluated to ensure that processes and programs are not just in place but are working effectively.**

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*MITRE's mission-driven teams are dedicated to solving problems for a safer world. Through our public-private partnerships and federally funded R&D centers, we work across government and in partnership with industry to tackle challenges to the safety, stability, and well-being of our nation.*

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