The Learning Tree: Creating a Learning Culture Through the Implementation of a Confidential Hotline and a New Tool to Analyze Incidents

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Summary

A confidential reporting hotline to capture close calls (near misses) and safety events was created as part of a safety culture improvement initiative in a large North American railway company. The hotline's intent is similar to the Confidential Close Call Reporting System (C3RS) run by the Federal Railroad Administration.

A traditional root cause analysis method was utilized to understand the close calls reported, but it found that this approach did not encompass all potentially relevant factors or perspectives. As a result of the need for further information from the close calls analysis, a new methodology was developed. The methodology for analyzing the safety events is called the "learning tree".

The learning tree is a structured process that facilitates collaboration between employees and management. The scope of the analysis lends itself to looking at the question of why the event happened, what led up to the event, and what failed in the first place in order for the sequence of events to occur. Further research must be conducted on the learning tree to understand it's capacities for recording and developing the contextual story of a safety event within an empirical setting.

Introduction

It is a common occurrence to experience or hear about a significant safety event within the railway industry as an employee, particularly those working in the field as they work closest to the safety risks. While has been little research has been conducted on preventing these critical incidents from occurring (Bardon & Mishara, 2015), practice indicates that the tracking and analysis of close calls can be imperative in learning from previous significant safety events. Close calls can be sources of insight for high risk industries about organizational safety system vulnerabilities. They provide a unique opportunity for learning, as no actual harm occurs but we can obtain unbiased information about the circumstances surrounding the incident.

Close calls are often not reported or utilized for organizational learning, as they fall through the loop holes of most standard safety reporting systems. As one railway technician describes it, unless a significant safety event occurs "it is difficult to know what constitutes an incident if nothing happens (fieldwork notes from Sanne, 2008)". A close call, in essence, is when a safety incident almost occurs, but it is somehow avoided or escaped and no one is injured. The close call can be either of low or high consequence, and of frequent or infrequent occurrence (C3RS, 2007). By developing a close call reporting system for railway employees, consistent output of information could be collected and analyzed to potentially prevent the close call from occurring again in the future.

As part of a safety culture improvement initiative in a large North American railway company, a confidential reporting hotline to capture close calls (near misses) and safety events was created. The hotline's intent is similar to the Confidential Close Call Reporting System (C3RS) run by the Federal Railroad Administration, taking a non-punitive approach and collecting reports in order to identify strategies to improve safety conditions. There is evidence that C3RS implementation can enhance safety culture, as the open discussion of close calls increases trust.

Initially, a traditional root cause analysis method was utilized to understand the close calls reported, but it found that this approach did not encompass all potentially relevant factors or perspectives. Although root cause analysis was effective at identifying system failures, it did not provide insight into why these failures occurred or help to identify the cultural factors that increase the risk in the first place.

In addition, the causal approach and technical language made collaboration between management and employee groups difficult. A simple analysis method where broad factors like barriers and culture could be analyzed together would be helpful in understanding the overarching context. A method where it would be possible to develop improvement opportunities from the analysis would also be beneficial.

As a result of the need for further information from the close calls analysis, a new methodology was developed. The methodology for analyzing the safety events is called the “learning tree”. The learning tree promotes looking at a close call or safety event as a learning opportunity. This is a structured process that facilitates collaboration between employees and management. It is a flexible tool, as the learning tree can be utilized in a group setting or on an individual basis to analyze an event.

This approach includes some of the aspects of existing investigation strategies (e.g. determining the sequence of events) but also includes unique elements that focus on learning and improvement. Before continuing to describe how the learning tree works, more detail will be given about the background of the tool and how the previous human factors analysis tool was utilized as a jumping point.

Understanding How the Learning Tree Was Created

When the hotline was first implemented, the Human Factors Investigation Tool (HFIT) (Gordon, Flin & Mearns, 2005) was utilized for safety events and close call analysis. The HFIT was developed within the oil and gas industry and can be used to collect different types of human factor information from safety events or close calls. This information includes the action errors preceding the event, recovery actions, thought processes leading to the event and underlying causes. Safety events are seen to be a product of these four categories.

In other words, the HFIT documents the process and timeline leading up to the event and how it was deal with in the moment. The HFIT assumes there is a direction of causation in terms of the chronological flow of events. While causation flows chronologically, the direction of the analysis begins with the safety outcome and works backwards.

While it was good to know about actions preceding the event and thought processes, there was still a lot of contextual information that was missing in order to help further the analysis. Understanding the underlying causes is a helpful first step, but there was no mechanism to incorporate potential changes to incorporate into the broader environment. Although the process helped to collect useful information about many antecedents to a safety event, the analysis did not help to identify what be done with this information in terms of improvement opportunities.

Therefore, as part of confidential reporting hotline initiative, a new method of analysis was developed based and the HFIT model was utilized as a jumping point. The new method is called the learning tree it is a flexible tool that facilitates collaboration between employees and management. This paper will describe the learning tree in more detail, how it has been used as a part of a confidential close call reporting hotline and lessons learned to date.

Six Phases of the Learning Tree Analysis

The learning tree process involves six phases of analysis. The logic is to focus on what the event tells us about our safety systems rather than focusing on cause. It is important to note that as the analysis is being conducted, it is okay to move between phases if something is forgotten or another piece of information needs to be added.

The next portion of the paper will discuss the step-by-step process of how to develop and conduct the learning tree analysis. See Figure 1 below for a sample of the learning tree.

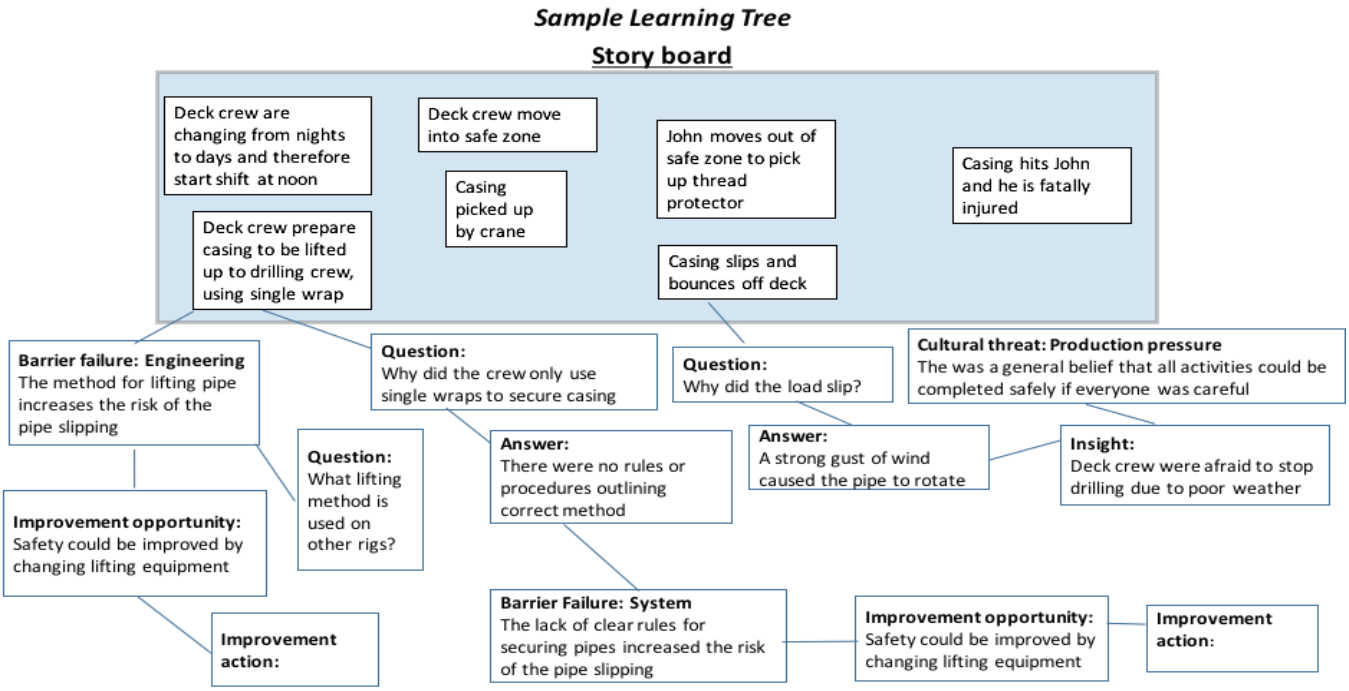

Figure 1. Diagram of a Sample Learning Tree

(Phase 1) The process commences with the **creation of a storyboard** for an event. This storyboard is a chronological order of the events that will include the circumstances leading up to the event, the event itself and subsequently, the consequences of the event. Event #1 begins the furthest on the left, followed by subsequent events to the right.

The rest of the analysis is built off of the storyboard, therefore it is good practice to spend a dedicated amount of time first understanding how the event occurred. As there may be multiple perspectives, the storyboard can include more than one version of events. The story board should only include events, actions or omissions and *not* the motivation of those involved.

(Phase 2) The second phase is called a **barrier analysis**. Its goal is to identify barrier failures and successes stemming from the event. There are different types of barriers within the workplace, including physical (e.g. safety harness), system (e.g. inadequate safety rules) and behavioral (i.e. employee not performing required actions) barriers.

(Phase 3) **Cultural analysis** is the third phase of the learning tree. It identifies cultural threats and defenses identified during the investigation. The cultural threats and defenses are classified into domains (e.g. complacency). Threats can be seen to weaken the barriers and the most common threats include complacency, tolerance of in adequate systems, normalization of deviance and production pressure. Cultural defenses strengthen the existing

barriers and defend against cultural threats. The most common defenses include leadership, learning, empowerment and accountability, and resilience.

(Phase 4) Phase 4(A) & (B) consists of identifying **types of errors** and factors contributing to the errors in relation to barrier failures. Understanding the type of error and reasons for why the error was made is important for identifying insights and improvement opportunities later in Phase 6.

(A) First, it must be identified whether it is a *skill, mistake*, or *violation-based error*.

A *skill-based error* involves an attentional failure. In other others, the employee knows and intends to do the correct action, but fails to execute the action correctly (e.g., pouring orange juice on cornflakes because the containers look similar).

Mistake-based errors can be either diagnostic related (misreading a situation or environment) or knowledge related (missing training of a rule or skill).

The last type of error is known as a violation-based error and involves an active violation of appropriate behavioral norms (e.g., speeding in a vehicle).

(B) In Phase 4(B), the focus is on factors that contributed to the error.

Factors involved in skill-based errors are often attentional (e.g., fatigue, distraction, or impairment). Factors involved in mistake-based errors are often training and experience related. Factors involved in violation errors are often include production pressure or lack of supervision

(Phase 5) **Questions, answers and insights** that result from the above are captured. Questions can arise from the storyboard events or the barrier failure or success. For example, *"why did the employee not attach his safety harness?"* It is possible that the questions will be answered or result in more questions, insights or improvement actions. Answers may not be complete, but based on the best available information.

The degree of certainty can be noted. Insights are considered pieces of knowledge gained from the event, these insights could be about how safety systems operate in practice or could be an insight about the safety culture.

(Phase 6) The final phase involves using the output of the above phases to **identify improvement opportunities**. Improvement opportunities do not need to be linked to the specific event, as they may arise for questions or insights. Specific improvement actions can also be identified and assigned to a specific individual and a timeframe for completion.

Process of Using the Learning Tree

During work groups conducted at the 2016 North American Occupational Safety and Health (NAOSH) week, the learning tree tool was introduced for initial feedback. Individuals worked together in groups and were given a safety event to analyze. The majority of groups reported working through the safety event by focusing on one action or piece of information at a time, and following it through each step of the analysis before moving on.

It was also found that the more details or accounts given from an event, the better the understanding, although sometimes the information can become hard to manage in terms of representing it on the storyboard.

The more accurate information we can record about the close call or safety event, the better reflection of our safety systems and safety culture we will have. Only then, once there is an understanding of how the context of the safety system relates to the event at hand, can we begin to consider improvement actions.

The next step of advancing the learning tree is developing a computer-friendly version in which story board templates can be used and then filled in and printed out. Further testing of the learning tree will be conducted first to finalize the six phases and to confirm that all key contextual information is being coded.

Advantages of the Learning Tree

One of the main advantages of the learning tree is the ability to link failures to different activities. The results from different events can be aggregated to assess common failures, successes, and opportunities for improvement. The systematic coding of failures, insights and improvement actions facilitate the identification of trends across events to determine if you are getting similar insights, actions, failures, and improvement actions.

In addition, since this tool is simple to use it facilitates collaboration between management and employees and builds trust. It is currently being as a tool within the confidential close-call hotline and helps to encourage communication and feedback between management and employees.

Limitations & Practical Implications

While the learning tree is seen as a useful close call analysis tool, it is not without it's limitations. The learning tree requires a dedicated amount of time to learn how to properly use in practice. It is important to properly grasp what each phase represents and how to filter out pieces of knowledge into contextual factors. Therefore, although it is a useful tool it is complex in it's current form.

Secondly, the learning tree must be tested in research setting as the analysis has only been tested within a working group thus far. Having further feedback and engagement in the tool will be informative as to how practical it is in an organizational setting.

A practical implication of the learning tree tool is the ability to incorporate a broad level of contextual and individual level factors. The scope of the analysis lends itself to looking at the question of why the event happened, what led up to the event, and what failed in the first place in order for the sequence of events to occur.

Conclusion

To conclude, the learning tree tool is a new method of analyzing significant safety events and close calls within high risk industries. It consists of six phases that involve identifying barriers and cultural indicators and piecing the information into a storyboard. There is space for questions and answers to be asked within the storyboard and ultimately, improvement opportunities can be developed. It is a tool that can be used by managers, supervisors and employees together as a group or individually.

The tool is meant to foster a collaborative environment when conducted in a group setting, therefore also creating a space for communication with the safety culture. Further research must be conducted on the learning tree to understand it's capacities for recording and developing the contextual story of a safety event within an empirical setting.

References

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