Appendices to Understanding Risk Communication Theory and Best Practices: A Guide for Emergency Managers and Communicators

Appendix A: Theories and Models of Risk and Crisis Communication

Theory or Model	Contribution to Event Phase			Major Researchers and Seminal Articles	Key Contributions	Key Weaknesses	Primary Research Methods
	Preparedness	Response	Recovery				
Crisis and Emergency Risk Communication (CERC) Model	X	X	X	Centers for Disease Control and Prevention (Reynolds, Deitch, & Schieber, 2002; Reynolds & Seeger, 2005)	5-stage model to determine whom to talk to, what to say, and how to say it in order to communicate messages during pre-crisis, initial event, maintenance, resolution, and evaluation phases	Assumes that crises will develop in predictable and systematic ways, which is often not the case	Has not been empirically tested, but often used as a model for explicating communication stages
Psychometric Paradigm	X	X	X	Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978	Explains how and why people process risk differently based on knowledge of risk and amount of dread	Does not encompass potential for individuals to overreact to risk	Statistical factor analysis used to assess the interrelationships among the ratings of up to 90 hazards on 18 risk characteristics. The analysis is conducted on the output of experimental designs that asks participants to rate hazards on several attributes and dependent measures

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Heuristic-Systematic Model	X	X	X	Griffin, Dunwoody, & Neuwirth, 1999; Griffin, Neuwirth, Giese, & Dunwoody, 2002	Connects desire for accurate information with processing abilities; examines the difference between superficial clues and comprehensive analysis of information	Assumes ensuring accuracy of information as a motive, doesn't take biased processing into account	Quantitative work and structural modeling to predict information processing in publics
Situational Theory of Publics (Expanded: Situational Theory of Problem Solving)	X	X	X	Grunig, 1966, 1997, 2003 (Expanded: Kim & Grunig, 2011)	Helps organizations identify publics; determines when publics will communicate with organization (information seeking and processing)	Requires detailed knowledge of publics and their view of organization messages and activities	Developed as a quantitative theory predicting communication and interest from publics based on experiments; also has been applied qualitatively through focus groups
Deliberative Process Model	X		X	Poortinga & Pidgeon, 2003; Renn, 1999, 2003	Explains competent, efficient, and fair communication with stakeholders, experts, and citizens	Lacks rigorous empirical testing	Uses citizen panels to guide communication development

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Actionable Risk Communication Model	X			Wood, Mileti, Kano, Kelley, Regan, & Bourque, 2011	Demonstrates the strongest communicator and motivator for preparedness are not public officials, but rather people who share what they have done with others who are less prepared	Additional research required to support the findings	National representative telephone survey of the US populace. Sample weights were adjusted to ensure weighted demographics matched population control values and help mitigate biases
Affect Heuristic Model	X			Peters, McCaul, Stefanek, & Nelson, 2006; Slovic, Finucane, Peters, & MacGregor, 2004	Incorporates impact of strong emotional experiences and responses of publics (affect heuristic) into risk communication to guide perceptions of risk and benefit	An evolving area is to develop into a process for incorporating the affect heuristic into risk communication development	Experimental studies to test the impact of the analytical and experiential systems on risk judgments
Extended Parallel Process Model	X			Witte, 1992	Relationship between perception of threat and perception of personal efficacy/behavior change. Also includes perceived collective efficacy and societal risk	High threat messages can lead to maladaptive fear-control in publics. Mainly studied with college students as participants	Experimental design; participants are exposed to low or high threat risk messages and asked about self-efficacy in relation to the risk

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Mental Models	X			Morgan, Fischoff, Bostrom, & Atman, 2002	Maps people's pre-existing perceptions (mental models) so that messages can be couched in ways that will be more readily understood through examining the choices people face, the beliefs they hold, and experts' relevant knowledge	Resource and time intensive to test and develop messages	Employs a five step process including the use of influence diagrams, interviews, questionnaires, subject matter experts, and testing
Risk Information Seeking and Processing (RISP) Model	X			Griffin, Dunwoody, & Neuwirth, 1999	Focuses on how much information people have about an issue versus how much information they think they need to make an effective decision, which affect risk information seeking and processing	Focuses on risks of a highly personal nature; there is little work done to understand how people might use information seeking and processing for non-personal events	Quantitative interviewing, focusing on information seeking, processing, insufficiency, and subjectivity

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Theory of Reasoned Action (Expanded: Theory of Planned Behavior)	X			Ajzen & Fishbein, 1980 (Expanded: Ajzen, 1991)	Norms and attitudes predict behavioral intention, which predicts behavior (Expanded: Ability to perform desired behavior impacts both behavioral intention and behavior)	Unidimensional understanding of attitudes (all attitudes are given equal weight, regardless of importance)	Attitudes measured through quantitative, semantic-differential survey items. Interaction effects between attitude and behaviors are studied and are most often based on individual survey responses

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Image Restoration and Repair		X		Benoit, 1997	Focus for choosing response strategy/communication is clear knowledge of both risk situation and public(s). Messages should be targeted and tailored	Often viewed as simply 'saving face,' artificial response; can be misused due to lack of knowledge, strategy	Primarily qualitative analyses of corporate and government responses to crises and risk; suggests best practices based on situation

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Situational Crisis Communication Theory (SCCT)		X		Coombs, 2012; Coombs & Holladay, 2010	Selecting effective response strategies based upon public perception; goals and reputation of organization; crisis type; and organizational crisis history	Focuses on organizational and corporate response; open to the 'saving face' critique	Quantitative measures of crisis history, attribution, and organizational reputation as impact factors; primarily tested through experiments and quantitative content analyses
CAUSE (Confidence, Awareness, Understanding, Satisfaction, Enactment) Model			X	Rowan, Botan, Kreps, Samoilenko & Farnsworth, 2010	Publics can struggle with confidence, awareness, understanding, satisfaction with solutions, and enactment of action. Risk communicators should test, plan, and repeat key messages	Lots of steps in the model can lead to increased potential for problems and misunderstanding	Discussed in light of fundamental tensions and goals within risk communication, creating a model for effective communication with publics. Not empirically tested

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Precaution Adoption Process Model				National Cancer Institute, 2003	Seven stages of adoption, from lack of awareness to adoption or maintenance of behavior	Framework has not been empirically tested	The model contains a sequence of prompts for practitioners to develop intervention strategies
Social Amplification of Risk Model			X	Kasperson & Kasperson, 1996; Poortinga & Pidgeon, 2003	Public's risk perceptions and ripple effects can be amplified by how institutions take the social context of risk into account when making decisions and conveying information to the public	The framework is primarily conceptual at this point	Conceptual guidance on amplification and attenuation stations, and their associated ripple effects. Qualitative methods have centered on case study approaches to guide understanding and analysis

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Systems Dynamic Model			X	Burns, 2011; Burns & Slovic, 2007	Key interactions and feedback loops influence public perceptions and responses.	Time and resource intensive to develop a robust model. Research in the early stage of development	The approach seeks to weigh the variables that influence public perceptions through quantifying case study data and experimental designs to populate and validate the model; quantitative approach to the Social Amplification of Risk Model

Appendix B: Applied Insights

Key Considerations	Major Researchers	Key Understandings	Implications for Risk Communication
Trust	Corman, Trethewey, & Goodall, 2008; Earle, 2004; Kasperson & Palmlund, 2005; Löfstedt, 2005; Palenchar, 2008; Poortinga & Pidgeon, 2003; Renn, 2004; Siegrist, Cvetkovich, & Roth, 2000	*Lack of audience trust in risk communicator leads to increased concern over risk * Publics trust risk communicators who look like them and share similar values *Publics' contribution to community decision making and its perceived fairness increases trust in risk communicators *Building consensus and engaging in dialogue with a range of stakeholders increases trust *Information and actions must be credible, connected, and competent to inspire trust	*Policy values should be aligned with individual/community values *Skepticism and questions from the public do not definitively equate to lack of trust *Information provided to publics must be credible, truthful and consistent, especially in highly complex events *Know how important (and why) an issue or event is important to the public
Emotional Responses of Publics	Covello, 2010; Jin, 2010; Jin, Pang, & Cameron, 2008; Lazarus, 1991; Lerner, Gonzalez, Small, & Fischhoff, 2003; Menon & Goh, 2005; Peters, 2011	*Strong emotions impact mental processing of information (potential for increased or decreased processing) *Controllable crises lead to anger and sadness; uncontrollable crises lead to fright and anxiety *Public emotion is linked to an institution's or organization's engagement and the public's coping strategy *Effective coping strategies are cognitive coping (gathering information to cope), conative coping (taking action to cope), and emotional coping (emotional support and expression to cope) *Emotion expressed is impacted by trust in and transparency of the organization involved *Anger often motivates people to	*Institutions and organizations should provide information, action steps, and emotional outlets for publics *Strong, trustworthy relationships prior to a risk event can decrease the emotional impact *Allow publics to express the full range of emotions felt

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		action; sad publics need comfort; anxiety motivates publics to seek concrete solutions	
Proximity to risk	Bateman & Edwards, 2002; Chess & Clarke, 2007; Heath & Abel, 1996; Heath, Seshadi, & Lee, 1998; McElroy & Mascari, 2007; Wise, Eckler, Kononova, & Littau, 2009	*Physical closeness of risk impacts perception of risk *Knowing how to decrease impact of risk also decreases proximity concerns *Physical closeness of risk impacts publics' levels of uncertainty, requested support, and dread, with little impact on trust, involvement, openness, and knowledge *Proximity increases likelihood of message response *Temporal proximity (events occurring in the near future) increases analytic processing of information	*Risk prevention messages are more effective than risk likelihood messages *Benefits of organization (ex: jobs) outweighs potential loss due to future risk events *Details of and responses to high proximity events are remembered more accurately than those of low proximity events *Proximity increases trust, so physically close organizations are seen as aids, not obstacles, to success
Severity of risk	Baker, 1995; Greene, Campo, & Banerjee, 2010; Park & Len-Rios, 2010; Paton, Parkes, Daly, & Smith, 2008; Rimal & Morrison, 2006; Weinstein, 1980	*Severity has no effect on attribution of risk/crisis responsibility *Publics are more likely to have an optimistic bias toward risk (other people are more susceptible than I am) than a pessimistic bias (I am more susceptible than others) *Publics who believe they have lots of information about the risk are less likely to respond to messages *Increased severity leads to increased responses to warning messages	*Severity and susceptibility are often used in tandem to determine overall risk and threat *When potential personal consequences are seen as too severe, likelihood of personal preparation decreases *Information should be provided to help publics distinguish between uncontrollable causes and controllable consequences of risk *Normative messages are better than anecdotal or statistical messages at conveying severity
Tolerability of risk	Fairman, 2009; Health and Safety Executive, 2001; Institute of Engineering and Technology, 2010; Löfstedt, 2004	*Contextualizes communication and safety guidelines on the level of acceptable risk to reduce potential societal overreaction. *The precautionary principle, telling publics everything about a risk at once, is often used as a 'better safe than	*Communication with publics should convey the need for acceptance of risk and the costs incurred in reducing risk *Risk should always be reduced to as low as reasonably possible

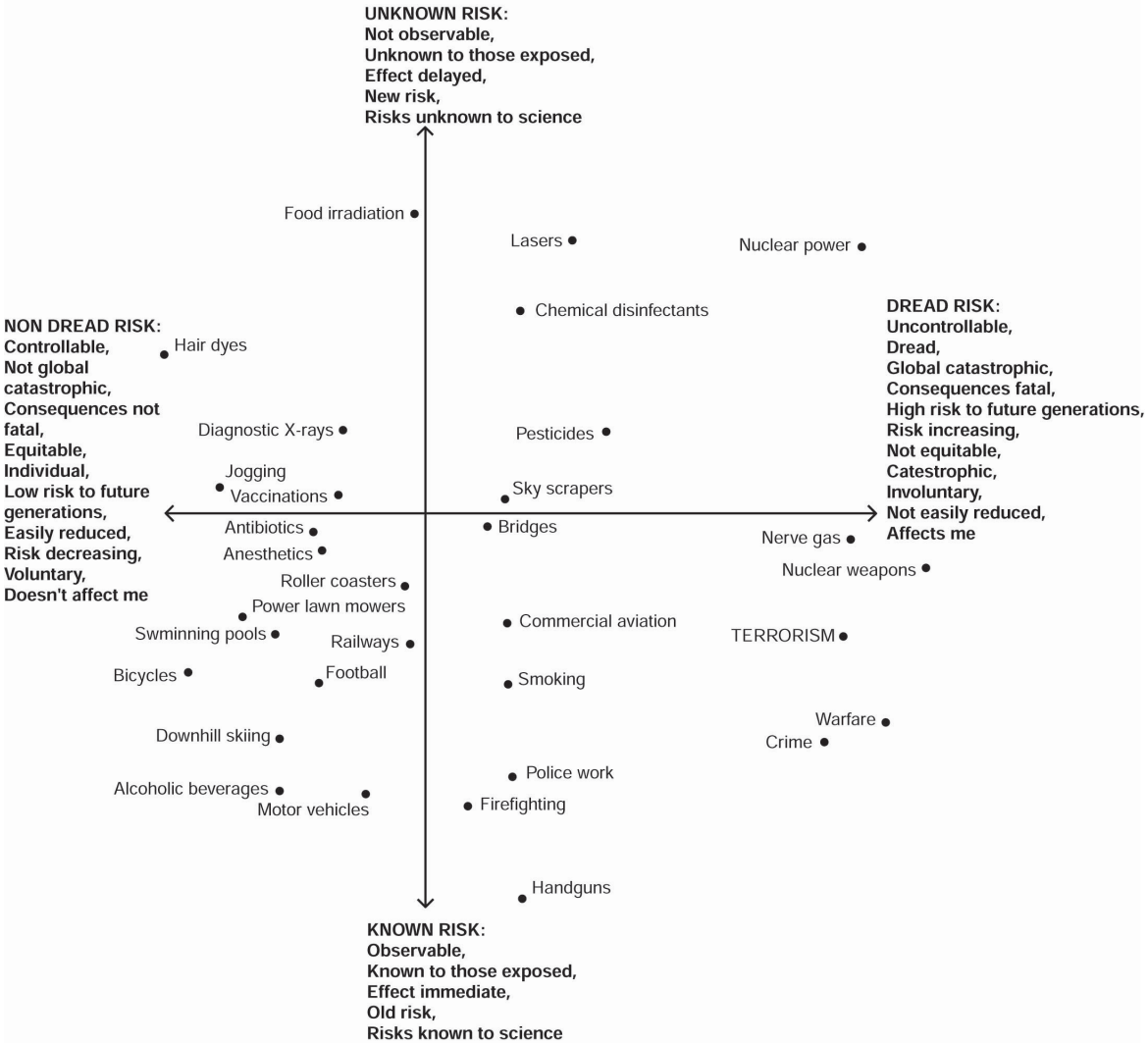
Key Considerations	Major Researchers	Key Understandings	Implications for Risk Communication
		sorry' approach. This is not always an effective method of information dissemination. *Understanding tolerability helps in involuntary, low familiarity, high dread risk events, particularly where the risk circumstances may persist for weeks, months or years. *Three levels of risk: broadly acceptable (when adequately controlled), tolerable (risk comes with benefits), and unacceptable (never okay)	
Prior relationships of publics	Averbeck, Jones, & Robertson, 2011; Coombs, 2004	*Crisis history and personal history combine to impact organizational reputation and attribution of crisis responsibility *Past history of crises increases responsibility attributions and decreases reputation	*When publics have minimal knowledge of a risk, they process heuristically, leading to increased fear levels and lack of comfort with information *Prior knowledge of risk improves processing and systematic processing
Special needs and other publics	Burnside, 2006; Heath, Palenchar, & O'Hair, 2010; Kahan, 2007; Kennedy, Glasser, Covello, & Gust, 2008; Littlefield, Reierson, Cowden, Stowman, & Feather, 2009; McComas, 2010; Menon & Goh, 2005; O'Brien, 2003; Paton, Parkes, Daly, & Smith, 2008; Penner & Wachsmuth, 2008; Slovic, 2002; Smith & Ferguson, 2010; Staksrud & Livingstone, 2009; Thompson, et al., 2008; Zietsma & Winn, 2008	*Children.* Tend to turn to friends and family for support, or to simply ignore the risk *Elderly and disabled.* Often feel and are neglected and disconnected from information and specialized assistance. *Less numerate.* Problems with numeracy lead to problems with interpretation and instruction following, and increase the need for interventions *Activists.* Project organized credibility, look to change ineffective conditions and sustain their actions. Identify need for change earlier than other publics. *Racial and ethnic groups.* Rely on social networks for information, emphasize community involvement, prefer ethnic- and race-specific information	*Risk communicators should strive for representativeness; tailoring messages is most effective prior to the risk event *Publics who want to prepare for a risk event but need guidance or aid should be distinguished from publics who do not want to prepare *Rehearsal and repeated training, especially for evacuation, can increase effectiveness *Utilize professionals trained in specific skills and needs (childcare, sign language, medical assistance, etc.) *Be prepared to continue to provide assistance well after the risk *Utilize multiple forms of information presentation (visual, verbal, mathematic, etc) *Keep messages simplistic and compact *Connecting risk information to personal touchstones and cultural understandings increases behavior change *Engage leaders from special needs public groups to

Key Considerations	Major Researchers	Key Understandings	Implications for Risk Communication
		White males. Perceive less risk than females and non-whites; effect is widely documented but poorly understood	spread risk information
Media usage	Andersen & Spitzberg, 2010; Bean & Mileti, 2011; Clarke, Chess, Holmes, & O'Neill, 2006; Covello, 2010; DiGiovanni, Reynolds, Harwell, & Stonecipher, 2002; Griffin, Neuwirth, Giese, & Dunwoody, 2002; Kent, 2010; Liu, Austin, & Jin, 2010; Liu & Briones, in press; Liu, Jin, Austin, & Janoske, in press; National Research Council, 2011; Procopio & Procopio, 2007; Smarick, 2010	*Traditional media.* Attention-getting information will get the most coverage; media usage should be adaptable; design and delivery are increasingly important; messages are impacted by history, research, and factors individual to publics; message specificity increases effectiveness *Social Media.* Effective aspects include interactivity, responsiveness, and dialogue; mobility of the Internet provides support for dispersed publics; publics are more likely to share humorous and insider information, and to use the format that reaches the biggest group of family and friends	*Public beliefs and confidence in media content and function increase depth of message processing *Messages must be timely, accurate, specific, sufficient, consistent, and understandable *Risk messages are more likely to be acted upon when delivered through multiple channels *Multiple messages should be crafted to reach multiple publics *Integral use of social media pre-crisis can increase resilience of publics *An information vacuum in the media is likely to be filled, even if with inaccurate content *Traditional and social media should work together, as necessary supplementing factors to one another

Appendix C: Table of Crisis Training Examples

Training Option	Description	Advantages	Disadvantages
Orientation/seminar	Facilitated session walking through CMP, roles and responsibilities with key personnel either individually or in groups (e.g., spokesperson training, all-employee training)	Involves less planning and complexity than other options; flexible structure adapted to organization's culture and needs; can be done online or face-to-face	May be difficult to hold attention; hands-off approach may not identify gaps in plan/approach
Tabletop exercise	Using CMP, key personnel talk through a step-by-step response to a fictitious emergency situation	Less planning and cost to organization than simulation; identifies gaps/issues with CMP; can be conducted online or offline; can be facilitated by internal or external facilitator	Without time constraints and pressure of actual (or simulated) crisis, response may be unrealistic, and gaps in CMP overlooked
Drill/rehearsal	Organization members practice some or all of the CMP (e.g., evacuate a building, conduct mock press conference)	Continuing drills can hone particular parts of a plan and keep them fresh in participants' minds; could be easier, less complex than a full simulation	Could become routine, disconnected from larger complexities of crisis situations
Simulation	Simulated crisis tests organization's CMP and team in real-time, often with complexities and complicating factors added throughout exercise	Provides functional, hands-on training; time constraints help prepare for more realistic, high-stress environment; can be used to test coordination with additional organizations	Higher planning cost and complexity

Appendix D: Assessments of Risk Along the Psychometric Paradigm Matrix



Appendix E: Types of Public Warning Systems
Adapted from Mileti & Sorensen, 1990

Warning type	Description	Event example
Type 1	Warning systems for long prediction, known impacts, and easy to detect hazards	Flood, volcano, earthquake prediction, slow nuclear power accident
Type 2	Warning systems for long prediction, known impacts, and difficult to detect hazards	Slow fixed-site hazardous materials
Type 3	Warning systems for long prediction, unclear impacts, and easy to detect hazards	Hurricanes, distant tsunami
Type 4	Warning systems for long prediction, unclear impacts, and difficult to detect hazards	Nuclear attack, protracted terrorist incident
Type 5	Warning systems for short prediction, known impacts, and easy to detect hazards	Flash flooding where there is an automated warning
Type 6	Warning systems for short prediction, known impacts, and difficult to detect hazards	Flash flood, fast volcano
Type 7	Warning systems for short prediction, unclear impacts, and easy to detect hazards	Tornados (if accurate detectability possible through an improved Doppler radar system, for example)
Type 8	Warning systems for short prediction, unclear impacts, and difficult to detect hazards	Tornado, avalanche, local tsunami, terrorist attack, sabotage

Appendix F: Stages of Precaution Adoption Process Model