Users' Conceptions of Risks and Harms on the Web: A Comparative Study

Batya Friedman[1], Helen Nissenbaum[2], David Hurley[1], Daniel C. Howe[1], Edward Felten[3]

[1]The Information School
University of Washington
Seattle, WA 98195-2840 USA
+1 206 616 2548
batya@u.washington.edu
hurley@u.washington.edu
dchowe@u.washington.edu

[2]Center for Human Values
Princeton University
5 Ivy Lane
Princeton, NJ 08544 USA
helen@phoenix.princeton.edu

[3]Dept. of Computer Science
Princeton University
35 Olden Way
Princeton, NJ 08544 USA
+1 609 258 5906
felten@cs.princeton.edu

ABSTRACT

In this study, we analyzed Web users concerns about potential risks and harms from Web use to themselves and to society at large. In addition, we assessed how strongly users felt something should be done to address their concerns. Seventy-two individuals, 24 each from a rural community in Maine, a suburban professional community in New Jersey, and a high-technology community in California, participated in an extensive (2-hour) semi-structured interview about Web security. Results show that Web users were primarily concerned about risks to *Information*, and secondarily about risks to *People* and *Technology*. Different sets of concerns were identified among the rural, suburban, and high-technology communities. Our discussion focuses on implications for interface design and information policy.

Keywords

Children on the Internet, cross-cultural differences, diversity, Internet, privacy, security, user conceptions, user differences, value-sensitive design, Web security, WWW

INTRODUCTION

Users' conceptions of risks and harms of Web use has a critical role to play in determining how Web designers and technologists focus their energies and resources in developing the next generation of Web technologies [2]. Accordingly, in this study we investigated three overarching questions. What risks and harms about Web use are of greatest concern to users? How strongly do users believe something should be done? How great are the differences in users' concerns across diverse communities [3]?

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METHODS

Participants and Procedures

Seventy-two individuals, 24 each from a rural community in Maine, a suburban professional community in New Jersey, and a high-technology community in California, participated in an extensive (2-hour) semi-structured interview about Web security. Equal numbers of men and women across the life-span participated from each community (mean, 42 years; median, 40; standard deviation, 14.8; range, 19 – 75).

We report here on one section of the interview that focused on participants' concerns about risks and harms from Web use to themselves and to society. Participants responded to standardized questions (e.g., "Are there any potential harms (or risks) that concern you when you use it? If so, what are these? Please write each concern on a separate card.") as well as to follow-up questions tailored to the individual's concerns (e.g. "You wrote 'who has my information'? What kind of information are you talking about?"). Moreover, to assess participants' judgments about the relative importance and urgency of their concerns, participants ranked each concern according to how strongly they felt something should be done about it.

RESULTS

Participants provided 197 concerns in total (mean, 2.85 concerns; median, 3; range, 0 - 8). Three overarching categories were identified in participants' concerns about their Web use. *People* refers to concerns related to human experience, social relations, or societal issues (e.g., "the problem that I have, it's almost too anonymous... I don't enter into certain dialogues on the web…because I don't know who's on the other side"). *Information* refers to concerns related to the quality, use, and protection of information (e.g., "might not have a credible source and its very hard to point what this source is, it could basically be anybody"). *Technology* refers to concerns related to hardware, software, and data (e.g., "Things breaking. … Viruses. Worms. Denial of service.").

The following results were significant (at the .05 p-value) using non-parametric statistics (e.g., Chi-square). As shown in Table 1, by and large more participants were concerned about risks to information (75%) than risks to people (42%) or to technology (38%). Moreover, several interesting differences emerged among the types of concerns articulated by the three communities: Suburban participants were more frequently concerned about risks to people (63%), particularly the quality of user experience and children's welfare, than their rural (25%) counterparts. High-technology participants were more frequently concerned about risks to information (92%) – particularly the security and privacy of information – than their rural counterparts (54%).

Table 1. Percentage of Participants Who Identified Risks and Harms on the Web By Community

Risks and Harms	Rural (n=24)	Sub. (n=24)	High-Tech (n=24)	Total (n=72)
1. People	**25**	**63**	**38**	**42**
1.1 User's Experience	4	38	8	17
1.2 Trust	4	4	4	4
1.3 Online Identity	0	8	13	7
1.4 Online Interactions	4	8	8	7
1.5 Children's Welfare	13	25	4	14
1.6 Other	0	21	0	7
2. Information	**54**	**79**	**92**	**75**
2.1 Quality	13	13	21	15
2.2 Management	4	17	8	10
2.3 Security	21	46	63	43
2.4 Privacy	21	46	63	43
2.5 Content	13	13	0	8
2.6 Spam	0	17	25	14
2.7 Other	0	0	8	3
3. Technology	**38**	**33**	**42**	**38**
3.1 Specific Technologies	0	4	8	4
3.2 Threat to Computer System	38	25	33	32
3.3 Other	0	4	0	1
4. No Concerns	**21**	**0**	**0**	**7**

An analysis was conducted on the most frequently identified risks and harms (i.e., those identified by more than one-third of the participants). Roughly half of those who identified these risks and harms felt *very strongly* that something should be done about them (security, 67%; privacy, 49%; and threats to their computer system, 58%).

DISCUSSION

How do users conceptualize risks and harms associated with the Web? Across the three communities (that varied with respect to technological expertise and education), users most often emphasized security, privacy, and threat to computer systems. Moreover, there was very little concern about trust, online identity, online interactions, information quality, information management, and information content. That said, there were also differences across communities. For example, users in the high-technology community were more concerned about security, privacy, and spam than those in the rural community. And users in the suburban community were more concerned about risks to people – particularly the quality of the user's experience (which entails the user's material, physical, and psychological well being) – than those in the rural community.

How should the design community respond to such heterogeneity of user concerns? One response might be that by and large the high-technology community should drive our design considerations. The reasoning would be that this community represents where the rest of the (less technically sophisticated) communities will be in time. There may be something to this position. For example, while our data showed that the rural community was entirely unconcerned about spam, conceivably these views will change as this community of users gain greater online experience and correspondingly encounter greater amounts of spam. But such a response – to ignore the perspectives of the rural and suburban communities across the board – seems unwarranted. In some cases, these communities showed greater concerns than the high-technology community (as in the suburban community's greater concern with people-centered risks). In other cases, the relative absence of a specific concern (such as for security) may reflect a lack of understanding of how the Web works. Such cases may warrant design interventions for less technologically sophisticated users.

Finally, a particular point of interest: A good deal of public debate around Web-based harms concerns children's welfare (e.g., children's access to pornography) [1]. Yet in our data this harm was of concern to only 14% of the participants. Thus our data suggests that while concern for children's well being online may be a very vocal part of the public debate, such fears may not be as wide-spread (or at least as deeply held) as previously thought.

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REFERENCES

1. *Declaration and Action Plan: Sexual Abuse of Children, Child Pornography and Paedophilia on the Internet*. UNESCO (Paris, FR, January 1999), http:www.unesco.org/webworld/child_screen/conf_index.html .
2. Friedman, B. & Kahn, P. H., Jr. Human values, ethics and design. In J. Jacko and A. Sears (Eds.), *Handbook on Human-Computer Interaction*. Mahwah, NJ: Lawrence Erlbaum Associates, (in press).
3. Shneiderman, B. Universal usability. *Communications of the ACM, 43*(5), (2000), 84-91.