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THE RELEVANCE OF THE INTERNET FOR ENHANCING DISASTER PREPAREDNESS OF RESIDENTS

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Abstract

Residents exposed to environmental hazards - such as cyclones, fires, volcanic eruptions, and floods - face difficult tasks and crucial decisions: should they stay in their homes or leave, in case of an emergency? If they decide to stay: how to prepare their houses and properties efficiently, and how to deal with animals? If they decide to leave: when, how, and where to? Furthermore, after a disaster: how to cope with the aftermath, and how to return to normal life? Obviously these issues create a very significant need for information related to risk mitigation before, during and after emergencies. Therefore residents need to be optimally informed about the hazard characteristics, preventative measures and appropriate behaviours during the onset of an emergency situation and after the event.

The Internet is the newest - yet also least researched - tool for informing residents about disaster preparedness. It includes information presented on the "world-wide web" (WWW) and communication via electronic mail (E-Mail) between authorities and residents.
This contribution focuses on three aspects: A conceptual framework for the relevance of the internet for risk communication; criteria for assessing the utility of WWW-based information; and results from empirical studies of selected websites that fire authorities provide (four Australian and two international ones were analyzed).

The results available so far indicate that the internet is well accepted but not yet much used by residents for emergency management issues, and that there is significant potential for the improvement of websites. Pertinent suggestions are outlined and research needs discussed.

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INTRODUCTION: HAZARD IMPLICATIONS FOR RESIDENTS

In countries such as Australia, residents are exposed to multiple environmental hazards, like cyclones, fires, volcanic eruptions, and floods. Consequently, they face difficult tasks and crucial decisions: should they stay in their homes or leave, in case of an emergency? If they decide to stay: how to prepare their houses and properties efficiently, and how to deal with animals? If they decide to leave: when, how, and where to? Furthermore, after a disaster: how to cope with the aftermath, and how to return to normal life? Obviously these issues create a very significant need for information related to risk mitigation before, during and after emergencies.

Therefore residents need to be optimally informed about the hazard characteristics, preventative measures and appropriate behaviors during the onset of an emergency situation and after the event (cf., e.g., Atman et al. 1994, Blaikie et al. 1994, Covello 1990, EMA 1997, Handmer 2002, Paton & Long 1996, Rohrmann 2003, Salter 1998, Webster 2000). Authorities must communicate the relevant information to residents and communities as a whole. This is also stated in the Australian/NZ Risk Management Standard. Furthermore, effective risk communication is a moral obligation, given that the health and well-being of citizens are at stake (Bennett & Kalman 1999, Willis et al. 1997). This applies to each of the three main types of aims, i.e., increasing risk awareness, decreasing risk concerns,, and aiding risk choices.

RISK COMMUNICATION MEANS & PROCESSES

Within information campaigns for enhancing disaster preparedness, media activities (television, radio, internet), meetings with residents, and a variety of visual communication means are used, including printed material such as information leaflets and brochures, picture series (slides, graphs, posters) and video-tapes.

Internet-based information provision - such as websites run by authorities (e.g. EMA, Fire Authorities, State Emergency Services) and email-based communication means - have only recently been established and are not yet 'mainstream' procedures, even though they are widely available. It is anticipated, however, that these 'electronic' information channels will eventually become as commonplace in disaster preparedness as in many other fields of public information, communication and education. In fact, risk communication based on the "world-wide web" (WWW)

has considerable advantages: information can be updated regularly and quickly, users can bookmark and store relevant hazard information, access is fast and blockage unlikely (unlike telephone contacts).

Of course, mere distribution of material is not enough - it is crucial that information efforts are effective (Fisher et al. 1991, Gaull 1997, Rohrmann 1992, 1999). This requires socio-psychological expertise about the impacts of text and visual material on risk perception and preparedness (e.g., D'Arcy 1998, Lopes 1998, Rohrmann 1995) and critical effectiveness evaluation (Kasperson & Palmlund 1989, Rohrmann 1992, 1998). Such research was lacking for quite a while (Fischer 1999, Joyce 1999), and inherent problems of the internet approach (Quarantelli 1997) have not yet received much attention.

Furthermore, the attitudes, habits and needs of users need to be considered. It cannot be assumed that WWW-based information is efficient, regardless of the proficiency level of a website; the efficiency of risk communication depends upon the interaction between technological features of the message and psychological characteristics of the receiver (Covello et al. 1989, Lundgren & Makin 1998, Rohrmann 2000).

EVALUATION CRITERIA FOR WWW-BASED INFORMATION

If the significance and utility of a website for the disaster preparedness of residents are to be assessed, three aspects are essential: content, process and outcome evaluation. Relevant criteria include (cf. Rohrmann 1992, 1999):

Regarding *content* evaluation (recipients' perspective)*:* completeness of the information (regarding the residents' problem), comprehensibility, congruence between message and residents' information needs/requests, potential to capture and maintain attention, appraisal of presentation style (pictures, colours, examples), and perceived feasibility of proposed actions.

Regarding *process* evaluation (for information presentation or education process): facilitation of the learning process, opportunity for questions & discussion of problems, information confirmation activities of recipients, perceived ease of making contact with the authority (or feedback possibilities), satisfaction with presentation process.

Regarding *outcome* evaluation (knowledge, intentions, behaviour): Provided materials discussed in household, materials (e.g. plans, checklists) utilized for

preparedness, acceptance of hazard messages a/o suggested actions, internet websites 'bookmarked', change of beliefs (mental models) regarding preparedness, advanced problem awareness (re perceived risk/vulnerability of people/property), preventive measures conducted/realized (house, property, family planning), dependency on external help reduced (increased self-reliance), confidence in information source, participants' satisfaction with outcomes of the information process as a whole.

EMPIRICAL DATA COLLECTION

In order better to understand the validity of WWW-based efforts to enhance the disaster preparedness of residents, several empirical studies were conducted. They focussed on bushfire (wildfire) as the most common environmental hazard in the state of Victoria and used both qualitative and quantitative research approaches (cf. Rohrmann 1999, 2000, 2002, 2003).

These studies include:

> Videotape perception
(Study type: A & B = Focus groups)

> Appraisal of brochures
(Substudies: A: Survey; B: Expert appraisal ; C: Experiment)

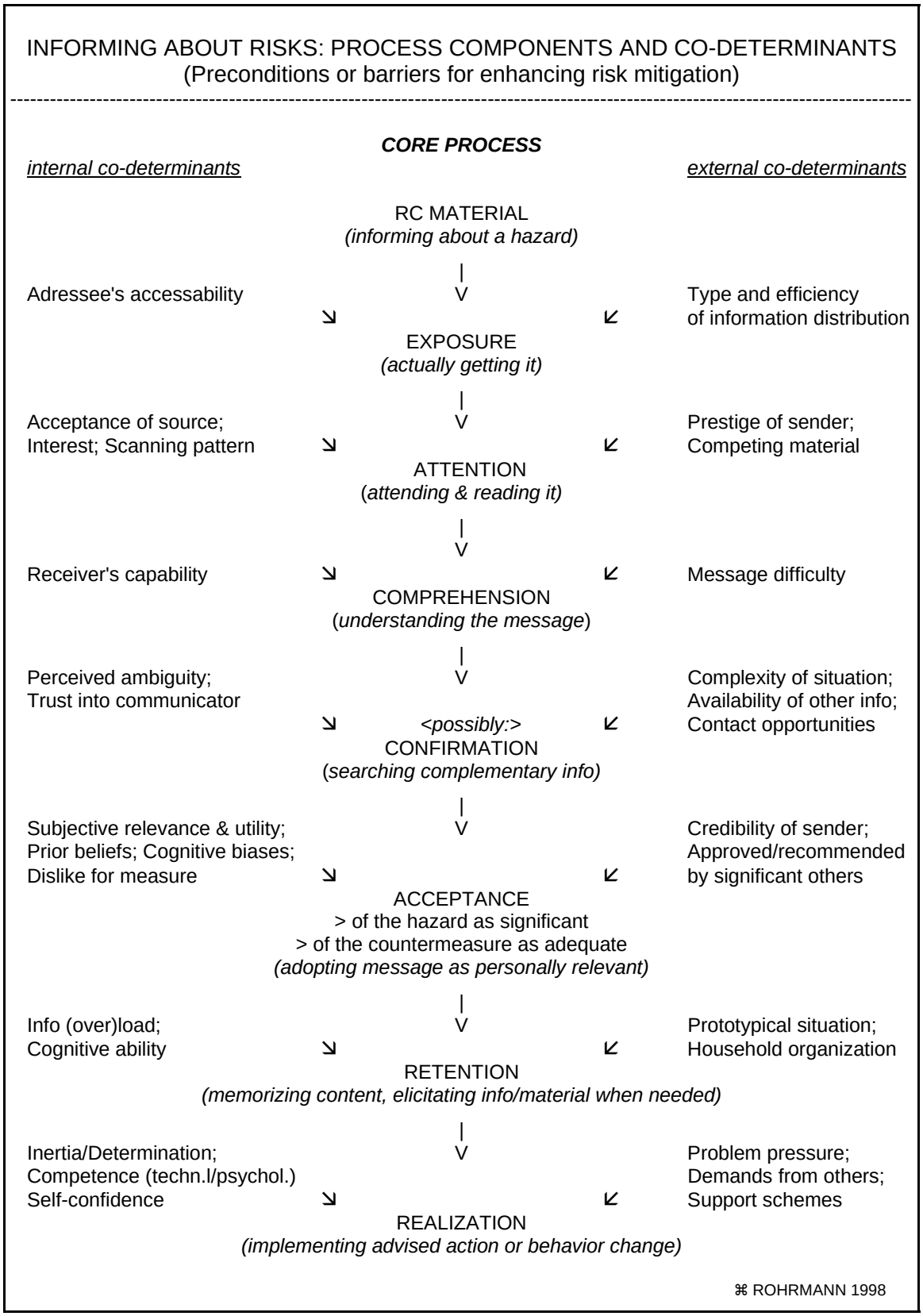
> Website assessments `
(Substudies: A: Expert appraisal; B: Survey; C: Focus group)

> General information utilization
(Study type: A: Personal, B: Telephone survey).

As far as feasible, the sampling was concentrated on residents.

All studies investigated information and material provided by the two essential authorities in Melbourne, the Victorian Country Fire Authority ("CFA") and the Melbourne Metropolitan Fire Brigade ("MFB"). Regarding websites, two further Australian authorities (the Rural Fire Service NSW and the ACT Firebreak) and two American ones (Canadian Forest Service and American Redcross) were chosen for reasons of comparison. The websites differ considerably in their style and purpose. None of them is solely or explicitly geared to the 'general public' but all include information for residents or employees.

Figure 1:


INFORMING ABOUT RISKS: PROCESS COMPONENTS AND CO-DETERMINANTS
(Preconditions or barriers for enhancing risk mitigation)
CORE PROCESS
internal co-determinants
external co-determinants
RC MATERIAL
(informing about a hazard)
Adressee's accessability
Type and efficiency of information distribution
EXPOSURE
(actually getting it)
Acceptance of source; Interest; Scanning pattern
Prestige of sender; Competing material
ATTENTION
(attending & reading it)
Receiver's capability
Message difficulty
COMPREHENSION
(understanding the message)
Perceived ambiguity; Trust into communicator
Complexity of situation; Availability of other info; Contact opportunities
<possibly:>
CONFIRMATION
(searching complementary info)
Subjective relevance & utility; Prior beliefs; Cognitive biases; Dislike for measure
Credibility of sender; Approved/recommended by significant others
ACCEPTANCE
> of the hazard as significant
> of the countermeasure as adequate
(adopting message as personally relevant)
Info (over)load; Cognitive ability
Prototypical situation; Household organization
RETENTION
(memorizing content, elicitating info/material when needed)
Inertia/Determination; Competence (techn.l/psychol.) Self-confidence
Problem pressure; Demands from others; Support schemes
REALIZATION
(implementing advised action or behavior change)
⌘ ROHRMANN 1998

Evaluation research has to find out not only *whether* but also *why* a program works (or not). The crucial question is: which factors determine whether hazard information - provided as text or pictorially or both - is useful in enhancing residents' preparedness? Empirical studies need to be based on a sound conceptual framework (cf. e.g. Mulilis & Duval 1997, Renn 1998, Rohrmann 1995, 2000, Zimmermann 1997).

Therefore, a socio-psychological model for the context in which risk communication occurs and a framework for the individual steps of dealing with a material/message must first be developed. Two such models were outlined in Rohrmann (2000); one of them is shown in *Figure 1*. It identifies the relevant preconditions (or 'barriers' to effective risk communication and preparedness) for each level of an information process - that is, the response 'chain' exposure-attention-comprehension-confirmation-acceptance-retention-realization.

MAIN FINDINGS - SELECTION

The research aim was to assess the usefulness of major websites about fire safety and preparedness, based on criteria which reflect both expert and layperson perspectives. The focus was on information needs of residents. In the expert appraisal studies, assessors were fire experts, fire researchers, disaster researchers, cognitive psychologists, website experts, and residents who are WWW-literate (N=16, 2 or 3 participants in each group). Core substantive quality criteria were: comprehensibility, relevance for residents, completeness of information, visual appeal; regarding technical website features: layout and navigability. Mostly standardized response scales were used; additionally, exploratory open-ended questions enriched the data collection.

Selected results are presented in *Table 1*. In addition to the individual scores, means across all six websites and mean ratings for the three sets of criteria are given. These results can be summarized as follows:

> Substantive quality: while the comprehensibility of these websites' content is rated quite positively (overall mean for criterion B2 is 3.7 on a 5-point scale) and their trustworthiness acknowledged (mean for B17 = 4.1), most other aspects are rated as only average, and they are not seen as very motivating (mean for B15 = 2.4). The visual quality (criteria B1, B4, B5) is assessed as 'medium'. Only one of the websites is perceived as 'good', in terms of meeting the information needs of people.

Table 1:
ASSESSMENT OF WEBSITES ON FIRE SAFETY PREPAREDNESS: RATINGS

CFA Country Fire Authority Australia MFB Melb. Metropolitan Fire Brigade ACT ACT firebreak
NSW NSW Rural Fire Service ARC American Red Cross CFS Canadian Forest Service

Q #	*Evaluation Aspect*	**CFA**	**MFB**	**NSW**	**ACT**	**ARC**	**CFS**	all websites ***mean***	***sd***
B1	Interesting to look at	3.2	3.7	3.1	2.7	2.7	2.7	*3.0*	0.9
B2	Understandibility	4.2	3.9	3.9	2.7	4.1	3.1	*3.7*	1.1
B4	Visual appeal	2.9	3.3	2.9	2.5	2.4	3.0	*2.8*	1.0
B5	Helpfulness of pictures/illustrations	2.2	3.4	1.6	1.9	1.5	2.2	*2.8*	1.2
B7	Comprehensiveness	4.0	3.6	3.4	2.4	3.8	2.6	*3.3*	1.9
B9	Length (1=short, 5=long)	3.1	3.1	3.1	2.0	3.1	1.9	*2.7*	1.0
B11	Good examples given	2.9	3.6	2.9	1.8	3.7	2.4	*2.9*	1.4
B12	Clarity of fire safety actions	3.3	3.9	3.6	2.4	4.1	2.9	*3.4*	1.3
B13	Own (residents') info need met	3.3	3.6	3.3	1.6	3.9	2.2	*3.0*	1.2
B15	Extent motivation for preparedness	2.6	3.0	2.3	1.6	3.0	2.0	*2.4*	1.0
B16	Difficulty remembering info *(reversed)*	3.4	3.1	2.7	2.1	3.5	2.9	*3.0*	1.2
B17	Seen as reliable source of information	4.3	4.5	3.9	3.9	4.3	4.1	*4.1*	1.0
	Mean B1-17:	*3.3*	*3.6*	*3.1*	*2.3*	*3.4*	*2.7*	*3.1*	
A3	Organisation of the website	3.6	3.5	3.3	3.4	3.2	3.3	*3.4*	.9
A4	Ease of navigation	3.6	3.7	3.2	3.4	3.9	3.8	*3.6*	1.0
A5	Ease of locating relevant information	4.2	3.4	3.4	2.9	4.3	1.9	*3.3*	1.3
	Mean A3-4-5:	*3.8*	*3.5*	*3.3*	*3.2*	*3.8*	*3.0*	*3.4*	
B21*	a) Suitability of website for residents	3.6	3.9	3.9	1.4	4.1	1.8	*3.1*	1.4
	b) Suitability for employees	2.1	2.7	2.7	1.3	2.3	1.3	*2.1*	1.1
	c) Suitability for high school teachers	3.5	2.5	2.5	1.9	2.5	1.9	*2.6*	1.1
	d) Suitability for high school students	2.9	2.7	2.7	1.7	2.5	1.8	*2.5*	1.0
	e) Suitability for university students	2.9	2.8	2.9	2.6	2.5	2.0	*2.6*	1.1
	f) Suitability for public authorities	2.3	3.1	3.1	2.9	2.7	2.6	*2.8*	1.3
	g) Suitability for journalists	2.7	3.2	3.2	2.3	2.8	1.8	*2.6*	1.1
	h) Suitability for researchers	3.0	2.8	2.8	3.9	2.2	3.4	*3.0*	1.2
	Mean B21:*	*2.9*	*3.0*	*3.0*	*2.2*	*2.7*	*2.1*	*2.7*	
C1	Recommendable to lay people	3.6	3.4	3.4	1.3	3.5	1.7	*2.9*	1.4
C2	Better than brochures	3.4	3.4	3.4	2.3	3.2	2.6	*3.1*	1.2
	Weighed mean across all aspects:	*3.3*	*3.5*	*3.1*	*2.5*	*3.3*	*2.6*	*3.1*	

Data from 16 raters; all ratings on 1-to-5 scales. *Source:* ROHRMANN 2003

> Technical website features: the assessment of layout and navigability are assessed as medium to good for all sources.
> Suitability for relevant target groups: the raters were quite critical in this regard (overall mean for the six websites regarding 8 potential targets is 2.7). Two of the sites are clearly not useful for residents or any other laypeople.
> The overall mean differences between the 6 websites are considerable (ranging from 2.5 to 3.5). The websites of the three major Australian fire authorities covered in this study, Victoria's Country Fire Authority, Melbourne's Metropolitan Fire Brigade and NSW's Rural Fire Service (NSW-RFS) are all rated in the upper range, on par with the fire information website of the American Red Cross (ARC). An advantage of the ARC and the NSW-RFS websites is that information for both forest/bushfires and urban fires is offered.
> Finally, did the assessors "think that the website is better for getting informed about fire safety than brochures"? Four were seen as slightly better, but the two others were not (cf. criterion C2, mean = 3.1). Nevertheless, this appraisal substantiates the potential of WWW-based fire preparedness programs.

In addition, a small field study was conducted in Victoria (N=20+100), based on exploratory interviews. It was investigated how many people know of and utilize WWW-based information sources regarding fire risk reduction, and how they evaluate pertinent websites. Within this sample, about 2/3 rate fire websites as principally useful, yet only about 1/3 have actually studied the information and preparedness advice provided there. Obviously for a significant proportion of these residents, using the WWW is not yet a familiar and easy task.

Respondents were also asked to rank-order relevant websites for overall quality and then identify the reasons for their rating. Main reasons for *liking* a website were: It is comprehensive, meets needs of different people, addresses necessary action for fire preparedness, has good visual appeal, helpful pictures and is easy to navigate. Typical reasons for *disliking* a website: Information not relevant to residents or insufficient, too much information, too technical, visually not appealing, and unsatisfactory layout which makes navigating difficult.

As these responses show, there is no single principal reason - users have high expectations for the combination of content and presentation style. It seems, though, that substantive quality is especially important for experienced web users, while newcomers often struggle to find their way through elaborate websites and therefore particularly value good navigation features.

Regarding people's information search attitude, all respondents where asked how they would prefer to contact a fire authority in the event that they had a query about a bushfire matter. The preferences were as follows: Ring: 75%; write a letter: 1%; send an e-mail: 4%; search through their website: 8%; go there in person: 12%.
This indicates that the telephone is still the choice clearly preferred, and that the e-mail option is hardly utilized for bushfire preparedness etc. However, it has the potential of supplementing 'phone trees' and the like.

CONCLUSIONS - RELEVANT INTERNET FEATURES

As the empirical studies conducted showed, internet-based information technologies such as websites run by authorities and email-based communication means are widely available but not yet widely used - at least not by residents. Nevertheless, they are essential (Burgess & Houghton 2002, Fischer 1999) and very likely to strengthen their relevance and influence. Their technological advantages and the fact that they can always be validated and updated are valuable features.

The authorities that develop websites and expect their usage should consider that many residents are not (yet) professional customers of such information resources, and therefore respect their experiences and needs. In *Table 2*, typical requirements of 'lay' users are listed.

Table 2:

MAJOR REQUIREMENTS FROM A RESIDENT'S POINT OF VIEW

Re *content* features:

- information on: how to prepare for fire events
- on decision-making re evacuation (criteria for staying or leaving the residence)
- on fire safety in public places such as schools and the workplace
- contact details (phone/letter/fax/e-mail) for the institution should be complete

Re *presentation* features:

- appealing graphics
- large easy-to-read text
- pictures to add visual appeal and to enhance the salience of fire hazards

Re website *design*:

- clear frontpage structure
- fast downloading
- efficient navigating within the website
- links to related institutions

To sum up:

In recent years, considerable sectors of the population became aware of and began to use 'electronic' information channels in general. However, websites offered by fire authorities are not utilized to a high degree, in spite of their enormous potential for improving hazard awareness, and for providing valid, current, comprehensive and fast information about hazard features and preparedness means. There are two main reasons for this: Many residents do not (yet) see websites as an essential information source regarding fires; and the existing websites are sub-optimal for residents' needs and information-seeking habits.

Consequently it appears desirable firstly to develop and apply concepts for websites which are specifically designed for residents, especially people who are not proficient internet users; and then to run a campaign which informs the public about such websites and helps to familiarize people with the potential they have for all residents in hazard-prone areas. This applies to both disaster preparedness and coping with emergencies. Furthermore, such efforts need to be linked to conventional pathways, such as brochures and other print material, as well as personal information procedures in community group activities.

Finally, even well-designed WWW-based approaches may not improve the disaster preparedness of residents as much as principally possible - therefore methodical evaluation research seems indispensable.

THOUGHTS ABOUT RESEARCH NEEDS

From a social-science viewpoint, empirical research is essential if the efficiency of information and education techniques require critical assessment, and if both the reasons for success and for shortcomings need to be identified. Relevant research questions include:

> Regarding *user features:* What types of people are likely to utilize WWW-based risk communication? Do they mainly 'surf' before, during or after disasters? Is information for non-English speakers warranted?

> Regarding *information content:* What are residents' core information needs regarding websites, compared with other information means? How do we address the needs of children and the elderly?

> Regarding *website design:* Which website styles do WWW 'newcomers' prefer? How do they cope with complex structures? What is the role of pictures and graphs?

Furthermore, the interrelationship between different risk information means/procedures warrants empirical tests. For example, videos could be linked to websites, and brochures designed to compliment electronic information means. Obviously the WWW cannot be a 'stand-alone' approach to the enhancement of disaster preparedness; therefore it is important to optimize the linkage between all elements of a program.

Finally, to take into account methodological principles (cf. Cook & Reichardt 1992, Fink 1993, Hinn et al. 2001) content, process and outcome criteria need to be studied using a longitudinal approach, and samples of users from different backgrounds should be covered in evaluation studies.

The research looked at here - that is, to investigate the soundness of WWW-based efforts to improve residents' disaster preparedness - calls for both substantial and methodological soundness; therefore *interdisciplinary* studies offer the best chances for valid results.

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REFERENCES

Atman, C. J., Bostrom, A., Fischhoff, B., & Morgan, M. G. (1994). Designing risk communications: Completing and correcting mental models of hazardous processes. *Risk Analysis, 14*, 779-788.

Bennett, P., & Kalman, K. (1999). *Risk communication and public health*. Oxford: Oxford University Press.

Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (1994). *At risk - Natural hazards, people's vulnerability and disasters*. London: Routledge.

Burgess, S., & Houghton, I. (2002). *Evaluation of selected NSW government websites: A user perspective* . Sydney: Faculty of Social Sciences, University of Technology, Sydney.

Cook, T. D., & Reichardt, C. S. (1992). *Qualitative and quantitative methods in evaluation research*. Beverly Hills, CA: Sage.

Covello, V. T., McCallum, D. B., & Pavlova, M. (1989) (Eds.), *Effective risk communication.* New York: Plenum.

Covello, V. T. (1990). A review of obstacles to public understanding and effective risk communication. In W. Leiss (Ed.), *Prospects and problems in risk communication* (pp. 1-49). Waterloo: University of Waterloo Press.

D'Arcy, J. (1998). *Technically speaking: A guide for communicating complex information.* Columbus: Battelle Press.

Emergency Management Australia (1997). *Hazards, disasters and survival*: A booklet for students and the community. Dickson: Department of Defence, EMA.

Fink, A. (1993). *Evaluation fundamentals, guiding health programs, research,and policy*. London: Sage.

Fisher, A., Pavlova, M., & Covello, V. (1991). *Evaluation and effective risk communication*. Washington: EPA.

Fischer, H. W. (1999). Using cyberspace to enhance disaster mitigation, planning and response: Opportunities and limitations, *The Australian Journal of Emergency Management,* 14, 60-64.

Gaull, E. S. (1997). Show me the results! *Fire Chief, 41*, 74-81.

Handmer, J. (2002). Are flood warnings futile? Risk communication in emergencies. *Australasian Journal of Disaster Studies*, 2000-3 <http://www.massey.ac.nz/ ~trauma>.

Hinn, D. M., Benson, A. P., & Lloyd, C. (Eds.). (2001). *Visions of quality: How evaluators define, understand, and represent program quality*. London: JAI.

Joyce, E. B. (1999). Disaster information on the web: providing an efficient index to current and reliable information. In EMA (Ed.), *Australian Disaster Conference, Proceedings*, Canberra.

Kasperson, R. E., & Palmlund, I. (1989). Evaluating risk communication. In V. T. Covello, D. B. McCallum, & M. T. Pavlova (Eds.), *Effective risk communication. The role and responibility of government and nongovernment organizations* (pp. 161-191). New York: Plenum Press.

Lopes, R. (1998). *Public perceptions of disaster preparedness presentations using disaster damage images* (Working report 79): University of Colorado, Institute of Behavioral Science, Natural Hazards Research and Applications Information Center.

Lundgren, R., & McMakin, A. (1998). *Risk communication: A handbook for communicating environemntal, safety, and health risks.* Columbus: Battelle Press.

Mulilis, J. P., & Duval, T. S. (1997). The PRE model of coping and tornado preparedness - moderating effects of responsibility. *Journal of Applied Social Psychology, 27*, 1750-1766.

Paton, D., & Long, N. (Eds.). (1996). *Psychological aspects of disasters: Impact, coping and intervention*. Palmerston/NZ: Dunmore Press.

Quarantelli, E. (1997). Problematical aspects of the information/communication revolution. *Disaster Prevention and Management*, 6, 94-106.

Renn, O. (1998). The role of risk communication and public dialogue for improving risk management. *Risk, Decision and Policy, 3*, 5-30.

Rohrmann, B. (1992). The evaluation of risk communication effectiveness. *Acta Psychologica, 81*, 169-192.

Rohrmann, B. (1995). Effective risk communication for fire preparedness: A conceptual framework. *The Australian Journal of Emergency Management, 10*, 43-48.

Rohrmann, B. (1998). Assessing hazard information/communication programs. *Australian Psychologist, 33*, 105-112.

Rohrmann, B. (1999) Appraisal of information material on disaster preparedness. In EMA (Ed.), *Australian Disaster Conference, Proceedings*, 251-256.

Rohrmann, B. (1999). Community-based fire preparedness programs: An empirical evaluation. *Australasian Journal of Disaster Studies*, 99-1 *<http://www.massey.ac.nz/~trauma/ issues/1999-1/rohrmann.htm>*

Rohrmann, B. (2000) A socio-psychological model for analyzing risk communication processes; *Australasian Journal of Disaster Studies*, 2000-3. *<http://www.massey.ac.nz/~trauma/ issues/2000-2/rohrmann.htm>*

Rohrmann, B. (2000). Critical assessment of information on bushfire preparedness for residents. *The Australian Journal of Disaster Management*, 15, 14-20.

Rohrmann, B. (2002). Bushfire preparedness of residents: Insights from socio-psychological research. In: Cary, G., Dovers, S., Lindenmayer, D. (Eds.), *ANU Fire Forum 2002*, Canberra: CSIRO Publishing

Rohrmann, B. (2003). The utility of the WWW for fire preparedness of residents. *Australian Journal of Emergency Management, 18,* 20-30.

Salter, J. (1998). Risk management in the emergency management context. *Australian Journal of Emergency Management* 13, 22-28.

Webster, J. (2000). *The complete bushfire safety book*. Sydney, Random House.

Willis, W. J., Okunade, A. A., & Willis, J. (1997). *Reporting on risks: the practice and ethics of health and safety communication*. Westport: Praeger.

Zimmermann, R. (1997). A process framework for risk communication. *Science, Technology, and Human Values, 12*, 131-137.

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