Session No. 762

Prioritizing Workplace Risks

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Introduction

Human perceptions of risk are notoriously inaccurate. For instance, we all know that our chances of dying in an airplane crash are far lower than our chances of dying in a car crash – yet, many of us fear the plane ride to a much greater extent. As safety professionals can attest, this is equally true in the workplace. Employees are willing to take many "chances" that expose them to unacceptable risk. But are we as safety professionals also prone to misjudging risks, particularly once we become more familiar with the task or industry being observed?

Inaccurate assessments of risk in the workplace may lead to very costly decisions – both in terms of the pain and suffering for employees who may be injured, but also in terms of the cost to the organization if resources are misallocated to addressing the wrong risks. The author recommends a systematic, objective approach to better prioritize risks. The approach has been refined through application in several organizations.

Perceptions of Risk

Workplace risks are often misperceived, even by seasoned professionals. The primary, underlying reason is that our perception of the acceptability of a risk depends on many factors that are not based on a scientific data and, in fact, our perceptions are not easily influenced by scientific data. Certain risk evoke more fear than others, in a generally predictable way based on certain attributes of the risk.[1] Risks that are in our immediate control and we understand well tend to cause much less fear and dread than risks that are out of our control and are less familiar. A pandemic flu scare tends to catch people's attention to a much greater extent that the dangers of a sedentary lifestyle, even though the latter poses a much greater risk. In the workplace, employees often underestimate the risk of suffering an amputation from a piece of industrial machinery they work with every day, and yet they often overestimate the risk of exposure to low levels of chemicals in an office area.

And while the attributes of risk that cause greater dread are predictable, this does not imply that everyone will perceive the same level of risk. For one thing, we all come from different

backgrounds and therefore each person's familiarity with the risk is different. Furthermore, each person's tolerance for risk varies widely, and events in their lives may have shaped a very strong belief about a particular risk. For instance, in workplaces where a fatality or serious injury has occurred due to a fall from heights, employees are likely to perceive the risk of working at heights to be much greater than employees in another organization who have no first-hand knowledge of a co-worker who has suffered a fall from heights.

But what about safety professionals? Surely the experts, through education and experience, are free from bias when judging risks in the workplace. Unfortunately, while there is certainly evidence that we can learn to be more effective and unbiased in our assessment of risk, there is also evidence that our experts are prone to some of the same bias.

Expert Judgment

Expert judgment is relied upon to assess risks in the workplace. It underlies all aspects of a risk assessment: in the identification of risks, in the prioritization of risk, and in the identification of controls for those risks. Expert judgment is particularly critical for occupational risk assessments, since many of the events we are trying to prevent are fortunately rare, and the risk of that event occurring in any particular workplace varies widely.

For example, several studies in the field of industrial hygiene and environmental exposure assessment have called into question the ability of experts to accurately predict the risk of exposure to particular chemicals in the workplace.[2,3,4,5] These studies have shown that experts are frequently off by an order of magnitude in their prediction of the concentrations of exposure. However, there was good news here too: because of the complexity of assessing workplace exposures, predicting them within an order of magnitude could be considered a victory, and provides much more insight into the risk than we had before it was assessed by the expert. Some of the same studies on exposure assessment have also revealed that if we train and calibrate our experts properly, the accuracy and precision of their judgments can be improved significantly.

Improving Risk Matrices

Because of the inherent human biases in the perception of risk, and since we know that even the experts need training and calibration to judge the magnitude of risks, we need to create an unbiased, systematic approach to risk assessment. Furthermore, the approach must account for the fact that our judgments will be imprecise – that often the best even an expert can do is predict within an order of magnitude the level or risk. Finally, we need to ensure our assessors are properly trained and calibrated on our risk assessment paradigm.

Traditional risk matrices use ordinal numbers to represent the potential frequency and severity of a risk occurring. These matrices, while very useful, can fall into several traps. First, they may offer too little differentiation between the levels of risk. That is, a "1" for frequency might be every year and "2" for frequency might be every two years. We know that even experts probably won't be able to reliably predict whether something is likely to occur every year versus every two years – at best, they can probably only guess whether it is likely to be every year or every ten years.

Another problem with the traditional risk matrix approach is that too many of our workplace risks end up falling into the same category, and therefore the risk scores are of little use when prioritizing which to address first. This is in part due to too little differentiation in the matrices, but also often occurs because the risks we are concerned about are severe, rare events (i.e.

fatalities that occur only very rarely), and therefore we end up choosing the same score for "severity" and "frequency" each time. So, it is important to start our risk assessment by constructing a risk matrix that provides adequate spread in the data. The scale between each level of the matrix should be about a factor of 10 (one order of magnitude), and if we choose the scale wisely, the risks we are assessing should fall in an approximately normal distribution around the middle of the scale. That is, if we use 1 to 5 to rate the potential severity of the adverse event, the greatest proportion of the events should score a 3, a lesser number should score 2 or 4, and an even small number should score a 1 or 5.

Exhibit 1 shows a sample risk matrix. It is important, though, to adjust this matrix to the population of risks you are trying to evaluate. Those using the matrix need to be trained and calibrated on how to decide which scores to assign to particular risk. Consistency in use of the matrix and adequate differentiation between risks are what is most important, even more so than precise accuracy with respect to the probability of an event occurring. For the example shown in Exhibit 1, a separate scale was used to arrive at the probability that an event would occur, based on the frequency with which employees were exposed to the risk and the probability of the adverse event occurring each time the exposure occurred. When used properly, the risk scores shown in the matrix, ranging from 0.0001 to 10,000, represent the approximate relative risk of each adverse event in relation to one another.

		Probability of Adverse Event this Year				
		< 1 in 1,000	1 in 100	1 in 10	1 to 10 events	> 10 events
Severity of Adverse Event	**Weight**	**0.01**	**0.1**	**1**	**10**	**100**
Minor injury	**0.01**	0.0001	0.001	0.01	0.1	1
Possible lost time injury	**0.1**	0.001	0.01	0.1	1	10
Serious - amputation, disability, etc.	**1**	0.01	0.1	1	10	100
Fatality	**10**	0.1	1	10	100	1000
10 or more fatalities	**100**	1	10	100	1000	10000

Exhibit 1. Risk matrices should be scaled appropriately to your population of risks.

Hierarchy of Controls

Safety professionals have been using risk matrices for years, and in some cases they are being used in a very effective and sophisticated manner in many organizations. However, even in these organizations, when the risks are prioritized, rarely are the cost or effectiveness of the proposed controls considered in the rankings. This can and has led organizations to focus on the wrong risks, or to spend their available budgets fixing the wrong problems.

For example, if we took the risk scores at face value, we might rank an ergonomic risk that affects a large population the same as the risk of sporadically entering a confined space. If we took into account the cost and effectiveness or proposed solutions – for instance, an inexpensive ergonomic tool compared to a large expense to re-engineer the confined space - we might find that almost without question our first priority should be to fix the ergonomic issue. Sometimes, these priorities may seem obvious, but other times they clearly are not. For instance, one large oil

company spent years implementing a comprehensive and effective safety program but spent little time or money on process safety – and the result was very low injury rates, but a high risk of a disastrous explosion, which in fact occurred.

In order to evaluate the anticipated effectiveness of available controls for a risk, a percent risk reduction can be assigned based on the type of control. It has long been recognized among safety professionals that certain types of controls are much more effective than others. This is commonly referred to as the "hierarchy of controls". Exhibit 2 shows an example of risk reduction values assigned to various types of controls. The effectiveness of a particular control can vary widely depending on the industry and the application, so the scale shown in Exhibit 3 should be adjusted to your situation.

Proposed Control(s)	Risk Reduction (%)
Elimination	100
Fail safe engineering	95
Engineering	80
Administrative/Barriers	50
PPE	20

Exhibit 2. Risk reduction scores can be assigned based on the type of proposed control.

Considering Return on Investment

The cost of the proposed controls also had to be considered. Some controls that are lower on the hierarchy are very simple and inexpensive to implement, whereas eliminating the risk or designing engineering controls are often complex and expensive. So, in terms of cost/benefit, a great deal of risk reduction can often be achieved for relatively low cost by going after simple, quick fixes. This does not mean that more robust controls should not be implemented, but rather, that in terms of priority sometimes the quick fixes can and should be put in place on an interim basis until more robust controls can be achieved. To simplify the cost-benefit analysis, a quick estimate of the cost within an order of magnitude can be made, as shown in Exhibit 3.

COST ($)
<= 100
1,000
10,000
100,000
1,000,000

Exhibit 3. Assign an approximate cost to implement each set of controls.

Putting it Together

A priority score can be assigned to each risk based on the anticipated risk reduction balanced against the anticipated cost of achieving that risk reduction. This score is essentially a reflection of the anticipated cost/benefit ratio of each recommendation. Arguably all of these assigned scores are qualitative in nature, that is, they can't be used as hard return on investment estimates, which require more sophisticated analysis – and would require us to estimate the costs of injuries, which you'll notice has not been done in this analysis, and is not necessary in order to assign a relative prioritization. However, there is an underlying assumption that the costs of the adverse events at each level in the risk matrix are an order of magnitude apart.

When the priority scores are assigned in a consistent manner, they should give an accurate order of the recommendations relative to one another. The calculation of priority is based on the following equation, which is effectively a return on investment calculation:

$$PRIORITY\ SCORE = \frac{(RISK\ SCORE)\ x\ (\%\ RISK\ REDUCTION)}{COST}$$

You can now create a prioritized list of identified risks and proposed control measures. It is often useful to further group the list based on the following categories: Quick Fixes, Small Projects, and Big Projects. The reason for this is small, quick fixes may be accomplished through a very different process, such as a work order system, compared to the big projects that may require major capital investment and approval. So, it is often unnecessary to debate the merits of the quick fixes in the same meetings where you're pitching the benefits of a major investment in safety infrastructure, such as a new local exhaust ventilation system to reduce chemical exposures. Exhibit 4 shows a conceptual framework for grouping your proposed controls into buckets.

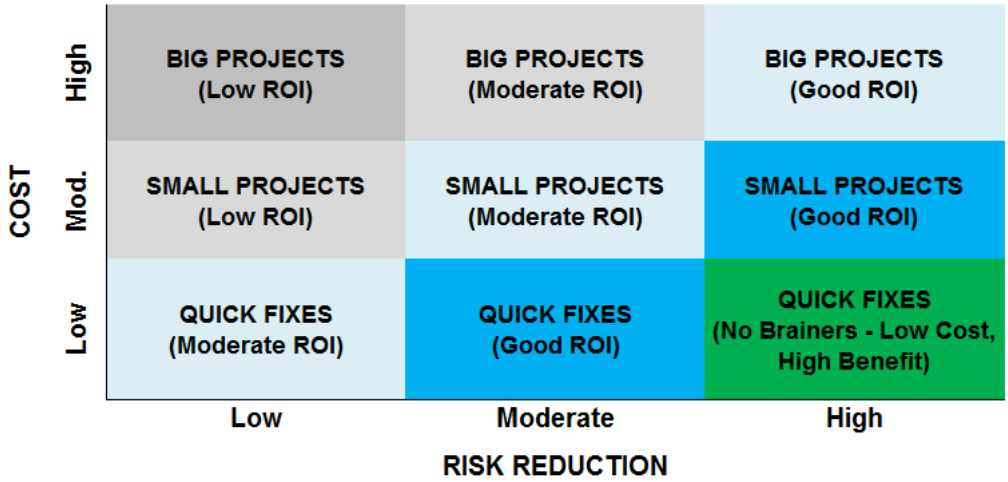

Exhibit 4. A suggested scheme to group your prioritized risks.

Communicating Risks

While it is important to objectively analyze and prioritize risks in our workplace in systematic manner, it is also important to remember when we are communicating risks that each member of our audience, whether it is a line worker or senior management, will each be subject to their own preconceived notions of risk based on the risk perception biases we discussed previously. Often the approach we'd like to take is to impress our audience with thoroughness and accuracy of our analyses, and we assume that this will be enough to influence them to agree to what is ultimately our opinion of the recommended priority of risks in our workplace. Unfortunately, while it is helpful for the audience to know we were thorough, systematic, and unbiased in our analysis, this knowledge – even if they believe it to be true – very well may not be enough to change their own opinions and beliefs. Our goal, though, is not to change everyone's opinions. Rather, it is to achieve what we hope is a sensible consensus on where to direct resources with respect to eliminating and reducing risks in the workplace.

Based on our experience, and the work of risk communicators such as Peter Sandman, consider the following tips when undertaking a risk assessment and later when preparing to discuss the proposed risk prioritization[6,7]:

1. Get buy-in beforehand. The best time to get buy-in for your risk prioritization methodology is prior to doing the assessment, so that it doesn't appear that you're choosing an approach to get the answer you want.
2. Use a participatory process. Allow stakeholder to participate in the risk assessment process. People are more likely to support a decision they helped make.
3. Keep your communications simple. Summarize your findings and express why they came out the way they did in a straightforward manner, without getting caught up in the details of the numbers and the analysis.
4. Don't be afraid to discuss uncertainty. This can be very uncomfortable for safety professionals, who are usually asked to make decisions in an authoritative manner that doesn't leave much room for others to question the validity of those decisions. However, where the choices are not clear-cut, your audience will respect and understand a decision they disagree with better when they understand that the process, while robust, sometimes requires tough decisions. The other advantage is that having an honest and open debate about the risks that are in the middle of our prioritization – in the "gray area" for a decision whether to do something about them or not – will help us avoid debates about the other risks that are much more clear cut (those that clearly should be acted upon immediately and those that clearly do not require any action at this time).
5. Never belittle or condescend to your audience, even to those who disagree with you, and even to those who may seem irrational or even rude to you. The best way to diffuse confrontational situations that can arise when you're debating what to do about risks in your workplace is to demonstrate that you are open to listening to other opinions and you're doing your best to incorporate everyone's opinions into your analysis.
6. Don't make promises you can't keep. A common pitfall for safety professionals is we try to do too much, and we try to address every potential risk that is brought to our attention. This often runs counter to the bigger picture of what we're trying to accomplish, because it takes resources away from higher priority risks. So, don't propagate this problem by promising you'll fix every risk you discuss in a meeting, but do promise to assess and consider each risk and proposed control on its merits.

Conclusion

Sometimes, business realities dictate that the relative priority of recommendations will not follow the order of the scores assigned. This is perfectly acceptable, since all of the recommendations identified in a risk assessment reflect an opportunity for risk reduction. However, in our experience, it is important to prioritize efforts in the area of safety management, and our prioritization framework allows for that to be accomplished while providing the greatest risk reduction in the most time and cost efficient manner.

Endnotes

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