**Session No. 607**

# Reducing the Systemic Risks of Human Error

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## Introduction

Disciplinary action is something with which we are all familiar. Our parents used disciplinary action to help jolt us back on track when we stepped out of line. Teachers and principals continue this strategy of using negative reinforcement to help drive desired behaviors. As adults, the criminal justice system arrests, tries, and punishes those who fall astray from the rules and regulations we collectively live by as a society. The primary purpose of disciplinary action is to punish those who make choices that are incongruent with acceptable norms. The secondary purpose is to pose a warning to others not to follow the same path.

Disciplinary action in the workplace is used in the same way. If a worker commits an error, disciplinary action can be implemented in order to prevent recurrence of the error. However, as an effective solution strategy, discipline has limited success. This is because most workplace errors are caused by gaps in attention, knowledge, skills, or procedures. There is rarely an intent to commit an error. Yet, when the focus of an investigation is on finding the person who committed the error; the solution is likely to be some form of disciplinary action. This will have a negligible long-term impact on the error rate for the task. However, it will likely lead to an increase in the risk that future errors will be committed. It will also encourage people to cover up errors.

In most cases, disciplinary action has, at best, zero impact on the risk of future recurrence. The main reason disciplinary action is used as a solution strategy so frequently is that many people do not know what else to do. A solid causal analysis program that identifies both actions and conditions as causes gives management multiple alternative opportunities for solutions. When discipline is taken off the table, the result is greater participation by those who have direct knowledge of the error. Conditional causes are discovered which, when controlled, have a much greater impact on controlling risk.

Discipline is occasionally warranted, usually when people are aware of the risks to which they are subjecting themselves, their coworkers, or their company, and decide to proceed anyway. However, this is usually not the case. By providing people with a more robust way to identify causes of problems, solutions will more likely be identified that fix the problem permanently.

## Overview of Risk

To say that human error is the most hotly debated subject relating to incident investigation may be hyperbole – but in my experience, nothing brings tempers to the boiling point faster. Make no mistake (pun intended), people certainly err. And when these errors occur in high-risk situations, bad things happen. Of course, inexperienced investigators confuse an incident investigation with a prosecution. They think their primary task is to find out who did what, or who didn't do what. The reason the error was made frequently gets lost in the shuffle. Risk management is often reduced to retraining or disciplining people.

Writing a paper on this subject can be risky – one must be careful not to demonize those investigators who have focused primarily on human error or else risk making the same mistake. It is therefore imperative to examine why the focus on human error persists, as well as on what can be done to improve the culture.

<u>Basics of Risk</u>

Let's face it – change happens around us all the time. Here's another news flash – this is unlikely to change in the future. So far, there is really no reliable way to predict changes with any accuracy – particularly as we look farther into the future. We are subject to a continuous stream of uncertainty about what the future holds for us. Not all outcomes are possible. However, because so many outcomes fall within the realm of possibility, we do our best to calculate probabilities and act according to predictions of what is most likely to occur. But as any stockbroker will tell you, probabilities are not necessarily predictive.

In many disciplines, risk is understood as a function of uncertainty. This is because many in industry define risk as the possibility that change will lead to an undesirable outcome, whereas uncertainty is a broader label encompassing all possibilities – both positive and negative. Below is a simple equation for calculating risk:

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$

There are variations on this equation. Sometimes a variable is included that accommodates the presence or absence of a barrier that would mitigate undesirable consequences. And because most of the time a group is estimating probability and consequence, the results can be highly subjective. Still, many find going through the scoring exercise to be valuable.

However, not everyone equates risk with the potential for a negative outcome. In the financial world, risk is not a subcomponent of uncertainty – they are one and the same. Financial analysts see risk as the potential that the future price of an asset will be something different than expected. Price volatility, measured statistically, provides a measurement of risk. In the financial analyst's world, risk includes the potential for both upside and downside outcomes – not just the downside -- hence the notion of a trade-off between risk and return. To earn large returns in a short amount of time, the investor is required to take large risks. Of course, another possibility is the realization of large losses.

Financial analysis requires that risk be measured as a combination of two components – systemic risk and non-systemic risk. Systemic risk is the risk associated with the business environment which is shared by all other firms in the same sector. For example, all automobile manufacturers share the same systemic risk component; thus, all are subject to the ups and downs of the automotive industry. Non-systemic risk is the risk associated with any individual automobile firm. Each individual firm has risk factors that differentiate it from its competitors. This individual risk is the non-systemic risk component.

This two-part concept of risk has validity beyond finance. For example, a football game is an environment in which all players are subject to a baseline risk level. This level of risk represents a risk floor that cannot be lowered. Non-systemic risk is associated with any individual player in the environment. For instance, if the linemen work hard on strength training, practice good stretching techniques, and purchase top-of-the-line equipment in order to help prevent injuries, the line will have a lower level of non-systemic risk when compared with the offensive lines of other teams. Other variables, such as size and age, also gauge the non-systemic risk of any individual. But none of this changes the fact that they are still offensive linemen in a football game.

The key distinction is that individuals in any environment have a degree of control over their non-systemic risk (their choices and actions). However, they can do nothing to lower the systemic risk floor of the football game itself. Both types of risk combine to equal the total risk to which any individual is subject.

## Role of Human Error in an Event

Human behavior is often the solitary focus of an incident investigation. What did someone do (or not do) that was the primary contributor to the outcome of the event? Many solution recommendations attempt to control human behavior in one manner or another. Disciplinary action—punishment—is one favorite. Other recommendations such as writing better procedures, sending people to additional training, and implementing best work practices are common actions. While some of these solutions may be good starting points, more can be done. These solutions address only the non-systemic risk components of an event, not the systemic environmental risk. Why not focus on dropping the systemic risk floor to a lower level? Doing so would subject all individuals to a lower level of risk, regardless of individual behaviors.

One reason this does not happen more often is that decision makers often lack the information required to identify systemic risks. Sometimes this is because the information is presented in such a way that it is not consistent with a strategy to reduce risk, yet still provide an acceptable return on investment. A thorough incident investigation, including a good causal analysis, provides decision makers with much better information.

## Elements of Causal Analysis

Most companies do root cause analysis, but few do it well. No process is perfect; every system breaks down at some point. Failures present us with unique insight into where we can eliminate risks, but only when we have a comprehensive root cause analysis process upon which to base decisions. This does not have to be difficult or expensive. But in order to achieve great results, you must do more than brainstorm around fishbone categories or ask 'why' five times. What is needed is a simple, yet robust, root cause analysis methodology to serve as the basis for a proactive approach to reducing the risk of future safety incidents.

RCA Step One: Problem Recognition and Definition

Every significant accident or near miss requires a formal root cause analysis. Once an investigation has been triggered, the investigator -- with help from the investigation team -- needs to create a problem statement by documenting specific information regarding the problem. At a minimum, this information needs to include:

- the problem title
- when the problem occurred
- where the problem occurred in the supply chain
- the impact – both actual and potential

Impact categories can often be identified ahead of time. For instance, if the product is a pharmaceutical, the following may be appropriate:

- patient safety,
- worker safety,
- regulatory impact
- product quality

This list is obviously not exhaustive, and it does not account for discrete impact values that may be important in any given investigation. Frequency of recurrence needs to be documented. Risk assessments also should be conducted at this point.

RCA Step Two: Identify Causes

An effective investigation is not solely brainstorming possible causes. The most effective way to identify causes is by starting with the problem identified in RCA Step One above. Then, using a logical process, the team deconstructs the problem to identify its underlying causes.

At a high level, it works like this:

- An effect is the result of at least two or more causes. These causes combine at a point in time, which results in the effect. This implies that every time you ask "why" of an effect, you find multiple causes – *all* of which are logically required in order for the effect to exist.
- Every cause is also an effect. As the investigator continues to ask why, more and more causes are found. The result is a diagram that looks like a tree on its side, with the trunk on the left and the branches developing to the right.
- You can keep asking "why" until your diagram is large enough to accurately represent the problem.

An important aspect of developing a logically sound cause diagram is to recognize two different types of causes. Some causes are catalysts which trigger a change in condition. They can be thought of as variables in the causal equation because their timing is often difficult to predict.  For example, a triggering cause of a "broken bottle" is "bottle dropped."  This cause is momentary and transferable; it can happen any time to any person holding a bottle.

Other causes are more stable over time.  These causes act as constants in the causal equation and are found in the conditional environment.  Continuing the example above, other causes of a "broken bottle" are "bottle material" = "glass" and "bottle elevation" = "five feet."  Both of these causes are required for the outcome of the event to be the effect of a "broken bottle."  Therefore, they should be represented in the analysis.

Both types of causes play a role in an event.  A good investigator – with the right training and a little practice – can achieve a high degree of proficiency at representing both types of causes in an analysis.  This is important for at least two reasons.   First, any significant problem is important.   In such a case, it is essential to develop a thorough understanding of the problem.  Second, a thorough understanding of a problem's causes allows the maximum opportunity to identify effective solutions, which is the goal of any investigation.  Often, these solutions can be fast, cheap, easy, and highly effective – always welcome qualities in today's economic environment.

This logical determination of causes continues until the investigation team has developed a thorough understanding of the problem.  This means that they can accurately explain what happened, and identify an effective list of solutions that reduce the risk of recurrence.  They may not find all the causes, nor do they need to.  The goal of the investigation is to explain the problem to others and to reduce the risk of recurrence through implementation of solutions that break the causal chain.  Once this has been achieved, the investigation can be closed.

Developing an accurate, logical representation of the causes is important, but there is another important step.  The causes need to be supported with evidence.  Evidence supports the inclusion of causes in the analysis.  Sometimes the available evidence is not very good.  Other times, it is as solid as a rock.  The goal of the investigation team is to uncover the best evidence.  The primary reason for finding solid evidence is to ensure the investigation team has confidence in the accuracy of its representation, as well as in the solutions it identifies.

<u>RCA Step Three:  Identify Solutions</u>

Once the causes have been identified, along with their logical relationships and supporting evidence, the team then examines the causes to find opportunities for solutions.  Effective solutions control causes.  Individually, a single solution reduces the risk that the problem will recur.  However, when multiple solutions controlling multiple causes are identified, the risk of recurrence drops even more substantially.  And the risk drops the farthest when causes from the conditional environment (the constants in the causal equation discussed above) are controlled.  These causes are consistent over a period of time.  If you change the conditional environment, you reduce the base-level risk that affects everyone operating in that environment.

<u>RCA Step Four:  Implement Solutions</u>

It is nothing less than a shame when a team does a good job investigating a problem and identifying solutions, and then those solutions fall by the wayside in favor of the newest crisis of the day.  It is true; many solutions never get implemented.  This happens more often than people like to admit.  Inherent in a robust RCA program is the ability to implement solutions in a timely fashion. This includes ensuring that the solutions implemented do not cause other problems in the supply chain, and evaluating the effectiveness after an agreed-upon period of time.

## Disciplinary Action Increases Risk

The goal of an incident investigation is to mitigate the risk of future recurrence. However, far too often an incident investigation leads to disciplinary action as the primary solution. In some cases, disciplinary action is absolutely warranted. An easy litmus test to determine when disciplinary action is appropriate is to simply review for recurrence: did the disciplinary action have an impact on the future recurrence of the problem? If so, then it must have controlled causes on some level. But that is only part of the test; another question must be answered as well. This question is: "Did the disciplinary action cause additional problems?" This is more difficult to assess. As stated in the opening section, in most cases disciplinary action has, at best, zero impact on the risk of future recurrence. And, depending on who you ask, it definitely causes additional problems. It is generally a coarse reaction to an event consisting of many nuances. From an experienced analyst's perspective, it usually represents a surrender to the limits of time, obsolete techniques, and outdated thought processes.

Some of the problems that share disciplinary action as a cause include:

- Stress in the employee population. People spend time "waiting for the shoe to drop." They question who is going to get in trouble. They also question the extent of the discipline. Like an episode of "American Idol" in which they are all participants, the suspense leading up to the outcome permeates their consciousness until the decision is made.
- Disagreement with the outcome. If employees do not agree with the outcome, they will not let it go. A perceived injustice does not have a statute of limitations. It gets hashed and rehashed – both internally, and externally.
- Fear of future mistakes. If employees fear punitive action as the result of mistakes, they will be afraid of making mistakes. Some may see this as a positive outcome – if employees are afraid to make mistakes, this will cause them to make less of them. The opposite is usually what happens.
- Closing the ranks. When future mistakes occur, anticipation of disciplinary action causes employees to close ranks. This means that potentially significant near misses go unreported and important causal details remain hidden for fear that the information will be used against someone.

These are all effects, but as we learned in the previous section, effects are also causes. When you combine "stress in the employee population," "disagreement with previous actions," "fear of future mistakes," and "closing ranks," the result is often a net increase in risk of future errors.

## Conclusion

I certainly recognize that sometimes disciplinary action is appropriate. Some companies do a super job of assessing whether discipline is an acceptable course of action. Siemens Energy, for instance, uses a decision tree based on James Reason's culpability model. But like an invasive surgery, even appropriate disciplinary action can still result in unintended consequences. The takeaway is to use disciplinary action in moderation or risk finding yourself contributing to the cause path of future problems.

Use of an effective causal analysis methodology to analyze significant events provides the team many causes from which to choose when brainstorming targeted solutions.  The best solutions control the environmental contributors to human error.  Cars these days are great examples of conditional controls.  Features like sensors that reduce closing speed when approaching another car, beepers that sense when you are about to hit something when backing up, rear view cameras, heated mirrors, windshield washer emitters, and the list goes on.  These are all changes to the conditional environment to either reduce the risk of errors or to trap them and mitigate their consequences.  Granted, the costs are greater, but I think results show the benefits are worth the investment.