Risk Communication

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1 Introduction

Product labeling, patient information leaflets inserted in product packaging, product warning labels—all of these represent ways in which consumers commonly encounter product-related risk information in their daily lives. Today, it is not only considered good business practice to inform consumers of potential risks associated with consumer products, but numerous laws and regulations—varying by product type and jurisdiction—also mandate risk communication to protect consumers from potential harm. Properly done, the communication of product-related risks also implicates actors from across the spectrum of product fabrication and use, including scientists, regulators, legislative representatives, and end users. Considering the highly interdisciplinary nature of the field, practitioners who communicate product risk should be able to understand the complex dynamics of risk communication from a number of vantage points, at both the individual and societal levels.

This contribution starts with a definition of risk communication that should help identify key features of effective risk communication. Those definitional aspects are followed by a section on the risk communication process, which provides practical examples for addressing product-related risks. The remainder of the contribution explores approaches for understanding how people perceive and interpret risk, and how producers might effectively communicate risk to consumers. Several theories have been proposed to explain why people evaluate and respond differently to risks and hazards. Thus, the contribution divides the major theoretical

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approaches into three groups: psychological approaches, sociological approaches, and interdisciplinary approaches.

Psychological approaches to understanding risk communication focus on factors that influence perceptions of risk at the individual level. In this contribution, both cognitive (unrealistic optimism) and affective (risk as feelings and affect heuristic, functional emotion theory) factors are introduced and their implications for risk communication are discussed. Scholars tend to emphasize the importance of risk information-seeking and processing as tools for making better risk decisions; the contribution thus explains important considerations for promoting those information behaviors. Beyond individual-level risk, this contribution also explores sociological contributions to risk factors at the group level (cultural theory), and it evaluates interdisciplinary (social amplification of risk) approaches to understanding perceptions of risk. Each sub-section concludes with practical insights for communicating risk.

2   Defining Risk Communication

Risk communication refers to an exchange of information about the "risks caused by environmental, industrial, or agricultural processes, policies, or products among individuals, groups and institutions" (Glik 2007, p. 34). Although risk communication comes in many different forms, in this contribution, the term refers to the communication of health, safety, or environmental risks associated with consumer products. Previously, risk communication had been considered a one-way form of communication, with consumers being told what the experts or companies consider important. With growing demand for consumer involvement in risk management, however, risk communication is now considered a two-way, interactive process involving informational exchanges between different groups of key players, including consumers, experts, companies, organizations, and institutions.

The primary objective of risk communication is to improve the match between the actual magnitude of a risk issue and the magnitude of risk that consumers perceive and to which they respond. Thus, to act as a bridge between the experts/companies and consumers, communication practitioners should develop a strong understanding of the risk issue as well as consumers' concerns, feelings, and reactions toward the risk issue. Recognizing the reasons behind a perceptual gap between the consumers and the expert/company constitutes one of the most critical enterprises in the practice of risk communications. Furthermore, communicating risk often involves information or messages that may be threatening to consumers, and which may trigger defensive reactions, unnecessary fear, misunderstanding, or suspicion. Risk communicators must therefore be able to diffuse these potential consequences by showing empathy and exercising negotiation skills, while also protecting their credibility and trustworthiness with the public.

Fig. 1 Risk
communication process

3 Processes of Risk Communication

As outlined above, risk communication is an interactive process involving informational exchanges between different stakeholders to address potential hazards or risks associated with consumer products. Several steps are involved in the development and execution of an effective risk communication program. As Fig. 1 illustrates, the process starts with identifying and assessing potential risks, and finishes with program evaluation.

3.1 Step 1: Identify and Assess Risk

Risk identification refers to the process of determining potential threats to the environment or human safety and health (in this contribution, as posed by consumer products). This critical first step in the risk management process allows companies to prevent product returns and recalls, and it reduces the threat of litigation that may arise if consumers are placed in danger. The objective is the early and continuous identification of product risks that may cause harm to consumers and their environments. To meet that objective, risk assessments are performed at different stages, from the product design to manufacturing. In many parts of the word,

product risk assessments of this sort are not mandatory, but in other jurisdictions, companies may be required by law to conduct product risk assessments (e.g., for toys in the US and EU). For example, governments frequently adopt into legislation elements from the international standard *ISO 10377: Consumer product safety—Guidelines for suppliers*, which offers practical guidance about product risk assessment such as hazard identification, the development of injury scenarios, and evaluations of the probability and potential severity of injuries.

3.2 Step 2: Determine Communication Needs and Objectives

Not all product risks can be eliminated, even after their identification through risk assessment. The subsequent step, then, in cases where some level of product risk persists, is to inform consumers of those potential product risks. A successful risk communication should have a defined purpose and set of objectives, because the tactics used to communicate risk may differ according to distinct goals. Potentially five different objectives may be established for risk communication (Kasperson et al. 1992): (1) to diagnose and maintain public trust; (2) to increase awareness of risks; (3) to improve public understanding of risk; (4) to develop mediating skills; and (5) to mobilize the public. Risk communication can further be divided into several categories depending on its purpose: care communication, consensus communication, crisis communication, and product communication (Lundgren and McMakin 2013; Ng and Hamby 1997).

3.2.1 Care Communication

The purpose of care communication is to inform consumers about potential risks and to educate end users on the effective means to reduce such risks, based on scientific evidence. As an example of the importance of relying on scientific information, coffee drinking was associated with an increased cancer risk as early as the 1980s. However, twenty-five years after classifying coffee as a possible carcinogen leading to bladder cancer, the World Health Organization removed coffee from the list of cancer causes in light of cumulative evidence suggesting no link between cancer and coffee drinking. Conversely, shampoo and other body care products routinely inform consumers about the dangers associated with swallowing; this is intended to reduce proven risks of intestinal illness or discomfort as a result of ingestion.

3.2.2 Consensus Communication

Consensus communication aims to inform and encourage relevant stakeholders to work together in order to make a decision about how the risk should be managed

(Lundgren and McMakin 2013). Typically, consensus communication involves activities such as panel discussions, public consultations, and audience interactions. Engaging in this sort of public involvement enables an organization or company to improve its decision-making processes, but just as importantly, it enhances the firm's local credibility. Communities are also more likely to accept decisions made with their input, which may reduce the likelihood of legal delays and political pressure (Sandman 1985). An example would be a citizens' advisory panel, a group of experts, and representatives from a governmental agency working together to decide on the location for a new nuclear energy facility.

3.2.3 Crisis Communication

Crisis communication aims to manage perceptions around unpredictable events that might threaten the product-related expectations of key stakeholders; such events include disease outbreaks and natural/human-caused disasters. Communication objectives during a crisis may seek to inform, convince, or motivate certain stakeholders to take some form of essential action, though the key objective in these circumstances is often damage control—an effort to prevent drastic negative changes in the relationship between stakeholders (Sturges 1994). The Tylenol crisis in 1982, which involved a series of poisoning deaths resulting from drug tampering in Chicago, constitutes an exemplary case of successful crisis communication (Lazare 2002). Johnson & Johnson immediately warned the public of poisoning risks and proactively issued a nationwide recall of Tylenol products. This incident led to reforms in over-the-counter substance packaging and in federal anti-tampering laws (Mitchell 1989).

3.2.4 Product Communication

Product communication intends to inform consumers about product risks particularly when introducing a new product. This type of risk communication is often mandated by regulations and has become more important as failure to properly inform consumers of product risks puts companies at exposure to large-scale lawsuits. Chemical companies, for instance, communicate potential hazards of their products through product labels, product health/safety bulletins, and material safety data sheets (MSDS). An example would be creating public awareness around the environmental and health risks associated with using pesticides. According to WHO specifications (WHO 1985), pesticides should be packaged and labeled in English or in the local language, and labels should indicate the contents, the proper safety instructions (warnings) to follow, and possible measures to take in the event of contamination or swallowing.

Pharmaceutical manufacturers also use product labeling (the Summary of Product Characteristics, SmPC), patient information leaflets (package inserts), and product warning labels to inform consumers about product risks. One of the

major challenges to product communication is delivering the risk information in an easy-to-understand format while also ensuring that the instructions are comprehensive and accurate. In developing a patient information leaflet, for instance, it would be important to avoid using technical jargon that only medical experts can interpret.

3.3   Step 3: Selecting Potential Audiences

Owing to the fact that a wide range of individuals and groups have a stake in the risk-related aspects of any product, it is important to properly identify these stakeholders and to understand their distinct views and concerns. In developing a communication program, risk communicators may prioritize target audiences depending on their roles and the magnitude and probability of the risks they face. For instance, in communicating risks related to children's products (e.g., toys), parents are the primary target audience as they make purchase decisions and serve as caregivers for the children who cannot make proper risk-related decisions themselves.

Communicative approaches—in terms of the content, tactics, and strategies—differ based on the intended audience largely as a function of their knowledge of the issue, their attitudes toward the company, and their reading level and numeracy skills. Understanding the intended audiences' perception of risk is thus an essential step in creating successful risk communication. Risk perception refers to "people's beliefs, attitudes, judgments and feelings, as well as the wider social or cultural values and dispositions that people adopt, towards hazard and their benefits" (Pidgeon et al. 1992, p. 89). As indicated in this definition, because each audience tends to have some commonality or shared identity, risk perception should be understood against the societal and cultural background, beyond the individual-level process.

For instance, the cultural theory of risk (Douglas and Wildavsky 1983) suggests that social aspects and cultural adherence shape how we perceive and respond to risk. Accordingly, variation in social participation can be accounted for by the interaction between the two dimensions: (1) the strength of allegiance to a group (the group axis) and (2) the extent of regulation within or outside of the group (the grid axis). Using the group-grid scheme, four kinds of social environments exist: individualism ("low grid, low group", protecting individual freedom) versus fatalistic ("high grid, low group", indifferent about risk), and hierarchical ("high grid, high group", relying on experts) versus egalitarian ("low grid, high group", striving for equality). Risk communicators should take these distinct social and cultural environments into account when developing strategies for effective risk communication.

3.4   Step 4: Develop Risk Messages

3.4.1   Comprehension and Accuracy

Risk information or messages should be appropriately suited to audiences' reading levels, prior risk experience, and perceptions/feelings about risk, in order to enhance comprehension. Instead of using technical terms that are unfamiliar to an audience, risk communicators should develop more easily understood terms with clear definitions. Using comparisons is a common strategy to enhance comprehensibility, as people often find it difficult to understand probability-based risk estimates (Slovic 1987). For instance, the risk associated with a particular new product can be compared to similar products' risks, to natural background levels, or to regulatory standards. To ensure comprehensibility, it is always desirable to pretest the developed risk messages through focus groups or in-depth interviews with members of the target audience prior to implementation.

Risk communication inevitably involves some degree of uncertainty. When delivering research findings in particular, uncertainties should be clearly acknowledged by addressing the study's limitations and caveats, expert disagreements, and inconsistencies. Because uncertainty can be perceived as incompetence, risk communicators should deliver factual information supported by cumulative research evidence and reviewed by an expert panel.

3.4.2   Fear Appeal

Fear inducing messages are often used, particularly in health campaigns, to promote protective behaviors or to deter unhealthy behaviors. The process of inducing fear works by raising the prospect of personal risk vulnerability, and by underscoring the severity of harm associated with unhealthy behaviors. According to the Extended Parallel Process Model (EPPM; Witte 1994), there are potentially two different coping strategies that audiences may adopt when they face fear-inducing messages: danger control and fear control. Danger control allows audiences to take precautionary actions to reduce personal risk, whereas fear control leads to maladaptive behaviors (e.g., avoiding risk information) as a self-defense mechanism. When fear is aroused, audiences can activate danger control, instead of fear control, only when they perceive themselves as capable of managing the risk. To promote protective behaviors using fear appeal, risk communicators should provide information on effective ways to reduce the risk (*response efficacy*) and on the audience's competence to perform those actions (*self-efficacy*).

3.4.3 Message Framing

Persuasive outcomes differ depending on how messages are framed. Although not all risk communication involves persuasion, message framing can be useful for changing perceptions of and solutions to risk. For instance, news framing research suggests that news coverage featuring an individual who suffers from a problem (episodic frame) makes readers more likely to attribute responsibility to the individual than to society, compared to coverage that focuses on the issue's overall impact in society (thematic frame) (Iyengar 1991). When the objective is to promote society-wide solutions to a risk issue (e.g., to establish a new policy), it might thus be useful to employ a thematic frame as opposed to an episodic frame; doing so would likely serve to emphasize society-level responsibilities in addressing the risk issue.

Many persuasion scholars have investigated the relative persuasive efficacy of gain- and loss-framed messages. A gain-frame focuses on the benefits and positive outcomes of taking the recommended action, whereas a loss-frame focuses on the costs and negative outcomes of not taking the recommended action. According to Prospect Theory (Kahneman and Tversky 1979), people tend to seek risks when the message is loss-framed and to avoid risks when the message is gain-framed. For instance, a loss-frame tends to perform better in promoting detection behaviors (e.g., cancer screenings), which involve the potential to receive negative risk information (Rothman and Salovey 1997). In promoting prevention behaviors aimed at achieving desirable outcomes (e.g., regular exercise), on the other hand, a gain-frame tends to be more persuasive than a loss-frame (Rothman and Salovey 1997).

Prior research suggests that the relative efficacy of gain- and loss-frames differs by individual predispositions, such as one's cultural worldview. In particular, evidence suggests that loss-frames are more effective than gain-frames at increasing policy support to address risk for those with a hierarchical worldview; however, the reverse appears to be true for those with an egalitarian worldview (Nan and Madden 2014). Combined with the cultural theory of risk (Douglas and Wildavsky 1983) explained earlier, gain-loss framing could be useful in risk communication when matched with the intended audience's cultural worldview.

3.4.4 Visual Presentations

Proper use of visuals can significantly improve an audience's understanding and recall of risk information. The use of bar graphs and pie charts in product labels, for instance, has been shown to improve consumer comprehension of nutrition information, compared to text-only product labels (Geiger et al. 1991). Visuals also help clarify abstract or complex concepts in risk information by allowing audiences to construct mental models (Graber 1990).

Product warning labels, such as those used for prescription drugs and household chemicals, often utilize visuals and graphics to convey product risks. For instance, graphic warning labels on cigarette packages have been found to improve consumer knowledge about the risks from smoking (Hammond et al. 2006); thus, such warning labels are now mandated in many countries. The United Nations Economic Commission for Europe and its partners developed a worldwide voluntary guideline for labeling chemical hazards, which requires specific symbols on labels to indicate particular hazards (e.g., a white jagged star inside a human silhouette to indicate a health hazard). These symbols can be applied to pharmaceutical packages to prevent children or pregnant women from taking certain medications. Because symbols may have different meanings in different cultures and industries, it is important to pre-test those symbols with target audiences prior to actual implementation.

3.5 Step 5: Select a Media Vehicle and Execute

Risk communicators utilize multiple media platforms, from traditional media (e.g., newspaper, radio, television) to social network platforms, to disseminate risk information through advertisements and press releases. Beyond diverse media outlets, risk communicators also frequently adopt more interactive approaches that involve public participation such as community meetings, panel discussions, and public consultation. Other tactics include brochures, information packets, fact sheets, newsletters, videotapes or slide shows, product inserts, and warning labels.

The selection of an appropriate media vehicle and tactic largely depends on the objective of risk communication and the characteristics of the intended audience. For example, mass media-based advertisements are typically effective at disseminating risk information. News coverage, conversely, is useful for increasing the salience of a particular risk issue in the public's mind. Because preferences over the outlet type and exposure levels vary by the audience, audience analysis can assist with the selection of appropriate forms of media through which to communicate risk.

3.6 Step 6: Evaluate the Communication Program

The evaluation of an overall risk communication program is an important final step that allows risk communicators to learn from their experience and mistakes. Evaluation can begin at the early stages of a program in order to identify issues and to make adjustments regarding the remaining program components. Like many other communication practices, however, it is a challenging task for risk communicators to document actual changes in knowledge, perceptions, and behaviors that result from program exposure. Thus, it is desirable to establish a baseline or

comparison group in order to draw the most accurate conclusions possible about the effects of a risk communication program. Feedback from the audience, gathered through post-program surveys, focus groups, or interviews, can help to identify issues such as definitional problems, conflicting expectations, and communication barriers, and thus to ensure the continual improvement of the risk communication program.

4 Unrealistic Optimism and Debiasing Risk Communication

People tend to believe they are not vulnerable or less likely than similar others to experience illness, injury and other negative health issues (Weinstein 1980). Unrealistic optimism about personal risk is a well-documented phenomenon in the literature across a wide range of topics and different populations. By negating one's own vulnerability, individuals are able to maintain positive self-view (e.g., healthy) and reduce anxiety that may be caused by thinking of uncontrollable future occurrences (Taylor and Brown 1988). However, underestimating one's own risk could be problematic because it may reduce attention to risk information and the performance of risk-reducing behaviors (e.g., Radcliffe and Klein 2002).

4.1 Conceptualization and Consequences

Understanding the consequences of optimism about personal risk (or perceived invulnerability) requires a careful examination of how the construct is conceptualized. People can be optimistic about their risk either *absolutely,* by considering their own risk to be lower than the actual level of risk they face, or *comparatively,* by believing their own risk to be lower than what they believe to be the average risk. Scholars have less frequently investigated absolute optimism by dint of the evidentiary difficulties that arise in obtaining the actual level of risk to which risk judgments can be compared in gauging the existence of absolute errors. Comparative risk is considered psychologically important given that people's understanding of risk in terms of odds and probabilities is limited and subject to cognitive errors (Slovic 1987). Also, social comparisons constitute an important part of how people understand their own personal risk.

Scholars have emphasized the importance of distinguishing optimism from bias or illusion (Dillard et al. 2009). While people typically consider themselves to be less vulnerable to risk in a comparative or an absolute sense, this estimation may be either correct (realistic) or incorrect (unrealistic optimism or unrealistic pessimism), depending on the individual's actual level of risk (Dillard et al. 2009). For example, if an individual estimates his or her own risk of pesticide poisoning to be

Table 1 Categorization scheme for identifying unrealistic optimism

Comparative risk perception	Actual comparative risk		
	Below average	Average	Above average
Own < Other's risk	Realists	Unrealistic optimists	Unrealistic optimists
Own = Other's risk	Unrealistic pessimists	Realists	Unrealistic optimists
Own > Other's risk	Unrealistic pessimists	Unrealistic pessimists	Realists

low because the person does not use pesticides (i.e., low actual risk), then it would be inappropriate to consider this person as unrealistic.

Comparative optimism and unrealistic optimism have often been conflated in studies, yet they differ critically. The former refers to a relative risk judgment irrespective of the accuracy of that belief, while the latter refers to a *mistaken* belief that one's risk is lower than that of other people or of one's actual risk (Radcliffe and Klein 2002). The appropriate identification of such biases thus requires an objective criterion for measurement and comparison (e.g., actual comparative or absolute risk). To determine whether "being biased" is consequential, one must be capable of identifying distorted risk perceptions at the individual level. Table 1 shows the categorization scheme for identifying unrealistic optimism.

Emerging evidence exists to suggest that unrealistic optimism, but not comparative optimism, has negative health consequences. Researchers have suggested that people's comparative risk judgments are often ordinally accurate and do not have negative implications; that suggests little need for making comparative judgments the target of interventions (e.g., Radcliffe and Klein 2002). Although high-risk individuals like smokers or siblings of cancer patients do tend to underestimate their own personal risk, they at least tend to estimate their risk to be higher than that of low-risk individuals such as non-smokers or people without a family history of cancer (e.g., Strecher et al. 1995).

Distinctly different patterns have been reported with respect to unrealistic optimism. Unrealistic optimists, as defined in terms of identifying bias, tend to perceive themselves to be at lower risk despite their actual high risk standing (Radcliffe and Klein 2002). More importantly, evidence indicates that unrealistic optimists often employ ego-protective strategies that help them to sustain their unrealistic beliefs, such as avoiding risk information and downplaying the riskiness of their behavior (Radcliffe and Klein 2002; Klein 1996). In a longitudinal study using a sample of college students, unrealistic optimism about alcohol-related negative events was associated with a greater number of respondents who actually experienced those events at subsequent time periods (Dillard et al. 2009).

4.2   Psychological Mechanisms and Interventions

Weinstein (1984) recommended several strategies to better endorse risk-reducing behaviors by changing risk perceptions such as emphasizing the association

between behavior and susceptibility, providing specific behavioral objectives, and offering others' preventive actions. Although some interventions were successful, many theory-driven intervention strategies have failed to change the bias in personal risk assessments (e.g., Weinstein and Klein 1995; Klein 1996). A better understanding of the psychological mechanisms related to how unrealistic optimists become biased serves an important starting point for tackling such biased perceptions.

Unrealistic optimism is thought to originate from multiple psychological factors that are quite difficult to tease apart. The most prominent explanations include (1) self-serving motivations to protect and maintain a positive self-image, and (2) cognitive errors in processing risk information due to egocentrism (which leads to a failure to think carefully about others' risk status), a lack of information about other's self-protective behaviors, and selective focus on one's risk-reducing factors (e.g., Weinstein 1980).

Egocentric thinking in the context of risk judgment refers to an inability to access information about other's risk levels while focusing exclusively on one's own risk factors. Based on the assumption that unrealistic optimism results from unmotivated errors in understanding the risk that people face—particularly others—, providing individuals with risk information that they had been unaware of or had overlooked is frequently cited as a remedy for such misunderstanding (e.g., Weinstein and Klein 1995). This informational approach has not always been successful in changing risk perceptions, however, suggesting that unrealistic optimism is not caused solely by unmotivated cognitive errors.

People tend to adopt various cognitive strategies to justify their own past unhealthy behaviors and to maintain a positive self-view (Klein 1996). This self-serving motivation often creates a situation in which unrealistic optimists resistant to correction via information interventions (Klein 1996; Weinstein and Klein 1995). Instead, addressing overlooked personal risk factors could actually prompt defensive information processing and interpretation, particularly in contexts in which an individual is motivated to self-defend (Weinstein and Klein 1995). For instance, when comparative optimism was directly challenged in research studies, people tended to hold on to their superiority either by distorting their memory about their own past unhealthy behaviors or by lowering the relevance or importance of these behaviors to their health (Klein 1996).

4.3   Practical Insights

Considerable evidence suggests that both cognitive and motivational factors contribute to the emergence of unrealistic optimism about personal risk. Informing individuals about the risk status of others or about behaviors for reducing risk is likely to reduce comparative risk judgments by lowering risk estimates about others, but those strategies are unlikely to influence personal risk estimates. As previously discussed, however, comparative optimism is typically of less concern

given that it is associated with rather positive outcomes. Thus, no strong grounds exist to argue in favor of providing other's low-risk information as a strategy for changing an individual's unrealistic optimism about personal risk. Instead, it seems crucial to identify those who have unrealistic risk judgments and to inform these individuals about their personal risk standing. The key to this process would be the reduction of possible defensive reactions, considering that unrealistic optimists are likely to be defensive.

Two intervention strategies have the potential to bring unrealistic optimists' perceived risk in line with their actual risk level: (1) eliminating the need for self-defense (via self-affirmation) before exposure to personalized risk information, and (2) providing vicarious experiences through narratives that depict a person who shares a similar risk profile with the audience. In the context of alcohol-related problems among college students (Kim and Niederdeppe 2016), for example, providing risk information to unrealistic optimists while also protecting their self-concept via either self-affirmation or narratives, tends to reduce defensive reactions and to align their perceived risk more closely with their actual risk. These intervention strategies are based on an educational approach (rather than using deception techniques), which can be applied to risk communication campaigns.

5   The Role of Affect in Risk Communication

Emotions are generally viewed as internal, mental states representing evaluative, valenced reactions to events, agents, or objects that vary in intensity (Ortony et al. 1988). Emotions are thought to be specific, focused, and foregrounded in consciousness; this puts emotions in contrast to mood, which is often viewed as a diffuse background affect of uncertain cause (Dillard and Peck 2000). Risk communication scholars have emphasized the role of emotions in interpreting and responding to potential hazards and risks. In this section, major concepts and theories relevant to the role of emotions are outlined and their implications for risk communication are discussed.

5.1   *Risk-as-Feelings and the Affect Heuristic*

Because emotions and affective reactions are triggered automatically, often before conscious evaluation of a risk, they offer important information about how individuals perceive risk situations. Scholars who investigate the role of affect in decision-making processes have noted a distinction between anticipated affect and anticipatory affect, especially in response to risks and uncertainties (e.g., Loewenstein et al. 2001). While anticipatory affect is "immediate visceral reactions (e.g., fear, anxiety, dread) to risks and uncertainties" (Loewenstein et al. 2001, p. 267), anticipated affect does not include immediacy but expected to be

experienced in the future. The risk-as-feelings perspective (Loewenstein et al. 2001) posits that factors such as anticipated outcomes (including anticipated affect) and subjective probability related to a risk influence an individual's feelings about the risk. This emotional reaction to risky situations, in turn, leads to a behavioral response to the risk either with or without mediation from cognitive evaluations about the risk. When emotional reactions are not in agreement with cognitive assessments of risk, the emotions often drive behavioral responses to those risks.

The affect heuristic explains how an individual's affect can change the way he or she makes risk decisions. People tend to make those risk decisions relying on their current emotion or "affect pool" as a cue about the judgment of a risk (Finucane et al. 2000); this subconscious process occurs quickly and efficiently as it allows the individual to shorten the decision-making process. The affect heuristic is often, then, used to make judgments about the risks and benefits of a particular situation or object based on the positive or negative feelings that people relate to that situation/object. Specifically, the negative relationship between perceived risk and benefit is closely related to the strength of positive or negative affect associated with the situation/object. For instance, if an individual's feelings toward a particular consumer product are negative, he or she will be more likely to judge the risk as high and the benefits low. In contrast, if an individual's feelings toward the product are positive, he or she is likely to evaluate the risks as low and the benefits high, even when doing so is logically unwarranted for that product. This suggests that a strong affective response toward a consumer product can change an individual's judgment about the product's risks and benefits, which could be an illogical judgment.

5.2   *Functional Emotion Theory and Crisis Emotions*

Functional emotion theory explains how different emotions influence the mobilizing and allocating of mental and physical resources for person-environment interactions. Generally, emotions operate as basic information processing systems designed to deal with a certain, limited set of person-environment relationships (Lazarus 1991); they signal the mobilization of psychological and physiological resources in response to that context (Dillard and Peck 2000). This action tendency is related to physiological changes, which in turn influence future perceptions, cognitions, and behaviors in accordance with the goal set by the action tendency (Lazarus 1991).

Emotions play an important role in how individuals respond to risk information in the sense that emotions serve as a frame, influencing the way in which information is gathered, stored, recalled, and used to make risk judgments. When emotion is evoked, its associated action tendency guides information processing and influences selective attention and recall (Nabi 2003). For instance, the public would be more open to mobilization efforts and stronger penalties for criminal offenses if an anger frame is repeatedly used with crime stories focusing blame on perpetrators.

This suggests that message-relevant emotions can lead to selective processing of emotion-relevant information, and, in turn, to decision-making.

Fear is typically considered an avoidance emotion, while anger is treated as an approach motivation that triggers action on the part of the consumer (Frijda et al. 1989). Because different emotions trigger different action tendencies, it is important to identify discrete emotions associated with a risk event, particularly a crisis that may trigger stronger emotional reactions. Emotions can be broadly divided into two categories, negative and positive.

5.2.1 Negative Emotions

Four primary negative emotions are associated with a crisis (Jin and Cameron 2007): anger, sadness, fright, and anxiety. In response to the September 11 terrorist attacks, anger, sadness and fear were the three most dominant negative emotions (Fredrickson et al. 2003). Based on the functional emotion theory, negative emotions promote selective processing of available information about a crisis and guide decision-making, which then influences attitudes toward the issue and the organization in crisis. For example, anger aroused by a toxic waste dumping story is associated with greater support for punishing goals compared to goals relating to systemic change or helping victims.

5.2.2 Positive Emotions

The role of positive emotions in a crisis has been largely neglected in the literature, in large part because they are considered to be less intense and less enduring than negative emotions. However, scholars emphasize that people in stressful situations experience both negative and positive emotions (Fredrickson et al. 2003); while positive emotions may seem inappropriate in the context of crisis, positive emotions indeed co-occur alongside negative emotions. For instance, gratitude, interest, and love were the three most frequent positive emotions noted in studies following the September 11 tragedy (Fredrickson et al. 2003).

Positive emotions not only provide more pleasant subjective experiences than negative emotions, but they also help reduce the focus on negative emotions. More specifically, they tend to work as a "breather" by undoing physiological arousal and enhancing broadminded coping (Fredrickson et al. 2003). As opposed to negative emotions that narrow people's attention to specific action tendencies (e.g., attack), people's attention, thinking, and behavioral repertoires are widened by positive emotions (Fredrickson et al. 2003). Applying these effects to the crisis context, positive emotions can aid an organization by allowing stakeholders to be more flexible in interpreting a crisis situation and to be more open-minded in the processing of relevant information. Positive emotions might also mitigate the impact of negative emotions on organizational reputation and may encourage stakeholders to engage in active communication.

5.3   Practical Insights

Emotions play a key role, often times more than cognitive evaluations of risk, in interpreting and responding to risks. Furthermore, because people tend to evaluate risk by relying on their current emotion as a heuristic cue, their risk decisions do not always correspond to the actual level of risk that they face. To promote more accurate evaluations of risk, practitioners would thus need to address illogical conclusions that could be drawn from heuristic thinking and to encourage consumers to consider probability-based assessments of product risk. In light of functional emotion theory, it would be also beneficial to understand the specific types of emotions that could be triggered by a particular risk issue or crisis, along with the associated action tendencies. For instance, the core action tendencies of fear and anxiety are changing plans in order to enhance protection or learning (Dillard and Peck 2000). Thus, if fear and anxiety are the dominant emotions to emerge in a crisis situation, risk communicators would need to provide information that reduces uncertainties or that offers other means to address protection and learning goals.

6   Risk Information Seeking and Processing

Information seeking and processing are critical components of risk decision-making, yet individuals vary greatly in their capability and motivation to engage in these processes. It is thus important to understand when individuals are likely to seek out risk information and how they are likely to process it. The risk information seeking and processing model (RISP; Griffin et al. 1999) explores predictors of these risk information behaviors guided by the heuristic-systematic model (HSM; Chen and Chaiken 1999) and the theory of planned behavior (TPB; Ajzen 1991). In this section, key components and predictions of the RISP model are introduced and its implications for risk communication are discussed. Fig. 2 offers a visual representation of the model.

6.1   The RISP Model

6.1.1   Information Seeking and Processing

In keeping with the dual processing models in psychology (e.g., HSM, Chen and Chaiken 1999), two types of information processing exist: systematic and heuristic. These two processes differ in the amount of mental energy an individual exerts to process the information at hand. Systematic processing requires both cognitive ability and motivation to process information in a relatively analytic and
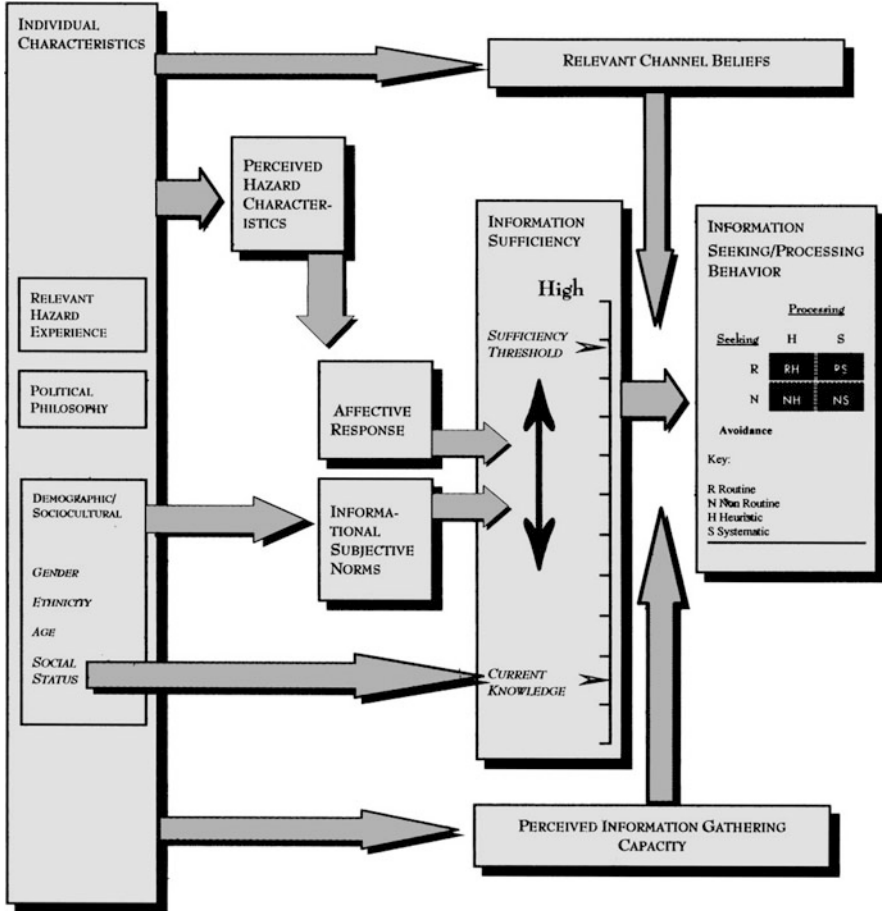
Fig. 2 Risk information seeking and processing model (adopted from Griffin et al. 1999)

comprehensive manner. On the other hand, heuristic processing makes fewer cognitive demands on the individual, as it relies primarily on cognitive shortcuts or "heuristics". While utilizing a mental shortcut has pragmatic benefits, it may also lead to flawed or biased risk decisions. Not surprisingly, compared to heuristic processing, systematic processing has been found to promote more long-lasting attitudinal and behavioural changes (e.g., Chaiken et al. 1989).

Information seeking refers to a volitional process of attempting to obtain desired information by selecting relevant information channels. Like processing, RISP suggests that information seeking can involve more or less mental effort: one could heuristically seek risk information through routine media exposure such as watching a TV news program after dinner, or, on the other hand, one might purposefully search for particular risk information via nonroutine media channels. The latter would be an example of engaging in systematic information seeking.

6.1.2   Model Components and Predictions

The primary proposition of RISP is that individuals seek out and process risk information depending on their subjective assessments of the gap between what they know about a risk and the extent to which they feel sufficient to respond adequately to that risk (*information insufficiency*). Based on "accuracy motivation" (Eagly and Chaiken 1993), systematic information seeking and processing occur only when one is sufficiently motivated to engage in the tasks required to achieve a desired degree of judgmental confidence regarding a risk decision (*sufficiency threshold*). Thus, a low sufficiency threshold activates heuristic seeking and processing, whereas a high sufficiency threshold promotes systematic seeking and processing. In a meta-analytic study (Yang et al. 2014), current levels of knowledge, rather than a sufficiency threshold, explained a larger share of the variance in predicting information seeking and processing. That suggests that individuals may not accurately estimate the amount of information they need to make proper risk decisions when dealing with less familiar risks, so the RISP model may have more practical utility in addressing risks that are relatively familiar to the respondents (Yang et al. 2014).

Informational subjective norms (ISN), derived from TPB (Ajzen 1991), refer to perceived normative pressure to engage in information seeking and processing. Based on "impression motivation" (Eagly and Chaiken 1993), individuals are more likely to seek and process risk information when they are under greater normative influence from close confidantes or loved ones. Evidence indicates that ISN does influence information seeking and processing, both directly and indirectly via changing information insufficiency (Kahlor 2010). Meta analytic studies suggest that ISN is the strongest predictor of risk information seeking and processing (e.g., Yang et al. 2014).

Two other major components in the RISP model moderate the relationship between information insufficiency and information behaviors: perceived information gathering capacity and relevant channel beliefs. *Relevant channel beliefs (RCB)* refers to perceptions about the nature and quality of available information (e.g., useful, unbiased, trustworthy). Individuals are more likely to utilize a particular information channel when they perceive that channel to deliver information that is most relevant to them. Information seeking typically involves multiple channels, which may vary by the context and information needs. Due to the corresponding challenges in conceptualizing and operationalizing RCB in clear and consistent ways, recent RISP studies (e.g., Kahlor 2007, 2010) have adopted the concept of behavioral beliefs, derived from TPB (Ajzen 1991), to assess people's beliefs about information seeking behaviors.

The RISP model accounts for the capacity, in addition to the motivations, that individuals possess to seek and process risk information. *Perceived information gathering capacity (PIGC)* refers to the perceived ability to acquire needed risk information from information channels. Similar to the concept of self-efficacy (Ajzen 1991), which has been suggested as an important predictor of behaviors,

individuals with higher capacity will find it easier to identify the most relevant and valuable information needed for their risk decision-making. Although the original RISP model suggests that PIGC is a key factor in promoting systematic information seeking and processing (and reducing heuristic processing), studies have found inconsistent evidence in support of that claim (e.g., Kahlor 2007), suggesting that PIGC may play a marginal role in the model (Yang et al. 2014).

The RISP model also proposes several antecedents to information insufficiency including cognitive evaluations of and affective responses to a particular risk. Cognitive evaluations of risk are termed *perceived hazard characteristics,* and are commonly conceptualized based on two dimensions: perceived likelihood and severity. Although the RISP model also includes affective responses to risk, particularly in the form of worry, the model focuses more heavily on cognitive factors. Other individual-level difference factors in the RISP model (e.g., demographic factors, past experience) serve as distal predictors of information behaviors, but their predictive power has been relatively small compared to other RISP factors (Yang et al. 2014).

6.2   Practical Insights

The RISP model offers useful insights for the design of risk messages and campaigns. For instance, practitioners who communicate risks should address the key potential motivators of risk information seeking and processing, such as accuracy motivation (relevant to information insufficiency) and impression motivation (relevant to ISN) (Eagly and Chaiken 1993). In light of the meta-analytic findings suggesting that ISN is the strongest predictor of information behaviors (Yang et al. 2014), it would be most useful to emphasize what is expected of the audiences by important referent groups, for instance, by increasing the salience of social environment where they can observe the behaviors and expectations of important others. Perceptions about the quality of an information channel can also play an important role in seeking and processing risk information from that channel. Thus, in selecting media vehicles, risk communicators should take into account the credibility and relevance of the media source in order to improve the likelihood that the intended audience will indeed be exposed to the message. Although the RISP model addresses both systematic and heuristic processing, the heuristic processing variables in the model show only limited explanatory power (Yang et al. 2014). More work is needed to better understand the factors associated with heuristic processing and the manner in which heuristic processing shapes risk assessments.

7   Social Amplification of Risk

Many risk scholars have been interested in understanding the gap between how experts and lay audiences assess risk. In particular, relatively minor risk events as evaluated by experts often elicit public panic and concern, thereby generating significant social consequences. Why might experts and lay audiences interpret risk events so differently? The social amplification of risk framework (SARF; Kasperson et al. 1988), a conceptual framework for understanding the processes of amplification and attenuation of public risk perceptions, offers plausible explanations to answer this question. Since its introduction in 1988, this framework has received widespread attention from both scholars and practitioners, serving as a useful conceptual tool for examining the social experience of risk. Figure 3 visually presents the framework.

7.1   Social Amplification of Risk Framework

The SARF describes the social mechanisms underlying the communication of risk messages, while integrating the cultural-, societal-, and individual-level structures that shape the public experience of risk. Its primary proposition is that risk events interact with psychological, societal and cultural processes to amplify or attenuate public risk perceptions and related behaviors. These, in turn, produce secondary consequences at the societal level, such as changes in political climate and risk monitoring/regulation, which may also amplify or attenuate the perceptions of risk. Secondary impacts then prompt social groups and individuals to engage in another stage of amplification spreading or "rippling" to other social parties. Thus, the
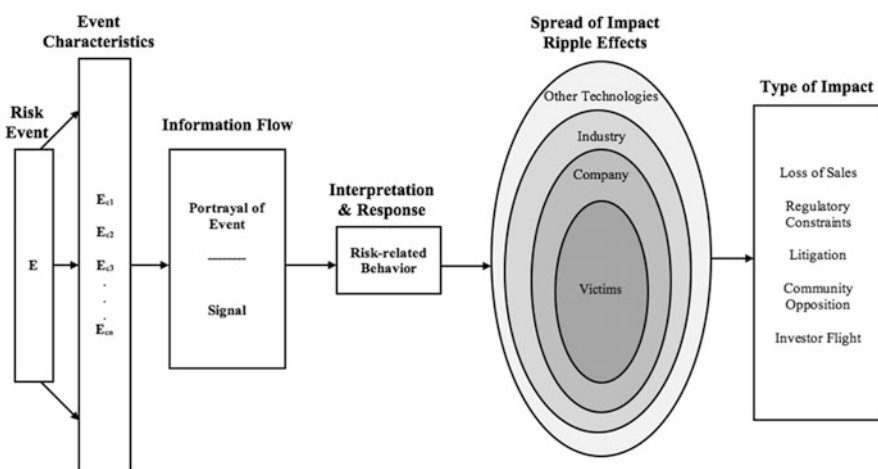

Fig. 3   Social amplification of risk (adopted from Kasperson et al. 1988)

social amplification of risk refers to a dynamic phenomenon of "the social structures and processes of risk experience, the resulting repercussions on individual and group perceptions, and the effects of these responses on community, society, and economy" (Kasperson et al. 1988, p. 179).

7.1.1 Socially Constructed Risk

Proponents of SARF suggest by way of criticism that the concept of risk, often conceptualized as the multiplication of the probability of risk events by the severity of the event consequences, has been too narrow and technical to serve as a useful guideline for making policy decisions. Instead, they emphasize a socially constructed definition of risk, which is shaped by individuals and social groups learning to create interpretations of hazards (Renn et al. 1992). These interpretations depend largely on how risk information is communicated via various social and individual amplification "stations", including scientists, risk-management institutions, the news media, opinion leaders within social groups and personal networks. Amplification or attenuation occurs during the transmission of information through these "stations" at both the information reception and recoding stages.

7.1.2 Two Stages of Social Amplification of Risk

The SARF includes two major stages: the transmission of risk information and the response mechanisms of society. Most people do not experience risks directly; instead they learn about the risk from others and the media. Attributes such as the volume of information, the amount of dramatization and dispute, and the symbolic connotations of information are all involved in the transmission stage of the social amplification of risk. For example, repeated media coverage and dramatization direct public attention toward a particular risk issue, which may trigger public fear about the risk. Disagreement among experts and disputes covered in the news media may also increase public uncertainty about unknown hazards, which can serve to amplify the public perception of risk. The risk event amplification process is typically assigned a signal value, which may not always correspond to the signal value of the risk itself (Slovic 1987). One essential role of the media comes in repackaging the signal value of a risk event and transmitting it to the general public, but the incentives of media outlets may not militate in favor of a true or appropriate signal value (Kasperson et al. 1988).

The second stage of the social amplification of risk addresses four components that formulate public reactions to risk events: heuristics and values, social group relations, signal value, and stigmatization (Kasperson et al. 1988). These mechanisms explain how risk information is understood and how values are assigned within social and cultural contexts. For instance, individuals evaluate risks using their mental shortcuts or values in order to respond to those risks in an efficient manner. Social group relationships also shape public responses to risks as those risk

events enter the political agenda. When a risk event becomes an important political issue, creating conflict among social groups, it gathers more public attention. The signal value characterizes the risk event; high-signal events mean that more serious risk is introduced than was previously known. Negative imagery associated with the risk can create stigmatization of social groups or individuals who were influenced by the risk.

7.2 Practical Insights

The SARF is a useful conceptual tool for understanding the complex social processes involved in the amplification and attenuation of public perceptions of risk. This framework is particularly useful for identifying communication pathways through which risk information is transmitted. Given their central role as amplification stations in the transmission of risk information, the news media has received much attention from communication scholars and researchers. Risk communicators should regularly monitor and evaluate the volume of coverage in the media, the amount of dispute, and the news angles and frames to prevent misrepresentation of risks by the news media. Because disagreements and disputes among experts tend to amplify perceptions of risk, it is important to reach a consensus before communicating risk to the public. Furthermore, owing to the crucial role that opinion leaders play within social groups, risk communicators need to identify these opinion leaders and properly address their concerns. The SARF highlights the news media as an important amplification station, but the role of other types of media has not been clearly established. Insofar as many people learn about risks through personal networks or social media, future work should examine other types of channels, beyond the news media, that might amplify or attenuate perceptions of risk.

8 Conclusion

Risk communication is a dynamic and interactive process involving informational exchanges between different stakeholders. To act as a bridge between relevant stakeholders, communication practitioners must have a strong understanding of both the risk issues and the concerns and reactions of consumers related to those risks. Recognizing the perceptual gap between consumers and the expert or company responsible for the product constitutes a crucial first step for an effective risk communication. Guided by psychological and sociological approaches, this contribution introduced theoretical frameworks that could serve as useful lenses for designing risk communication programs. In outlining those frameworks, the contribution offers a better understanding of the complex dynamics involved in risk communication, both at the individual and societal levels.

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