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Risk Perception and Communication Unplugged: Twenty Years of Process[1]

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Over the past twenty years, risk communication researchers and practitioners have learned some lessons, often at considerable personal price. For the most part, the mistakes that they have made have been natural, even intelligent ones. As a result, the same pitfalls may tempt newcomers to the field. This essay offers a personal (even confessional) history of the field over this period. It identifies a series of developmental stages. Progress through the stages involves consolidating the skills needed to execute it and learning its limitations. Knowing about their existence might speed the learning process and alert one to how much there still is to learn.

KEY WORDS: Risk perception; risk communication; risk management; environment.

INTRODUCTION

Biology teaches us that "ontogeny recapitulates phylogeny." That is, the development of the individual mimics the evolution of the species. For example, a human fetus acquires an increasingly differentiated cellular structure, as did the precursor species to homo sapiens.

Over the past 20 years or so, risk communication research has undergone its own evolution. At each stage, it has made progress toward acquiring some new skills, only to discover that there were additional, more complicated problems to solve. Every year (or, perhaps, every day), some new industry or institution discovers that it, too, has a risk problem. It can, if it wishes, repeat the learning process that its predecessors have undergone. Or, it can attempt to short-circuit that process, and start with its product, namely the best available approaches to risk communication.

Although learning from the experience of others is appealing in principle, it may be difficult in practice. One possible obstacle is being too isolated to realize that others have faced the same tasks. A second is being too headstrong to admit that help is needed. A third is not having a chance to observe others' learning process. As a result, newcomers may be condemned to repeat it. Few risk communication researchers or practitioners can claim to have gotten it right the first time. If what they tried first made sense to them at the time, it may also tempt others. Although the ensuing mistakes may be intelligent ones, they are still wasteful if they could have been avoided. Moreover, in risk (or other) communication, the damage can be irreversible—if relations with one's communicants are poisoned. A shadow of a doubt can be difficult to erase. Ask industries or politicians who have tried to rescue tarnished reputations.[1]

This essay offers a brief history of risk communication, organized around the developmental stages listed in Table I. Each stage is characterized by a focal communication strategy which practitioners hope will do the trick—and by the lessons learned about how far that

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[3] This conference, too, is intended to reduce these obstacles, by pooling the experience of practitioners, summarizing the results of researchers, and allowing the two communities to converse (1). The articles collected in this volume offer a more detailed exposition than is possible in this summary essay.

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Table I. Developmental Stages in Risk Management (Ontogeny Recapitulates Phylogeny)

- All we have to do is get the numbers right
- All we have to do is tell them the numbers
- All we have to do is explain what we mean by the numbers
- All we have to do is show them that they've accepted similar risks in the past
- All we have to do is show them that it's a good deal for them
- All we have to do is treat them nice
- All we have to do is make them partners
- All of the above

strategy can go. Each stage builds on its predecessors. It does not, however, replace them. Simple skills are often essential to executing sophisticated plans.

Obviously, such an account is quite speculative. No one has systematically documented the history of risk communication. Moreover, even if my interpretation were entirely accurate, capitalizing on the experience that it summarizes would present a significant challenge. In many areas, complex skills are acquired slowly. And, by many accounts, it is hard to proceed to a new stage until one has mastered its predecessors.[2,3] Thus, aspiring musicians need to attend many concerts, and practice many hours, before they can benefit from participating in master classes. At any stage, it is important to know the limits to one's abilities. That way, one can avoid commitments that one cannot fulfill, have realistic expectations for what one does try, and secure complementary services for the rest.

Continuing the metaphor, there may be value in music appreciation classes, long before one is ready to solo. However, those who provide those classes, or hortatory talks like this one, have an obligation to be candid about the limits to their craft. Describing one's own learning process might be part of such candor—as long as the state of the art is presented as offering a current best guess, and not a definitive solution.

FIRST DEVELOPMENTAL STAGE

All We Have to Do Is Get the Numbers Right

Communication often begins before a word is said. One's very willingness to talk sends a message, which is amplified by one's suppositions about what needs to be said. Often, risk communication gets off on the wrong foot when the potential sources of information have no intent of saying anything. Those sources may have something to hide, either from the public or from competitors. However, they may also just see no need to talk about the risks in their care, as long as those risks are being kept at acceptable levels.

Instead, these risk experts focus on the (arduous and skilled) tasks of trying to master the design, execution, and operation of their technology. It seems self evident to them that they are the best-qualified individuals for these jobs. Moreover, both their professional pride and market forces (e.g., waste minimization, liability reduction) provide strong incentives to control risks. As a result, there doesn't seem to be much to talk about; the risks are as small as they reasonably could be. In some cases, the experts might be required to back up their claims with quantitative risk analyses. If so, then their job may seem to be over once the numbers come out satisfactorily (perhaps after some design revision).

Indeed, quietly doing diligent technical work will often suffice. The risks of many enterprises attract no attention at all. Unfortunately, if a risk does become an issue, the preceding silence may raise suspicions—of a sort that can complicate the ensuring communication. There may have been good reasons for the risk managers not to have initiated contact on their own (e.g., "no one asked," "no one would listen," "we reported everything to the government"). The credibility of such excuses may depend on how well the technology bears up under public scrutiny.

Technologies that have relied on risk analyses may have particular difficulty in demonstrating their adequacy. In part, this is because of the unfamiliar, even esoteric qualities of risk analysis. In part, this is because risk analysis is, in fact, hard to perform adequately. Diligent analysts do the best work they can, gathering observational data, adapting it to novel cases with expert judgment, and tying the pieces together with some model. Nonetheless, even the most sophisticated analyses are still exercises in disciplined guesswork.[4–8][4]

Those who work within a discipline accustom themselves to its limitations. They learn to live with the reality of critical unsolved problems (e.g., how to model operator behavior, how to extrapolate from animal data). They are vulnerable, though, if living in the world of analysis makes them too comfortable with its limits. Further vulnerability arises from treating an applied intellectual technology as a scientific pursuit. Like other

[4] It will be interesting to see what effect, if any, is achieved by the current fad of relabeling probabilistic risk analysis as probabilistic safety analysis. The change could put a happier face on the process or be seen as a disingenuous diversion.

pursuits (such as much survey research and cost-benefit analysis), risk analysis may seek the rights of science without assuming its full responsibility (e.g., independent peer review, data archiving, credentialing processes). Although understandable, adopting such a narrow view may compound public suspicions. It means, in effect, that the analysts are assuming more responsibility for risk management than they can deliver. Conceivably, talking to others might have been a useful antidote to hubris.

SECOND DEVELOPMENTAL STAGE

All We Have to Do Is Tell Them the Numbers

When risk managers discover that they have not been trusted to do their work in private, a natural response is to hand over the numbers. How good a story those numbers have to tell depends on how well the first developmental stage has been mastered. How successfully they tell that story depends on how well the numbers speak for themselves. Frequently the answer is "not very well." Nonetheless, numbers are often delivered to the public in something close to the form in which they are produced. This may occur in corporate reports, public briefings, press statements, or computerized data bases.

There is something touching and forthright about such a straightforward delivery. However, it is likely to be seen, perhaps accurately, as reflecting the distance between the analysts and their audience—insofar as the experts clearly do not realize how poorly they are communicating. Being seen as out of touch is a good way to undermine one's credibility. Further erosion will follow if the numbers make no sense, especially if that is seen as the result of deliberate obfuscation, rather than inadvertent obscurity.

Confused recipients of such raw materials may add some of their own uncertainty to that expressed by the analysts. Suspicious recipients may adjust risk estimates upward or downward to accommodate (what they see as) likely biases. Both responses should frustrate those analysts who have tried to do conscientious work and report it as they saw it. They are, in effect, being treated as too different from ordinary folk to be trusted to appraise events occurring in real world. Attention may settle on those few technical issues that prove readily accessible. Perhaps there is some local expertise, perhaps an activist group has summarized the relevant research, perhaps citizens have independent perspectives (e.g., on the validity of evacuation plans or operator behavior models). Technical experts may find this as unduly narrow. Citizens may treat the focal issues as representative of the imprentrable whole. If there is some truth to their suspicions, then citizens may not trust the numbers any more than their producers should.[7,9]

Clarifying the uncertainty surrounding quantitative risk estimates means admitting one kind of subjectivity. That admission is gradually gaining acceptance in professional circles.[5] There is slower growth in awareness of a second kind of subjectivity, the extent to which risk estimates reflect ethical values. Risk analysts have fought hard to create a clear distinction between the facts and values of risk management.[11,12] Doing so, to the maximum extent possible, is a matter of good intellectual hygiene. However, there is a limit to how far it can be done. Values are inherent in risk assessment. They influence, for example, the allocation of resources to studying specific risks or risks in general—and, thereby, produce the data needed to motivate action or quiet concerns. Values are also reflected in how risks are characterized.[13–15] For example, hazards may be ranked differently if their risks are assessed in terms of the probability of premature fatalities or in lost life expectancy (which puts a premium on deaths among the young).

One of the earliest results in risk perception research was the discovery that experts and laypeople might agree about the fatalities that a technology produces in an average year, but still disagree about its degree of "risk." These disagreements seem to reflect differences in how "risk" is defined. One possible difference is that laypeople place greater weight on catastrophic potential. The size of that potential is a topic for scientific research (although one where hard estimates are particularly hard to come by). However, the weight to be given to that potential is a matter of public policy.[16,17]

Risk analysts often seem unaware of such issues, or at least uncomfortable with them. Their assigned job is to produce estimates, not determine social values. However, where the choice of definition affects the estimated riskiness of technologies, they cannot escape some responsibility—any more than cost-benefit analysts can escape the analogous responsibility when they work the other side of the ledger.[18] Unless these assumptions are made explicit, the risk numbers will not speak for themselves.

[5] It is, I believe, advocated in Vice-President Gore's (10) *Reinventing government.*

THIRD DEVELOPMENTAL STAGE

All We Have to Do Is Explain What We Mean By the Numbers

When the numbers do not speak for themselves, explaining them is an obvious next step. Those who attempt such full disclosure face significant technical problems, including a largely unprepared audience. For example, individuals who have only heard confident-sounding experts might misinterpret an explicit expression of uncertainty as evasiveness or equivocation. They might get the impression that scientists are completely confused or that one scientist's guess is as good as any other's. The controversy over climate change sometimes seems to be interpreted in this way. There is considerable overlap in the probability distributions of those scientists who are most and least concerned about greenhouse warming, yet the debate is sometimes interpreted as though "anything goes."

Thus, those who initially introduce a perspective may take some heat for it, as though they were needlessly obscuring or complicating the issue. This realization may account for the reluctance of many sources, including journalists, to use numbers at all, much less probability distributions—or more nuanced expressions of uncertainty.[6] Indeed, the very idea of analysis may be foreign, even offensive.[19,20] As a result, those communicators who first "come clean" may get a mixed reception. Thus, there is a learning process for the public paralleling that for the experts. Those who start on that process will face a messy transition period.

One way to smooth that transition is to pick one's fights carefully. Clearly communicating any number is a complicated task. Therefore, one should focus on those numbers that really matter. All too often, however, communications about risk involve a gush of issues, with little selection. Even widely disseminated communications (e.g., the Surgeon General's AIDS brochure) may fail the test of "why are they telling me this?" Even when an outpouring of information is mandated (e.g., toxic release inventories), it has to be possible to focus attention on those facts that matter the most to their recipients. Telling much more than people need to know can be (and be seen as) deliberately unhelpful.

Communications should tell people things that they need to know. Doing so requires thinking, in detail, about recipients' circumstances. That is a natural part of everyday conversations with specific individuals. It becomes much more difficult with distant and diverse audiences. Merz [21,22] approached the problem of selecting decision-relevant information by creating explicit models of people's decisions. Then he evaluated the impact of learning about various risks on the expected utility of the ensuing choices, assuming that people were rational decision makers. Applied to a medical procedure, carotid endarterechtomy, his procedure showed that only a few of the many possible side effects made any practical difference. Thus, while physicians should hide nothing, their primary obligation should be ensuring that those few critical facts are understood.

Merz's approach assumes that recipients (a) know nothing to begin with and (b) can stop learning once they have mastered a few quantitative estimates. The former assumption often holds with medical procedures. The latter assumption would hold for people who have well-formulated decision problems, and are waiting for a few inputs in order to run the numbers. At times, though, people aren't particularly interested in parameter estimates. Rather, they just want to know how a risky process works. They may need to know how to operate a piece of equipment, or want to monitor activities at a local industrial facility, or hope to follow the public debate over a technology. They may even feel that they can get a better feel for the degree of risk in a process from seeing how it operates than from hearing about some esoteric numbers.

We have attempted to address this need with what we call the "mental models" approach. It begins by creating an influence diagram,[6] showing the factors involved in creating and controlling a hazardous process—as those are understood by science. Individuals' beliefs are elicited using a mixture of open-ended and structured procedures. Those beliefs, or "mental model" are then characterized in terms of the influence diagram, or "expert model." Communications can be crafted to fill gaps, reinforce correct beliefs, and correct misconceptions—with some assurance that the messages are to the point and can be comprehended by recipients.

FOURTH DEVELOPMENTAL STAGE

All We Have to Do Is Show Them That They've Accepted Similar Risks in The Past

While systematic analyses of people's decisions are rare, more casual analyses are quite common. They often

[6] This is a form of directed graph. It is formally related to the decision-tree representation of a choice. That relationship helps to ensure the decision-relevance of the material included in an influence diagram. These properties are not, however, exploited fully in this work (23).

take the form of risk comparisons, in which an unfamiliar risk is contrasted with a more common one. Individuals are invited to use their response to the familiar situation as a guide to action in the new one. Certainly, it is legitimate to seek consistency in one's actions. However, little follows directly from most comparisons. Risk decisions are not about risks alone. One can accept large risks if they bring large benefits and reject small risks if they bring no good.

Even within these constraints, risk comparisons could still be mildly informative. Unfortunately, the specific comparisons often are chosen with rhetorical purpose. Their canonical form then becomes something like, "the risks of Technology X [which we promote] are no greater than those of Activity Y which you do already [so why not accept X?]" The anecdotal experience of many risk communicators is that such comparisons are as unpopular in practice as they are disingenuous in principle. In their well-known guide to risk comparisons, Sandman, Covello & Slovic [24] repeatedly warn that "USE OF DATA IN THIS TABLE FOR RISK COMPARISON PURPOSES CAN SEVERELY DAMAGE YOUR CREDIBILITY." (capitals in the original) Risk comparisons can backfire even when they are created in good faith—by people who find them eminently sensible. Such individuals need to pass through this developmental stage themselves before they can create useful messages for others.

A common corollary of this perspective is to believe that people must want zero risk, if they won't accept a small risk. That observation is often accompanied by homilies regarding how important it is for people to realize that everything has risks.[25] It is, of course, convenient to have ad hominem arguments against people who oppose one's plans. However, the systematic evidence supporting this claim is thin.[26] Moreover, there is no reason to accept any avoidable risks, unless there are compensating benefits. It is altogether possible that people sometimes neglect the small benefit that they receive from technologies that create small risks.[27] Misperceiving benefits is, however, different than having unreasonable aversion to any risk.

FIFTH DEVELOPMENTAL STAGE

All We Have to Do Is to Show Them That It's a Good Deal for Them

People need information about both the risks and the benefits of any activity that might affect them. This realization requires changes in more than just the formatting of messages. Within an organization, it means adding the skills of analysts capable of estimating benefits (both economists and specialists in consequences that cannot be readily monetized). Externally, it means acknowledging the public's right to compensation for risk. That compensation might include reductions in other risks, as well as more conventional payments (e.g., tax abatements, jobs).

Thinking seriously about benefits raises issues analogous to those confronted when estimating risks. For example, analyses can be specified in different ways, with alternative specifications representing different ethical positions—belying their ostensible objectivity.[18,28] Whatever specification is chosen, the uncertainty surrounding its results will have to be assessed and expressed. That uncertainty will include disagreements about parameter estimates and disagreements about fundamental theories.

Together, risk and benefit estimates tell a story that neither does alone. Their juxtaposition alone may prompt changes in risk management—such as redesigning industrial processes, so that they provide an acceptable tradeoff for each person exposed to their risks. If that case cannot be made, then the message will be a disheartening, and perhaps, embarrassing one.

Whatever tale there is in the numbers, it will have to be told. We have rather less experience, and research, regarding the communication of benefits, tradeoffs, and deals. However, the basic research literature suggests some special problems. One class of those problems is "framing effects," in which formally equivalent representations of the same tradeoffs evoke inconsistent evaluations.[29–32] For example, a payment may seem less attractive than a losing gamble when labeled a "sure loss," but more attractive when labeled an "insurance premium." A health program may seem more attractive when described in terms of the lives that it will save, rather than the lives that will still be lost. Explicitly showing the cumulative benefits of a protective measure may enhance its attractiveness, even though they can be inferred directly from its short-term benefits. The relative and absolute increase in risk that a technology causes may seem to demand rather different compensation (e.g., a doubling of risk—from .000001 to .000002).

These effects mean that the attractiveness of an action may depend on how it is presented. That can lead to instability in preferences, as frames vary over time. It can lead to suspicions of manipulation, in the choice of frame. As with risk comparisons, the choice of frame need not reflect malicious intent. People may just present the perspective that makes sense to them. If that per-

spective led to the choice that served their interests, there would be little natural incentive to think hard about alternative perspectives.

It is, of course, also possible to influence perceptions with alternative representations that are not formally equivalent. For example, genetic counselors (and other medical professionals) have found surprising (to them) gaps in patients' understanding of medical conditions (and, hence, the risks and benefits of treatment). As a result, they have focused on what consequences really mean (e.g., what it is like to live with cystic fibrosis).[33] In such cases, fuller descriptions are actually different descriptions. Or, some technical analysts have moved on from comparing risks to comparing options, computing the reductions in risk that are possible with a given investment in competing risk-reduction strategies.[34,35] These comparisons are, however, more rhetorical than meaningful if the funds are not fungible (i.e., if they cannot be moved to take advantage of the best buys in risk reduction). As before, choosing a presentation that favors a particular option may be intentional or inadvertent.

SIXTH DEVELOPMENTAL STAGE

All We Have to Do Is Treat Them Nice

Thus, getting the content of a communication right requires a significant analytical and empirical effort. It means summarizing the relevant science, analyzing recipients' decisions, assessing their current beliefs, drafting messages, evaluating their impact, and iterating the process as needed. Accomplishing these tasks can significantly reduce the chances of producing messages that patently violate the norms of communication.

However, even perfect messages need not be perceived as such. It can take recipients a while to analyze the adequacy of a message carefully. Preceding, or replacing, that effort, recipients may look for more general cues. In particular, they may ask how trustworthy the communication and communicator seem to be. If that first impression is bad, they may look no further or discount some of what they do find. Even with a perfect message, an inappropriate delivery can exact a toll. People want to be treated respectfully, in addition to being leveled with. That desire is, in part, a matter of taste and, in part, a matter of power. People fear that those who disrespect them are also disenfranchising them. In risk debates, charges of incompetence are a (perhaps the) classic path to brushing aside pesky citizens.[36]

The need for a suitable demeanor is increasingly being recognized, whether as a public right or a practical necessity. A popular response to this challenge is training is communication skills. There are enough subtleties to the mechanics of communication that most people can use some help (and not just with risk issues). Some problems with the mechanics of communication are neatly preserved in many published messages. For example, these messages may lack an overview and summary, even though both are known to aid learning. They may impose no obvious logical order on their material. They may use language that is needlessly condescending or technical. Their displays may be cluttered and poorly labeled.[37] Even if these are just "mechanical" oversights, they still can undermine relationships. It takes a sophisticated recipient to forgive a communicator for failing to get professional help. It may have been ignorance or oversight, but still looks like neglect.

In-person communication offers additional pitfalls and opportunities. Blank looks and hostile expressions can quickly show when messages need refinement; ad lib responses may make matters better or worse. Nonverbal cues can support or undermine an overt message. Nervousness over the act of public speaking can be misconstrued as discomfort over what is being said. As a result, training in presentation skills per se make may a real, and legitimate difference, by eliminating unwarranted suspicions. A smooth delivery could, of course, compound problems if the content of the message is inadequate—so that smoothness is seen as a substitute for substance. The ignorant smiles of PR types are a good tool for digging oneself into a hole.

SEVENTH DEVELOPMENTAL STAGE

All We Have to Do Is Make Them Partners

Dispensing niceness is an element of essential decency. It may, however, repel recipients if it seems as though the experts are doing the public a favor, or attempting to cool it out, by preemptively softening opposition. Doing so respects the public's ability to prevent solutions, but not to create them. The only responses of interest are, in effect, "I don't understand you" and "I don't believe you." Often, though, members of the public want, and can fill, a more active and constructive role. At times, they have information to consider. At other times, they may just want a seat at the table. These are components of being partners in risk management.[38]

Anthropologists often use "indigenous technical knowledge" to describe nonspecialists' unique understanding of how their world works.[39] Risk knowledge might be divided into exposure, toxicity, and mitigation information. Laypeople could, in principle, have privileged knowledge about each component.[40] For example, whatever the source of a risk, exposure to it is the result of human activities. Although their knowledge may not be organized in a systematic way, people should have some insight into where they go, how deeply they breathe, what they eat and drink, how long they shower, when they wash their hands, and so on. Careful study may estimate and reduce biases in their perceptions (e.g., self-serving exaggeration of positive activities, overestimating how recently unusual events have occurred).

Analogous arguments surround the strengths and weaknesses of lay beliefs regarding other components of risk. For example, what does it mean when they perceive health effects that science has not established? Or, how should one treat their skepticism about an elaborate official evacuation or inspection or training plan? Might they know something about what motivates people like themselves? Do they have an independent perspective on what motivates technical experts, possibly clouding their professional judgment?

Unless their every suggestion is to be rejected out of hand, it pays to ask. Just asking redefines a relationship, in ways that recognize the public's reality and competence. The sooner one asks, the greater the impact that public concerns will have on the analytical process. Other things being equal, risk data should be collected, vetted, and presented in ways that suit the audience that they are meant to convince. If the experts see things differently, then a mutually respectful relationship will provide a forum for making their case. Or, better, it might allow for bringing lay members up to speed, on that kernel of technical information needed to make policy-relevant judgments.[41]

One of the miracles of democratic life is the ability of lay people, often with little formal education, to master technical material when sufficiently motivated (e.g., by the siting of a hazardous facility). Unfortunately for risk managers, the motivation for this self-education often comes from a feeling of having been wronged. If passions become inflamed in the process, then this learning may produce more heat than light. All sides will be tempted to focus on data supporting their prejudices. Each will master the radical skepticism needed to assail any study having inconvenient conclusions.

Yet, some comprehensive knowledge is a necessary condition for stable beliefs, immune from buffeting by each new result and rumor. Ideally, the more people know about a technology, the more they will like or dislike it—as its true colors emerge.[42] Attracting the interest of people whose minds are still open will require special efforts. Some seemingly successful efforts involve active outreach. For example, the neighbors of an industrial facility might be invited to learn about its activities and, perhaps, join a standing advisory committee.

Such invitations run the risk of revealing problems that people had never imagined. However, they can also show the safety measures taken in recognition of those risks. Moreover, this kind of communication fulfills other conditions of a partnership. It shows an interest in the public without its having to cause trouble or even raise suspicions. It can also reduce experts' fear of the public by offering direct contact, in regulated settings conducive to creating human relations. Those fears can color perceptions, if they create the impression that the experts have something to hide or just dislike the public. Recognizing that they are people, too, with foibles and emotions, is a part of experts' developmental process.

Partnerships are essential to creating the human relations needed to damp the social amplification of minor risks—as well as to generate concern where it is warranted.[23,43] Often controversies over risk are surrogates for concern over process. People feel that they have been treated shabbily. However, they discover that being disgruntled does not have legal standing, while complaining about risks does. After some period of complaint and friction, the ensuing controversies over risk can take on a life of their own.[44,45]

CONCLUSION

Developmental psychologists distinguish between capacity and performance, that is, between having the ability to execute a task and exploiting that potential. Individuals (and organizations) who have gone through a developmental process may still not use what they have learned. That may reflect sloppiness or unwillingness to make the effort.

On purely practical grounds, deciding how much effort to make requires a comparison of the costs and benefits of perfunctory communications. In some ways, communication is like an insurance policy. It is a fixed cost that can prevent larger damage. In evaluating a particular policy, one needs to decide how complete the coverage is, how much protection one can afford, and how much the attendant peace of mind is worth. Like other protective behaviors, it is most easily justified when there is the threat of catastrophic damage.

In making these estimates, the descriptive literature on risk communication can help predict which issues will get out of hand or escape needed attention—in the absence of deliberate competent communications.[46] It can also show something about the ability of communications to help recipients focus their risk-related efforts. In both cases, the evidentiary record is less full than one would like. Moreover, some issues are inherently hard to study, like cases where proactive communication has helped risk issues to play out constructively.

In addition to addressing these pecuniary concerns, effective risk communication can fulfill part of the social contract between those who create risks (as a byproduct of other activities) and those who bear them (perhaps along with the benefits of those activities). That should, of course, be an end in itself. If additional encouragement is needed to make the extra effort, one might invoke the value of preserving a civil society. A complex network of mutually respectful relationships may offer the best hope of reaching agreements, when they are there to be had.

It must, however, be recognized that avoiding all conflict is not a realistic, or even a legitimate, goal for risk communication. It should not and, in an open society, often cannot paper over situations where people are getting a bad deal. The best-case scenario for risk communication (and, indeed, risk management) is having fewer, but better conflicts. Some conflicts would be avoided by preventing needless misunderstandings, others by forestalling (or redesigning) unacceptable projects. Those that remain would be better focused on real issues.

For any of this potential to be realized, risk communication has to be taken seriously. One cannot rely on undisciplined speculation about the beliefs or motivations of other people. One cannot expect to quiet a raging controversy with a few hastily prepared messages. One cannot assume that expensively produced communications will work without technically competent evaluations. Those who ignore these issues may be the problem, as much as the risk is. The price of their ignorance is borne by everyone concerned. The public is demeaned by the experts as being hysterical, while the experts are vilified as being evil.

Ideally, risk management should be guided by the facts. Those facts concern not just the sizes of the risks and benefits involved, but also the changes in political and social status that arise from the risk-management process. A few people make their living from provoking or stifling controversies. Most, however, just want to get on with their lives. As a result, there should be a market for social settings within which the facts matter. However, creating them requires considerable attention to detail. It also requires realistic expectations, tempered by knowledge of how far we have progressed in this developmental sequence, and how much we will invest in applying what we know.

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