

# Risk Work in Three Scenarios of Risk



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Contemporary organizations are increasingly preoccupied with the various risks they face. In trying to deal with them, they face different scenarios of risk. The first risk scenario concerns the need to address established risks, which are familiar and widely recognized. The second concerns the need to manage emerging or novel risks, which involve considerably more scope for contestation and conflict. The third concerns organizations that are trying to eliminate risks by substituting hazardous products or processes with safe alternatives. We examine each of these scenarios, showing how organizations in the field of industrial chemicals in Canada have tackled them.

## Scenario 1: Managing Established Risks

Organizations face a wide range of established risks. In this scenario, the hazard or harm is familiar and its causal link to some particular entity, activity or individual has been demonstrated through significant and uncontroversial scientific study. As a result, the way of establishing whether a 'risk object' exists is widely accepted: by measuring and calculating the magnitude and probability of harm through scientific study. Actions can then be taken to avoid or reduce the risk. In this way, unknown and unpredictable hazards are transformed into predictable, calculable risks. In practice, however, established risks are not always so straightforward. Individuals must contend with incomplete information and scientific uncertainty, as well as with divergent judgments about what constitutes an acceptable level of risk.

### Case Study: Vinyl Acetate Monomer

Our case concerns vinyl acetate monomer (VAM), an industrial chemical found in paints, adhesives and personal care products. Scientific findings have indicated that long-term exposure to vinyl acetate might cause cancer although it remains in widespread use.

Carcinogenic chemicals pose established risks: the harm – cancer – is well known and has been linked through accepted scientific methods to particular risk objects.

In 2006, The Canadian Government decided to prioritize VAM for risk assessment. Initially, assessors concluded that it was toxic to humans based on a finding that it had a 'non-threshold' mode of action i.e., there is a possibility of harm to human health at any level of exposure. Industry then challenged this by arguing that VAM had a 'threshold' mode of action i.e., only exposure above a certain threshold level was harmful. The Government subsequently accepted that VAM did have a threshold mode of action. It went on to consult data about exposure scenarios i.e., did the use of VAM in Canada exceed the safety threshold? It finally concluded that the threshold exposure level had not been exceeded, i.e. Canadians were not exposed to VAM at sufficiently high levels for it to constitute a danger to human health. Therefore, VAM did not pose health risks.

In coming to this decision, the risk work carried out by the Government included the following:

Referencing, where accepted scientific knowledge and methods are applied with reference to existing research, scientific experts and other jurisdictions;

Anchoring, where current activities are related to past activities, decisions, experience, and/or precedents, and continuity is emphasized;

Categorizing, where clearly bounded categories are used, from which certain actions follow;

Sequencing, where actions are temporally sequenced through pre-established timelines, charts, flow diagrams, etc.

This risk work helped to ensure that the authority of the accepted body of risk knowledge was reproduced, and the credibility of scientific experts was reaffirmed. The risk object – in this case, VAM – was identified through a nexus of pre-existing reports and papers, such as scientific articles, policy documents, and risk assessments from other organizations. This 'discursive' work had been carried out in the past and was widely accepted. In fact, the status of the body of risk knowledge was sufficiently taken-for-granted that, even though this decision was completely reversed, the change in status was not controversial and generated no outcry from scientists, NGOs or the public.

## Scenario 2: Managing Novel Risks

The second risk scenario involves dealing with 'emerging' or novel risks that stem from hazards that are unfamiliar, and which are only starting to be recognized by some, but not all, members of scientific and other communities. These risks are often controversial, with divergent opinions regarding the very nature and existence of a hazard, let alone how best to calculate its magnitude or the likelihood of its occurrence.

### Case Study: Bisphenol A

Bisphenol A (BPA) is used in baby and water bottles, canned goods, CDs and DVDs. Some scientific findings suggest it is an endocrine disruptor, i.e. a chemical that interferes with hormones to cause reproductive, developmental, neurological or other problems. Whereas the risks associated with carcinogens are widely accepted, those associated with endocrine disruption are more recent and controversial. In 2006, the Canadian Government prioritized BPA for risk assessment and found that it was toxic to both humans and the environment. The use of BPA in baby bottles was subsequently banned, making Canada the first country in the world to restrict products containing BPA.

In comparing BPA with VAM, we noted that although some referencing, anchoring, categorizing and sequencing did occur, there was far more evidence of other forms of risk work:

Particularizing, where a case was made for unique considerations or special treatment;

Questioning to highlight uncertainty and incompleteness of information;

Innovating, where novel methods and use of new approaches were encouraged; and

Pluralizing, where diverse stakeholders were involved in risk assessment and management.

BPA was singled out, or particularized, as the only chemical to warrant its own 'fact sheet' and 'frequently asked questions.' There was also far more questioning than in the case of VAM, and more reference to scientific uncertainty as to BPA's toxicity. The Government emphasized the importance of innovating, to find new ways of dealing with endocrine-disrupting chemicals, and pluralizing – involving stakeholders other than scientists and government officials participated in risk assessment and management.

The Government's risk work drew on the risk work of others – notably endocrinologists. These scientists had particularized BPA, arguing that as an endocrine disruptor, it does not conform to the basic principle of toxicology i.e., that the 'dose makes the poison.' This means that the greater the exposure the more likely there are to be toxic effects. Instead, endocrinologists questioned this concept and emphasized the concept of 'non-monotonic dose-response' where chemicals such as BPA interact with cellular hormone receptors in ways that result in *lower* doses posing higher risks. By advocating novel methods associated with a different 'paradigm' to traditional toxicology, endocrinologists questioned the existing body of risk knowledge and challenged the toxicologists who have produced it. In response, toxicologists maintained that methods used by endocrinologists ignored well-established scientific principles, had not been properly evaluated, relied on invalidated testing, and were focused on the wrong outcomes.

This form of risk work is necessary because of the tenuous status of risk knowledge: what constitutes relevant knowledge, how it should be produced, who should produce it, and what should be done with it are all up for grabs. As a result, individuals have to engage in extensive contemporaneous discursive work: as struggles over the paradigm intensify, actors are obliged to defend their position on multiple fronts. In the case of BPA as compared to VAM, a great many more documents were produced, with many more people engaged in such discursive work.

## Scenario 3: Eliminating Risks

The third risk scenario arises when organizations take actions to eliminate 'known' risks through substitution. Hazardous products or processes are substituted with alternatives that are believed to be safe, so the need to manage risk is avoided. This scenario is less common, as organizations appear far more inclined to reduce risk to an acceptable level rather than to try to eliminate it altogether. Nonetheless, risk elimination remains a goal for some organizations, as in the case of those adopting 'green' (or sustainable) chemistry.

### Case Study: Perchloroethylene

Our case study concerns perchloroethylene (perc) – a solvent used in dry cleaning. Existing scientific findings indicate that perc is hazardous to human health (as a carcinogen and a neurotoxin) and the environment (as a soil contaminant that is toxic to aquatic organisms). In other words, perc poses an established risk. However, rather than simply manage the risks by limiting exposure (e.g., through dry cleaning machinery design, facility controls, and handling procedures), green chemists have proposed eliminating it altogether. One safe, viable alternative is CO<sub>2</sub>. One drawback is that, while CO<sub>2</sub> is both cheap and plentiful, the cost of a CO<sub>2</sub> dry cleaning machine is high. Green chemists argue that the initial capital investment will save money in the long term by eliminating the costs of hazardous waste disposal, as well as regulatory costs. In adopting this approach, they hope to leverage market forces to promote the voluntary abandonment of a hazardous technology by dry cleaners.

In comparing perc with VAM and BPA, we can make a number of observations. First, in striving to eliminate risks, green chemists draw on the existing body of risk knowledge to identify a 'known' risk for elimination, as well as to evaluate the suitability of alternatives. Consequently, much of the risk work revolves around conventional, quantitative risk assessment. There are, then, parallels with the established risk scenario. Second, like the novel risk scenario, the risk object is identified by actors not centrally located in the field who

must deal with more dominant players – in our case green chemists with regular chemists. However, instead of an adversarial relationship, as there was between endocrinologists and toxicologists, green chemists have inserted themselves into mainstream chemistry. To do so they have had to work hard to clarify and legitimate their approach to risk. For example, the Presidential Green Chemistry Challenge awards were launched to recognize successful attempts to apply green chemistry principles. The Green Chemistry Institute was created with the mission of advancing green chemistry research and education. The field's first textbook (Anastas & Warner, 1998) elucidated twelve principles to guide the elimination of chemical risks. Prestigious research chairs have been created, green chemistry courses introduced, and international conferences set up. Over time, green chemistry has become increasingly accepted within the scientific discipline of chemistry as a result of a significant amount of discursive work to build its scientific legitimacy.

Table 1 summarizes the implications for risk workers based on the scenario of risk they face, showing the different kinds of risk work required. It also shows that, in two scenarios, additional discursive work is needed i.e., reports, papers and documents have to be produced to justify the nature of the risk work being undertaken. The effects are also different in the three scenarios. In the case of established risks, the field remains largely the same – the existing powerful stakeholders remain in charge. In the case of emerging risks the field is riven with conflict as a result of new entrants advocating a very different way of assessing and managing risk. Depending on the outcome of that conflict, the field may change significantly. The field also changes in the third scenario, but in a less confrontational way. New stakeholders ease themselves into the field, working with existing stakeholders – there is less conflict and more collaboration.

**Table 1:  
The Risk Scenarios**

|   | <b>Managing Established Risks</b>  | <b>Managing Novel Risks</b>  | <b>Eliminating Risks</b>   |
|---|--|--|--|
| <b>How is the risk object identified?</b>     | The risk object is assumed to be identifiable with existing models and techniques for measuring risk as a function of hazard and exposure; the emphasis is on reducing exposure to hazard.   | The risk object is assumed not to be identifiable with existing models and techniques for measuring risk as a function of hazard and exposure; the emphasis is on alternative models and techniques to identify risk.                                  | The risk object is assumed to be identifiable with existing models and techniques for measuring risk as a function of hazard and exposure; the emphasis is on eliminating hazard via hazard-free alternatives.   |
| <b>Who are the risk workers?</b>              | Actors who are embedded in the dominant paradigm, and who occupy central and highly institutionalized positions in the field.  | Actors who are embedded in an alternative paradigm, and who occupy peripheral positions that are not recognized as legitimate by central, dominant actors.   | Actors who are embedded in a nascent paradigm, and who occupy peripheral positions that are not recognized as legitimate by central, dominant actors.  |
| <b>What is the nature of risk work?</b>       | Methods to ascertain and address risk are routine and institutionalized: risk work is initiated by central actors according to normalized methods and procedures.  | Methods to ascertain and address risk are novel, conflictual: risk work is initiated by peripheral actors who focus on problems i.e., they question the appropriateness of the body of risk knowledge and advocate alternative methods and procedures. | Methods to ascertain risk are routine and institutionalized, but practices to address risk are novel and collaborative: risk work is initiated by peripheral actors who focus on solutions i.e., they accept the body of risk knowledge but suggest alternative trajectories for its development |
| <b>What is the nature of discursive work?</b> | Little discursive work because risk workers draw on discursive work undertaken in the past; struggle occurs within an established paradigm underpinning the body of risk knowledge, arises in relation to individual risk objects, and is contained. | Extensive discursive work by risk workers to legitimize their alternative body of risk knowledge and delegitimize the established one; struggle occurs over competing paradigms and appropriateness of the body of risk knowledge, and is significant. | Extensive discursive work by risk workers to legitimize their new subject positions within the incumbent body of risk knowledge; some struggle occurs over the direction in which the body of risk knowledge should be developed.  |
| <b>What are the effects?</b>                  | The existing body of risk knowledge is reproduced; new risk knowledge continues to develop incrementally along a continuous trajectory; dominant stakeholders continue to be privileged.   | The existing body of risk knowledge is undermined; an alternative body of risk knowledge is developed; new stakeholders become legitimated, disrupting dominant stakeholders.  | The existing body of risk knowledge is reproduced; new risk knowledge develops along a discontinuous trajectory; new stakeholders become legitimated, but join rather than disrupt dominant stakeholders.  |

## Learning points

Here are six suggestions for how your organization can address the different scenarios of risk:

1. Understand that organizations face different risk scenarios. Consider both the nature of the risk and how you want to respond to it to identify which scenario you face.
2. Do not assume the risks your organization faces are necessarily established ones that can be effectively managed using accepted approaches. Novel risks do emerge – often unexpectedly – and embroil organizations in controversy. Be sensitive to the ambiguity and uncertainty that may herald a novel risk.
3. Recognize that risk elimination can be a viable – and possibly game-changing – scenario. Rather than accept the inevitability of specific hazardous products and processes and then trying to reduce the level of risk they pose, why not explore how your organization might eliminate risks altogether by substituting these hazardous products or processes with safe alternatives?
4. If you are sure that you are dealing with an established risk, consider whether you have the procedures and expertise in place to assess and monitor it. Do you know where to find the necessary ‘pre-packaged’ discursive work, such as scientific articles, prior risk assessments, guidelines or other documents, on which you’ll need to draw to make your decisions? Are you in contact with the relevant experts? How can you feed the results of your risk work back into the body of risk knowledge?
5. If you are dealing with a novel risk, consider whether you have the procedures in place to deal with ambiguity. Are you developing the necessary innovations to reduce this ambiguity and make the risk more evident? Are you prepared to do the necessary discursive work to explain your approach to risk? Are you able to deal with the controversy and conflict that is likely to arise?
6. If you are trying to eliminate a risk, consider whether you are selecting the right kind of risks on which to focus. Have you identified solutions that can be feasibly implemented? Are you engaging in enough discursive work, such as dialogue and consultations, so that other stakeholders are willing commit themselves to these solutions? Are you collaborating effectively with the dominant stakeholders in your field?

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