President's Message

Risk Analysis: Of the People

Risk analysis studies people's interactions with their material surroundings. At times, people are the creators of risks; at times, they just bear its burdens. At times, they play both roles, as when they try to reduce personal risks. As a result, effective risk analyses must incorporate the best available social science, in addition to the best available natural science and engineering. However, this may not be an easy task. Social scientists are often missing entirely from analytical teams. When consulted, they are often unaccustomed to translating their knowledge into analysis-friendly terms. Their status may shift rapidly from being irrelevant to being late: if they can't produce the desired numbers quickly enough, then the analysts might just make something up, in order to keep social variables in the analysis.

Three recent examples might suggest the opportunities and obstacles to creating behaviorally realistic risk analyses. Each was unsatisfying, yet potentially a small step in the right direction.

Small Step 1: A couple of years ago, I got a call from a consulting firm, saying, "We've got the contract for modeling [biohazard X]. We know it depends on things like whether people notice symptoms, get vaccinations, sue for side effects, obey quarantines, believe that their loved ones are being cared for . . . Can you come here, for a day, to give us the numbers for behavior?"

It was nice to be asked. However, how could any one person know all the relevant research, represent its results, uncertainties, and controversies, in a single day, while ensuring that the model has been properly framed—and then monitor the use of those behavior estimates as the model evolves over time? I didn't think that I could, and declined. I don't know if that was a mistake. They had at least asked and I had refused to say anything, rather than saying something imperfect.

Small Step 2: Recently, I was asked about the soundness of a device for detecting a terror hazard. One of my first questions was, "How can you ensure its usability, both in terms of how well operators can use it and in terms of the social system that will respond to its stream of true and false signals?" The answer was, "We have a couple of users come in one day a week."

That was certainly better than just imagining its use. However, how could any two users know the relevant human factors science, devise valid performance standards, monitor adherence to their advice, anticipate the range of possible uses, and represent alternative approaches? Although initially dissatisfied (and, privately, dismissive), I came to realize that having two users, raising potentially awkward questions, could refine the analysis—if someone could, then, translate their concerns into analytical terms, supplemented with research results.

Small Step 3: A few weekends ago, a colleague wrote, saying "[X] needs to know the ratio of 'worried well' to actual injured, in the event of a terror attack." It was nice that [X] didn't just make up a number or ignore the problem altogether. However, how could any one number address the range of initial conditions, represent alternative definitions of "worried well," and capture the uncertainties in the literature—while not feeding the disrespect inherent in the question, with its implication of "needlessly worried well."

Over the weekend, we assembled a small team electronically and produced a short memo, saying that the research suggests a ratio between 1.02 and 100,000. At the one extreme lie situations where the only additional casualties are the few people prone to somaticizing stress. At the other extreme lie situations where communication is so hard, or so bungled, that many people are left legitimately wondering whether they have been exposed to something that is treatable, if they get help soon—as happened in the 2001 anthrax crisis. We hoped to provide some crude guidance, while suggesting that we could do better right now, with better task specification, and even better in the future, with additional research.

Although outsiders always feel aggrieved when their work has been ignored, the path forward may require such small steps, swallowing hard and saying something consistent with the research, hoping that the next request will allow for more. We might also reflect on the cases where the tables are turned, as when social scientists assess risk perceptions, without systematically determining which facts matter most.

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President's Message

Risk Analysis—By the People

About 25 years ago, I had the opportunity to spend an afternoon with Stephen Cotgrove, at the University of Bath (UK), an early student of conflict over environmental protection. One of his comments that particularly struck me was, "The hardest thing for me to do is to convince engineers that they have emotions."

In Cotgrove's view, as I understood it, this denial had two important consequences. One made him less sympathetic to engineers, the other more. The former was that seeing themselves as relying entirely on reason made it too easy for engineers to dismiss their critics as being driven by emotion. We all have our favored ad hominem arguments. "Hysterical public" is a convenient, ego-enhancing one, when citizens object to an engineered system. However, it is not a helpful diagnosis unless supported by evidence.

Recently, I was invited to address a largely technical group about integrating risk analysis and risk communication in the context of terrorism. The ensuing discussion was lively and constructive until someone began a question with "As I understand it, the accepted wisdom is that if an attack occurs, the public will panic . . ."

I had devoted one slide to that exact topic and it had said exactly the opposite. I made two snap decisions. One was that the questioner was not disputing my claim. He simply had not heard it, because it so contradicted his expectations. (Psychologists use "selective perception" to describe such processes.)

The second snap decision was that I did not want to be invited back. So, I replied somewhat undiplomatically, saying that although psychologists have made a living documenting the foibles of lay judgments, few compared to this fable about lay people, which was so widely held in the expert community.

Looking at natural disasters, wartime experiences, and other collectively stressful events, scientists have found that panic is rare, and pro-social, even brave, behavior the norm. Indeed, ordinary citizens provide much of the first response to such events. As a result, this misconception typically has relatively small practical consequences. Citizens have already done their work before the professionals arrive to do theirs. We may not be so lucky, if our society is put on a permanent wartime footing due to anxiety over terrorism. In that case, the image of an incompetent public, partially fed by the myth of panic, could foster a militarization of the home front that invests protective resources inefficiently, while undermining civic society.

The persistence of the panic myth brings to mind Cotgrove's second claim—the one regarding how engineers' denial of emotion increased his sympathy toward them. Engineers often bear enormous responsibility for solving intellectually challenging problems protecting life, limb, and economic well-being, under socially chaotic circumstances, producing wildly conflicting pressures. Small wonder, if they felt some emotion.

Over the past 20 years, researchers have learned a lot about the effects of specific emotions on specific judgments. For example, anger, unlike other negative emotions, makes people more optimistic. It also encourages seeing other people as responsible for problems rather than blaming the circumstances in which those people find themselves. By contrast, sadness increases the attribution of problems to general circumstances, which seem less readily addressed than troublesome people.

Thus, anger might help people to get some things done if it does not cloud their judgment in ways that keep them from doing things right. Sadness, on the other hand, might evoke the compassion needed to remember just how complicated circumstances can be, while evoking sympathy (or at least empathy) for those trying to solve them.

In such ways, emotion can serve a mobilizing function. Those who deny their emotions deny the legitimacy of needing help to stay the course. Cotgrove's book, *Catastrophe or Cornucopia: The Environment, Politics and the Future*, contrasts two competing visions of the future of the natural world. Like most views on topics of any importance, these have both cognitive and emotional elements. (Dual process theories in psychology treat how these interact, along the interplay of people's detailed beliefs and their general orientation to a problem.)

Each side in a risk conflict has its engineers. Although they may be responsible for the cognitive part of the operation (leaving the emotions to the liberal arts grads), doing their job well requires a passion for it. Emotions often include a general level of arousal, whose interpretation depends on situational cues (providing an answer to "why do I feel this way?").

A common source of situational cues is confrontation with critics. It naturally triggers anger focused on the source of the criticism, rather than on the circumstances producing it—others doing their job passionately. Recognizing these processes might help people to get the best out of their emotions. So might recognition of how difficult it is to insulate judgments from conflicts of interest. Analysis might benefit from a battle of emotions, as well as the usual battle of the wits.

Baruch Fischhoff
Pittsburgh, PA, 11 June 2005

President's Message

Risk Analysis—For the People

The tragedy of Hurricane Katrina should give pause for anyone in the risk business. I am writing on 5 September, while there are, likely, people still dying in isolated quarters of the New Orleans area. Although there will be better evidence later, the passage of time can also blur both memory and emotion. The "blame game" is currently a repeated phrase. One can safely assume that it will be played long after this column is published. What might fade, though, is the "shame game" of wondering whether we have somehow been part of this risk management failure.

The theme of my presidential columns has been how we can create behaviorally realistic risk analyses. My first column considered the appropriate level of complexity, as dictated by risk realities and decision makers' needs. The second considered how to identify behavioral determinants of system performance and use research results (rather than ad hoc assumptions) to estimate them. The third considered using expert judgment wisely, recognizing the experts are people, too.

I had planned to conclude by writing about behaviorally realistic risk communications. I hoped to close the loop (begun with the first column) by reflecting on how to give people the information that they need in a form that they can process efficiently. These goals clearly were not achieved for many people along the Gulf Coast. An investigation worthy of those who perished, those who had their lives disrupted, and those who labored to save them would examine the roles played by the following factors:

Irrational citizens. To what extent did people fail to do sensible things, despite getting good information in a timely fashion? Where this happens, an emergency system that relies on communication fails the test of behavioral realism. Evaluating this possibility requires empirically establishing citizens' goals and beliefs (for example, did they know the risks, but stay behind for loved ones? Did they hear conflicting messages and not know which to trust? Did they stick around for the looting?—not nice behavior, but not necessarily irrational).

Incomprehensible communications. To what extent did citizens not understand what they were told? Where they do not, either the emergency system should be abandoned or better communications are needed. Evaluating this possibility requires evidence regarding how actual messages were interpreted and how far the envelope of understanding could be expanded with properly designed messages.

Irrelevant communications. To what extent did messages contain the information that citizens needed most? Where they did not, the system should be redesigned to identify the facts that are most critical to citizens' needs (and do not go without saying). Evaluating this possibility requires determining whether communications were driven by public health concerns (focused on the welfare of the audience) or public affairs concerns (focused on the image of the source).

Inappropriate communicators. To what extent did citizens so disdain the messenger that they ignored critical, comprehensible information? Where that happens the messenger needs to be improved or replaced. Evaluating that possibility requires looking at the perceived honesty and competence of both the individual communicators and the institutions that they represent.

Inadequate analysis. To what extent did communicators not know what to say, because the risks had not been analyzed properly? Where that happens, officials should remain silent until they have done their homework. Evaluating this possibility requires looking at the staffing and work practices of the official organizations.

Impossible situations. To what extent did communicators have nothing useful to say? Where that is the case, the honest thing to say is that "You're on your own"—and try to be more useful the next time. Evaluating this possibility requires risk analyses that are realistic about the behavior and performance of official organizations.

These are intellectually challenging evaluations. Like other forensic work, they are best pursued in a nonpartisan manner, with the needed natural, engineering, and behavioral science expertise. Lawyers have a valuable role as experts in legal constraints, but not as arbiters of politically acceptable truths. Having local residents on the team should increase its relevance to their concerns, realism about their circumstances, and comprehensibility to others like them. Their presence should also help to sustain the passion for getting it right next time.

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