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INTRODUCTION

1.1 The Context of Risk Communication

There are many different kinds of risk. In one study, we asked a group of citizens to “make a list, in whatever order they come to mind, of the risks that most concern you now” (Fischer et al., 1991). The most frequent nominations were everyday threats to life and limb, such as accidents, disease, and crime. Also listed were economic risks, such as the possibility of losing a job or making a bad investment. Some people listed personal concerns, such as their love life going sour or their child flunking out of school. The risk of eternal damnation was also mentioned. Only 10% of the risks cited were from environmental hazards, natural hazards (e.g., floods and earthquakes), or technology. Clearly “risk” is a very broad topic. In a subsequent study, when we asked people to focus specifically on “health, safety, and environmental risks,” they readily provided many such hazards. However, as shown in Table 1.1, even then, everyday risks, such as drugs, auto accidents, and conventional pollutants, dramatically out-ranked more exotic ones.

Whereas professional risk experts devote many hours to considering rare and unusual hazards, most people do not share this preoccupation. With jobs, family, friends, and the other demands of daily living, their lives are filled with more immediate concerns. Of course, given that modern life is awash in risks, people must deal with them in one way or another. When they do, their attention is most often directed toward com-

mon day-to-day hazards. For eminently sensible reasons, the time that most people can devote to rare or unusual risks is usually very limited.

In some cases, people can exert direct personal control over the risks they face (e.g., through diet or driving habits). In other cases, they can only act indirectly, by influencing social processes (e.g., the allocation of law enforcement funds, the enactment of environmental legislation, the siting of hazard facilities). In all cases, they need a diverse set of cognitive, social, and emotional skills in order to understand the information that they receive, interpret its relevance for their lives and communities, and articulate their views to others. They can acquire those skills through formal education, self-study, and personal experience. However, as diligent as they might be, individuals are helpless without trustworthy, comprehensible information about specific risks.

Fortunately, many people are engaged in providing such information. Doctors' offices are full of brochures and posters about ways to control risks. In 1988, the Surgeon General mailed a pamphlet about AIDS to every home in the United States. The 1986 reauthorization of the Superfund Act requires notifying local communities about both routine chemical emissions and potential catastrophic actions. The Centers for Disease Control have conducted a massive campaign to inform Americans about the risks (and nonrisks) of HIV/AIDS. The Food and Drug Administration has created nutritional labels for all food products and is in the process of creating standardized risk labels for over-the-counter drugs. Workers handling chemicals are entitled to see Material Safety Data Sheets, informing them about the nature and handling of risks.

All these communications aim to supply people with the information that they need in order to make informed decisions about risk. For risks under personal control, successful communication can help people to identify those risks that are large enough to warrant some of their very limited time and attention. It can help them to identify the "best buys" in risk, where there are large compensating benefits for taking risks and no missed opportunities for cheaply reducing risk – or gaining great benefits by accepting a little more risk. For risks under societal control, successful communication can help ensure the "diffusion of knowledge among the people," which Thomas Jefferson argued is the only sure strategy "for the preservation of freedom and happiness."

Table 1.1 Types of risk mentioned when subjects were asked to “make a list, in whatever order they come to mind, of the health, safety, and environmental risks that most concern you.”

Type of Risk	Percentage of Mentions
Health (22.9%)	
Cancer, heart disease	4.8
Sexually transmitted diseases	5.9
Drugs, alcohol, and smoking	7.4
Other	4.8
Safety (22.4%)	
Motor vehicles	6.7
Other transportation	2.8
Natural hazards	2.4
Fire and explosion	3.3
Other, including home and workplace	7.2
Environment (44.1%)	
Conventional air pollution	7.6
Conventional water pollution	7.0
Conventional solid waste and other	6.5
Toxic/hazardous chemicals	5.2
Pesticides, fertilizers	2.0
Ionizing radiation	4.8
Large ecological	8.0
Human ecology	2.0
Other	1.0
Society (10.6%)	
War	3.0
Other	7.5

Adapted from Fischer et al. (1991).

1.2 The Goals of Risk Communication

As practiced today, risk communication is often very earnest but also surprisingly ad hoc. Typically, one cannot find a clear analysis of what needs to be communicated nor solid evidence that messages have achieved their impact. Nor can one find tested procedures for ensuring the credibility of communication.

The stakes riding on public understanding are high for those who create risks, as well as for the public that bears them. With many risks, it takes little imagination to identify the individuals and institutions who

would like others to exaggerate or underestimate risks. As a result, there are significant disagreements about the content of risk communications. To many of the manufacturers or managers of technologies that create risks, “risk communication” means persuading the public that the risk from a technology is small and should be ignored. In such contexts, according to Sheila Jasanoff (1989), “risk communication is often a code [word] for brainwashing by experts or industry.”

As used here, “risk communication” means communication intended to supply laypeople with the information they need to make informed, independent judgments about risks to health, safety, and the environment (Fischhoff, 1990; Gibson, 1985; Gow and Otway, 1990). Given people’s time constraints, effective communication should focus on the issues that recipients most need to understand. If a communication omits critical information, then it fails the most obvious responsibility of communicators. It may leave recipients worse off if it creates an illusion of competence, so that recipients erroneously believe themselves to be adequately informed. If it presents irrelevant information, then it wastes recipients’ time and diverts their attention from more important tasks.

Once they have determined the appropriate content, the developers of a risk communication need to ensure that this message is understood as intended. Failing that test wastes recipients’ time (not to mention the resources invested in the communication). It denies them empowerment for dealing with the risk. Recipients may resent the communicator if they feel that they are being denied an opportunity to understand. They may doubt themselves if the experience leaves them feeling incapable of understanding. Failed communications can also contribute inadvertently to controversy and conflict. In all these ways, poor risk communications can create threats larger than those posed by the risks that they describe. We should no more release an unproven communication on people than an unproven drug.

Effective risk communications require authoritative and trustworthy sources. If communicators are perceived as having a vested interest, then recipients may not know what to believe. They may accept the message at face value or reinterpret it in ways that attempt to undo perceived biases. As a result, the impact of communications will be blurred, and the communication process further complicated. Not knowing whom or what to

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believe can make risk decisions seem intractable (Fischhoff, 1992). Such confusion and suspicion can erode relations between experts and the public, as well as open the door to less credible sources.

Such failures of communication can be deliberate, as when communicators attempt to manipulate the public or simply fail to take their duty to inform seriously. However, they can also be inadvertent, as when communicators fail to realize the complexity of their task or the opportunities for failure.

1.3 The Goals of Communication Recipients

What a risk communication should contain depends on what audience members intend to do with it. Sometimes recipients just want a trustworthy expert to tell them what to do. Sometimes they want to make their own choices but need quantitative details (such as probabilities or prices) in order to do so (Fischhoff, Bostrom, and Quadrel, 1997). Sometimes, they want help in organizing their thinking. We consider each situation briefly in turn.

Advice and answers People who are poised, waiting to be told what to do, just need explicit instruction, summarizing the conclusions that they would reach if they had sufficient time and knowledge. It is not hard to imagine sometimes wanting a trusted doctor, lawyer, insurance agent, or investment counselor to spare us the details and tell us what we should do.

When the same advice is given to many people, all should have similar goals, which the experts attempt to help them achieve. That is, the advice should reflect the best available technical knowledge, applied in a normatively defensible way. Experts should not have a vested interest in how members of their audience behave, beyond wanting to help them to act in their own best interests. For example, a financial expert appearing on a television investment program should not recommend a stock with plans to sell it in a few days, hoping to get many viewers to buy it and drive the price up.

Responsible advice helps recipients understand how their options are shaped by social forces – and how the creation of additional options may

require collective as well as individual options. It should help people to create new options for themselves and contribute meaningfully to public debate (Fischhoff, 1992).

Numbers People often want to make choices themselves. Rather than instruction on how to choose, they want quantitative summaries of expert knowledge. For example, they may need to know the costs, probability of success, and probability of adverse side effects associated with alternative medical treatments. Having received such information, they can plug the values into their personal decision-making model and make the choice that makes the most sense for their personal situations. To serve that process, communicators must analyze the decisions that their audience members face and then determine the information that is most relevant.¹ Assuming that the resulting estimates can be made credible and comprehensible, this might reduce the expert knowledge that people need to a few well-chosen numbers (or ranges) – rather than the “core dump” of, say, the typical patient package insert.

Processes and framing In some cases, people need to know more than just a few numbers. They need to learn how a risk is created and how it can be controlled. That information allows them to monitor their own surroundings, identify risky situations, and devise appropriate responses. Such knowledge allows people to follow (and join) the public debate and be competent citizens. A risk communication that provides such information assumes that its audience is motivated to obtain such understanding and invest the effort required to gain it (when they believe that their efforts will be rewarded).

Communications intended to provide such broad understanding face an enormous selection problem, insofar as any fact with some arguable connection to the risk might be transmitted. Our approach addresses this need for

¹Merz, Fischhoff, and Mazur (1993) have used this approach to identify the most relevant information for patients facing the prospect of carotid endarterectomy, a procedure for scraping out an artery leading to the brain in order to reduce the risk of strokes. Only a few of the many possible side effects were found to matter to any more than a tiny fraction of potential patients.

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selecting and presenting information. We recognize that there are situations calling for the more modest but still challenging goals of communicating numbers and advice. We have treated them in other writing (e.g., Fischhoff, 1992, 1999; Fischhoff, Bostrom, and Quadrel, 1997; Fischhoff et al., 1998). Speculatively, even those goals might be advanced by a more comprehensive approach, so that people have an understanding of why they are being told to follow a particular course of action or what basis there is for a quantitative claim. More specifically, our goal is to create an adequate mental model of the risky process, allowing people to know which facts are relevant and how they fit together. That knowledge should help them to make sense out of any new facts that come their way and their own direct observations. Within this general framework, their attention should be focused on those facts that make the greatest difference in determining risk levels.

1.4 Criticisms of Risk Communication

We have met risk specialists who, at least in private, argue that the Jeffersonian ideal of a well-informed public is naïve, making risk communication for the general public mostly a waste of time. Some of these skeptics assert that people are technically illiterate and ruled by emotion rather than by substance – hence education is hopeless. Others argue that all important decisions about risk are made by special interests and power elites – hence education is pointless, even if possible. Our reading of the evidence is that neither assertion is true.

Because people's time is short, they can't learn about, much less influence, all risks. As a result, people often want specialists to make sure that life doesn't get too hazardous. Yet the history of democratic countries shows that when they see experts failing, laypeople can effectively assert their desire to affect both personal and political decisions. These battles for control may not be quick or tidy processes. Technical specialists often resist communication with the public, in ways that erode their credibility. Table 1.2 summarizes the historical stages through which communication often evolves when organizations discover that they have a risk problem. Once specialists lose the trust needed to serve as credible sources, the public's learning process becomes much more complicated. Laypeople no

longer know where to go for information. Their interactions with risk specialists may be colored by emotional reactions by all parties.

Risk specialists may not like to acknowledge their own emotional involvement nor to deal with that of the public. However, emotion is often a natural part of high-stakes choices. The specialists have a job to do and find it frustrating to have to deal with the public – a task that few envisioned when they chose technical careers and for which few are properly trained. For their part, citizens should not like risks imposed upon them, especially without consultation. Nor should they like to assume risks so that other people can become rich and powerful. Nor do people like the feeling of being lied to. Anyone would (and perhaps should) become emotionally involved when they see themselves in such situations.

Such emotions need not mean that risk communication is hopeless, nor that people are incapable of making reasoned decisions about risks. Indeed, emotion can provide motivation for acquiring competence – even if it makes people more critical consumers of risk communications. Although citizens may begin their learning process with relatively little technical understanding, we believe that most can understand the basic issues needed to make informed decisions about many technically based risks – given time, effort, and careful explanation. Unfortunately, when a message is not understood, the recipients, rather than the message, often get blamed for the communication failure. If technical experts view the public as obtuse, ignorant, or hysterical, the public will pick up on that disrespect, further complicating the communication process.

As mentioned, some critics argue that risk communication is typically manipulative, designed to sell unsuspecting recipients on the communicator's political agenda. Of course, some consultants make a good living approaching risk communication in this way, and sometimes they succeed. In an open society, however, there are often multiple sources of information. The fact that some risk communication is cynically manipulative doesn't mean that all risk communication must be. Our goal is to help those hoping to develop balanced materials, providing lay audiences with the information that they need to make informed, independent decisions. In Chapter 2, we will argue that such design must start with an examination of the choices people face, the beliefs they hold, and experts' relevant knowledge. It must be assumed that the principal obstacles to understanding are lay time and attention, not intelligence.

Table 1.2 Historical stages in risk communication.

<p>One way to think about risk communication is as an evolutionary process in which communicators gradually reach higher levels of understanding about the nature and complexity of their task. Communicators at each stage lack some of the understanding of public concerns that become apparent at later stages.</p>	
<p>1. <i>All we have to do is get the numbers right.</i> The simplest communications rely on words rather than deeds. If risks are well managed, or obviously worthwhile, or have no clear substitutes, then no one may ever be interested in hearing about them. Indeed, many risk managers aspire to this status, hoping to do their job well and be left alone. If this strategy works, then time and trouble have been saved by all parties. However, if it fails, then people may ask awkward questions about the long silence. Was something being hidden? Or did the experts just not care?</p> <p>2. <i>All we have to do is tell them the numbers.</i> The quickest response to the demand for information is to share one's work. As a result, when risk managers discover that they have a public risk perception problem, they may be tempted to present the research that convinced them that the risk was acceptable – in something close to the form in which it was produced. Although there can be something touching and forthright in such a straightforward delivery, it is unlikely to be very effective. Moreover, not understanding the public's perspective may be interpreted as not caring about it.</p> <p>3. <i>All we have to do is explain what we mean by the numbers.</i> When risk estimates do not speak for themselves, an obvious next step is to explain them. That can be a difficult task with an audience that shares no common vocabulary or conceptual background with the risk experts. For example, a candid disclosure of risk information will include the degree of scientific uncertainty surrounding it. However, accomplishing that task for a specific risk requires a prior understanding of the general nature of scientific inquiry and disputation. Without it, the candid communicator may seem to be evasive, equivocating, or contentious. Furthermore, the numbers alone do not tell the entire story about risks. Often, people need to understand how a risky process works, in order to devise strategies for dealing with it or to feel competent to follow public debate.</p> <p>4. <i>All we have to do is show them that they've accepted similar risks in the past.</i> Having done their best to get the numbers across, communicators may be frustrated to find that little is resolved. One common expression of their frustration is to argue something like, "the risks of technology x [which we promote] are no greater</p>	<p>than those of activity y [which you already accept], so why not accept x?" Although such comparisons can be worth considering, they are no more than suggestive. Acceptability depends on benefits as well as risks. Those who advocate consistency in risk levels too vociferously endanger their own credibility.</p> <p>5. <i>All we have to do is show them that it's a good deal for them.</i> Considering both risks and benefits in communication means, in effect, adopting recipients' full perspective, because they will have to live with both kinds of consequences. Doing so may lead to changing the activity in question so that it actually provides a better balance of risks and benefits. Explaining benefits encounters difficulties that are analogous to those involved in explaining risks, along with some added twists. For example, logically equivalent ways of presenting the same options can produce systematically different choices (known as "framing effects").</p> <p>6. <i>All we have to do is treat them nicely.</i> People judge communications by their form and their substance. The form suggests, among other things, how much faith to place in the content and how respectfully the communicator regards them. If people do not feel respected, then they have more reason to suspect that they are not being fully informed. They also have more reason to fear that risks are not being managed on their behalf and that the risk-management process is part of a larger trend to disenfranchise them. Although sympathetic delivery is no guarantee of respect, it does show that one is recognized as a person with feelings (even if those are being manipulated).</p> <p>7. <i>All we have to do is make them partners.</i> Stages 1 through 6 involve increasing stages of viewing the recipients of the message as individuals with complex concerns. However, the understanding is cultivated in order to get across a message whose content has been determined by the communicator. That means seeing recipients as individuals but not engaging them as such. This stage takes on the public as partners in risk management. It means providing them a seat at the table and allowing them to communicate their own concerns. In effect, it means opening a communication channel in the opposite direction.</p>

Source: Fischhoff (1995).

When evaluating the success of communications and the competence of citizens, it is important to be realistic about the path from understanding to action. For example, it took many of us several years to install smoke detectors after learning about them. Although carbon monoxide detectors are now quite cheap, many of our homes still lack them. These delays don't reflect lack of understanding of the risk of fire or lack of caring about the safety of our families. Nor do they result from an emotional approach that ignores or rejects the facts. They occur because people have other pressing things to do. Changes just take a while.

1.5 How People Think about Risk and Uncertainty

Experts sometimes describe "risk" in terms of the expected numbers of deaths. Viewed this way, the accident risk of a technology can be obtained by multiplying the probability of an accident by the number of people who will be killed if it occurs (summed over all possible accidents). When members of the public rank activities and technologies in terms of "risk," the lists often deviate considerably from those generated by best-guess statistical estimates of expected fatalities. Some experts have cited this disparity as evidence of public stupidity or ignorance. When anecdotal observation is replaced with systematic study, a rather different picture of lay risk perceptions emerges. It shows that people use more complex, "multiattribute" definitions of risk, which include additional considerations beyond the expected numbers of deaths (Slovic, Fischhoff, and Lichtenstein, 1980). When laypeople order well-known hazards in terms of deaths in an average each year, they tend to agree with the statistics. When they order hazards in terms of how *risky* they are, laypeople produce a somewhat different order. The difference reflects the inclusion of additional factors such as how well the risk is understood, how equitably the risk is distributed across the population, how well individuals can control the risk they face, and whether the risk is assumed voluntarily or is imposed on people without their approval (Fischhoff et al., 1978; Slovic, 1987). Using the statistical technique of factor analysis, these attributes can be organized in terms of a small number of factors, as shown in Figure 1.1. The location of a hazard within this "factor space" says quite a lot about how the public is likely to