

Disaster Communication on the Internet: An Examination of 12 Disaster-Relief Web Sites



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Abstract

This study employs content analysis to examine selected Web sites containing disaster information. It develops a typology of disaster-relief information, including relief, recovery, preparation, general information, and feature articles. This typology is intended to provide a useful frame of reference for practical use in disaster communication. Link and text on each site are examined for specificity and variety. In addition, content volume and subject among our domains, .com, .edu, .gov, and .org, are compared. Indication of differences in both subject specificity and volume were found between sites as well as domains.

In the past, people have utilized traditional forms of mass media for information about understanding, enduring, and recovering from natural disasters (Petrozello, 1997; Scanlon, 1998 Summer). In recent years, however, disaster communication on the World Wide Web (WWW) has also become an important field of study and practice (Noack, 1997; Sigurdson, 1998 June). In addition, rapid development of new communication technology has been paralleled by a shift in communication practice as it relates to disaster management. It is a transition that has prompted many involved in disaster communication to seek a two-way communication model for both coverage and relief (Sahlin, 1992). The purpose of the present study

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is to examine disaster communication on the Internet, arguably a potentially interactive form of mass media (Dysart, 1999; Ha & Lincoln, 1998; Morris, 1996), in light of this shift in practice.

This study employs content analysis to explore information at Internet users' disposal, and develops a typology of disaster-relief information, identifying and examining potential categories of content (relief, recovery, preparation, general information, and features articles) on selected disaster relief web sites from four different domains: .com, .edu, .gov, and .org. It is intended that this typology will provide a useful frame of reference for future research in disaster communication.

Disaster Communication — Background

Disaster communication refers to communication in which information regarding preparation for, response to, and recovery from natural disasters is exchanged, particularly between mass media and the general public. Disasters typically included in this area of communication include hurricanes, droughts, tsunamis, typhoons, tornadoes, floods, earthquakes, volcanoes, wildfires, landslides caused by adverse weather conditions, and winter storms, including naturally occurring avalanches. Communication surrounding these events is uniquely different from most "unnatural disasters," such as explosions, crashes, and accidents, covered by the mass media in that it is concerned with phenomena that are seldom directly caused or influenced by humans. Natural disasters often impact a large geographical area, but rarely give rise to litigation, public relations efforts, or investigative news reporting, although such coverage may rise when accidents happen during disaster conditions (Scanlon, 1998).

As technology has allowed the media to develop a more integral role in disaster relief, those involved with the media, for example journalists, have the opportunity to gradually become more cooperative in such efforts. In recent years, sources of disaster communication such as government (i.e., Federal Emergency Management Agency officials) and non-profit relief agencies (i.e., Red Cross coordinators) have developed a steadily increasing amount of trust and respect for their audience, slowly abandoning the notion that the media's role in disaster reporting is that of chaos control (informing audience to avoid certain areas or behaviors and remain in specific places) and agency advocacy (promoting the effectiveness or altruism of assisting organizations) (Sahlin, 1992). The notion is growing that not only can viewers handle bad news, but that they can also manage such information productively and efficiently, effectively responding instead of

panicking. This indicates a significant paradigmatic shift that warrants examination.

The old paradigm, that utilized the media in a one-way communication model, differentiated between professionals and volunteers. This reflected a general philosophy to handling disaster relief efforts: A hierarchical supervisor and laborer approach was often employed in relief efforts, with a group of authorities or officials giving the orders and volunteers following them. The two groups were segregated instead of unified in their recovery efforts. In addition, these tactics excluded or limited the free flow of both interpersonal and mass communication by using one standard approach in all disaster management situations (Sahlin, 1992).

In the past decade, this mentality has begun to shift toward that of a two-way communication model, in regard to how agencies and officials use both mass and interpersonal communication. Although mass media characteristics are often one-way in design, supplemental Web sites and other contact information increase the potential for audiences to respond to what they are reading or viewing in an increasingly interactive manner, particularly in the use of the Internet. In addition, expectations of up-to-the-minute information have become standard in disaster communications. Fortunately, existing technology makes that expectation reasonable (Corbley, 1999; Johnson, 1999; Slepicka, 1998; Wireless packet network helps Red Cross keep communicating, 1993; Welch, 1999).

As disaster relief officials continue to communicate more openly with their publics, response coordination is one of several roles that are emerging for the media in disaster communications. Survival and recovery from a natural disaster are somewhat contingent upon maintaining effective communication prior to and throughout a disaster. Important roles that the media continue to fill during a disaster include early warning, relaying information on preparation (when applicable), reporting to the general public, recruiting victim assistance, reporting weather conditions, recovery progress, causes of the disaster, and agency responses (Petrozello, 1997). In addition, the media undertake the responsibility of providing feature coverage of the disasters that are targeted to the current events interests of the general public.

The Internet and Disaster Communication — Uses

As of November 2000, the number of Internet users worldwide has been estimated to total more than 407 million (How many online?, 2000a), up 242 million from January of that same year (Internet

statistics, 2000b). CommerceNet projections estimate 490 million users by the end of 2002 and 765 million users by year-end 2005, which may be conservative estimates considering it projected only 349 million users by the end of year 2000 (Internet statistics, 2000b).

Because of this rapid growth, the Internet provides an increasing opportunity not only to reach large numbers of people, but also the potential to mobilize immediate responses from those people regarding their needs and wants. Communicators now have resources and avenues to tailor information to even the most specific needs of people who find themselves in disaster situations, particularly in communities that have tried to make the Internet available to a more socio-economically diverse range of their population.

Such Internet availability has been an increasing concern for government and corporate agencies alike, primarily because the rift between those with access to the Internet and those without has been growing as rapidly as the Internet itself. Several corporations have been leading efforts to help close this gap through special funding and grants used to provide computer and Internet access to low-income neighborhoods and minority populations (Hasseldahl, 1999; Internet-based tech centers being developed in 7 states, 1999; Head, 1999; Hoover, 1999, Rogoski, 1998). In addition, for fiscal year 2000 the Clinton administration sought \$65 million in funding for community Internet centers. That figure is a \$55 million increase from last year's budget request (Hatch, 1999).

The Internet and the Digital Divide

As early as December 1996, General Telephone (GTE) and Easy-Web, Inc. were funding projects to bring technology to low-income areas (Rogoski, 1998). Only months after the National Telecommunications and Information Administration (NTIA) released a report warning that the "Digital Divide" was in danger of growing into a "Racial Ravine," Gateway Computers donated 50,000 computers to help avert such a crisis. In a joint project with AOL, which donated 100,000 free America On-Line (AOL) accounts to various schools and computer learning centers, Gateway is helping to increase availability of the Internet in low-income areas through a \$10 million program called "PowerUp" (Hoover, 1999). In another \$10 million project, Free-PC gave away 10,000 Compaq computers and Internet service to low-income households, earning revenue from desktop advertisements rather than computer sales (Hesseldahl, 1999). AT&T has awarded more than one half of a million dollars in grant money to the National Association for Advancement of Colored People

(NAACP) and the National Urban League, who will use it to establish Internet-based "tech centers" in nine United States cities (Internet-based tech centers being developed in 7 states, 1999). American Telephone and Telegraph (AT&T) also pledged over \$700,000 to southern California communities for the development of technology education. Although the breadth and depth of the access gap are far-reaching, these substantial economic and time-consuming projects indicate potential progress in addressing this problem. Still, it is likely to remain a problem for some time to come.

Voluntary disaster organizations can perform any number of services to assist survivors with disaster response, providing food, water, shelter, counseling, advocacy, clean-up, education, training, repair, reconstruction, and consultation for community organizations (Bruinooge, 1996). Now they, too, have begun to make use of the Internet to relay large volumes of information more effectively. During the flooding of Grand Forks, ND, in the spring of 1996, Northscape News, the Web version of the Grand Forks Herald, provided E-mail and bulletin boards disaster through which victims could contact each other and on-line video clips of damaged areas. Within a span of three weeks, site traffic increased dramatically from 4,000 to more than 75,000 page views a day (Noack, 1997).

The Internet and Organizational Uses

Organizations can use the Internet to make resources readily available for relief efforts by coordinating the influx of information and providing immediate access to communication resources. Even for those who may not have access, the advantages are often prevalent in adverse situations, provided an organization has prepared itself (Slepicka, 1998). For example, in January of 1998, an ice storm knocked out the majority of overseas communication for ICS Petroleum Ltd. The year before, the company had prepared for such a disaster by implementing an E-mail aliasing service called AKA, provided by the Electronic Mail Co. (Also known as ... Nokomis, 1998). The storm left more than 3 million people without electricity or water for several weeks, but because ICS had familiarized itself with the E-mail service through everyday message-management use, it was able to reroute its messages and solve its communication problems in less than five minutes. If a similar situation occurred in which a disaster relief agency had adopted such preparedness, the retention of communication during a crisis situation could potentially benefit all area residents, even those who did not have Internet access.

The use of the Internet for disaster communication has sparked very little debate since there has been no argument whether the use

of two-way communication to relay this sort of information is effective. Bulletin boards, E-mail, on-line chats, news groups, and other Internet features can all serve to supplement other methods of disaster communication. Although potential donors should always be wary of anonymous individuals nefariously attempting to make money under the guise of a crisis, well-established disaster relief agencies are already using the Internet for soliciting of private donations of money and goods. In May of 2000, for example, the Red Cross raised \$340,000 in donations for disaster relief and other humanitarian services in its first national "virtual auction," believed to be the most successful Web charity auction to date (Lewis, 2000).

The Internet can also affect both social and professional networks. As communities are largely based on information exchange, the Internet provides a presumably barrier-free frontier for new social networks. Rheingold (1993) especially places emphasis on the healing effect that a sense of community can have on individuals. This could have particularly important implications for disaster communication because in this context, the community is often uprooted. Cyberspace could provide a means of maintaining a certain amount of communication between community members until they are able to physically resettle.

The Internet will continue to expand as a medium, with definitive methods, challenges, and objectives that distinguish it as a unique resource for disaster recovery. As the communication lines continue to open up between both public and private relief agencies, the general population, and channels of mass media, the opportunities for this variety of communication to facilitate individuals' recovery from natural disasters multiply. Because of the potential for disaster communication on the Internet to provide a wide variety of information to an equally varied base of specific users, it is important to establish a framework for organizing and understanding its content. This typology should specifically seek to identify sources of preparedness, resource, and response information. Such a typology could also facilitate efforts to assess the uses people make of the Internet and the benefits they derive from it in disaster communication.

Purposes and Objectives

The purpose of this content analysis was to investigate the types of disaster information available on 12 disaster-relief Web sites. The study's specific objectives were to describe the specificity, or how many items related to specific disaster response procedures; variety, how many different categories of content were included; and volume,

or amount of disaster information on the selected Web sites within individual sites and sites within specific domains, as well as between different Web sites and sites between different domains. Research questions include:

- 1) What characteristics in the level of content specificity regarding disaster information exist between Web sites? Between different domains?
- 2) What characteristics in the variety of disaster information exist between Web sites? Between different domains?
- 3) Are there variations in the volume of information category between Web sites? Between different domains?

Methods

During the month of July in 1999, twelve Web sites were judgmentally selected from the most frequently appearing Web sites produced in Web searches on Hot Bot[®], Lycos[®], and Excite[®].¹ In addition to frequent appearances in search results, Web sites that were selected had to have an obvious emphasis on and purpose of providing disaster relief information such as facts and recommendations about disaster relief (Elliott, 1999). Four searches were conducted using the advanced search option and the key words "disaster relief." Each search was restricted to one of the four domains. Although this study does not assert that these are the all-inclusive top 12 sites, the three most frequently appearing Web sites on Hot Bot[®], Lycos[®], and Excite[®] search engines were as follows:

- .com domain: The Disaster Center, Disaster Relief Resources from Nerd World Media, and Disaster Message Service.
- .edu domain: Cornell University's CE Net, North Carolina State University's Natural Disaster Relief Program for Families, and the University of Illinois Extension's Disaster Resources Home Page.
- .gov domain: Center for Integration of Natural Disaster Information (CINDI), Disaster Finder, and Federal Emergency Management Agency (FEMA).
- .org domain: Disaster Relief, The American Red Cross, and RedR's Engineers for Disaster Relief.

In addition to measuring each site's home page, ten of each site's secondary pages were selected randomly for analysis from the total number of links included on the first page.

The units of measure chosen for this analysis were links and paragraphs. Links are distinct pathways leading to other information, whether hypertext, links within a site, or those leading to another one. Text is traditionally organized by subject into paragraphs. For the purposes of this research, it was not necessary to weigh how detailed each paragraph was because it was the content category of the text that was being recorded. Therefore, instead of recording the subject of each individual word, the main subject of each paragraph was coded.

Based on general informal observations of various disaster resources both on and off the WWW, a list of potential content categories was compiled for coding by the author, including general, preparation, relief, and recovery information, news and feature articles, and composite links to disaster general relief resources. Subject categories were then divided into specific content and broad content. Specific content, which includes preparatory, direct relief, indirect relief, and recovery information, relates to material that is tailored toward specific use to disaster victims in managing the effects of a natural disaster. Broad content is a more general range of information that caters to a general curiosity about natural disasters and meteorological or geographical phenomenon. This includes general and features items, as well as composite links, which give no explicit details about the range of information to which they lead through their name alone (i.e., a link that reads only, Disaster Information). With a sub-sample of links and paragraphs totaling 600 (N=2936), after moderate training, the inter-coder reliability (ICR) of a second coder ranged from 72.2% to 100% depending upon the category, with an average ICR of 94.4%. Table 1 provides a summarization of these categories and examples of coding:

Results

Content Specificity — Web Sites

Results from this content analysis indicate that different Web sites and their domains may vary in content specificity. As Figure 1 illustrates, Cornell (site 1), North Carolina State University (site 2), University of Illinois (site 3), and The American Red Cross (site 12) all had more specific content (preparatory, direct relief, indirect relief, and

¹ Lycos® is a registered trademark of Carnegie Mellon University, Pittsburgh, PA. HotBot® is a registered service mark of Wired Ventures, owned by Lycos. Excite® is a service mark of At Home Corporation, Redwood City, CA.

recovery), while other Web sites, including Disaster Finder (site 4), CINDI (site 5), FEMA (site 6), Disaster Message Service (site 7), Nerd World Media's Disaster Relief Resource (site 8), The Disaster Center (site 9), Engineers for Disaster Relief (site 10), and Disaster Relief (site 11) contained more broad information (general information, composite links, and news or features articles). Sites 1 and 12 were markedly more specific in their content than the other Web sites.

Using Pearson's correlation coefficient ($\alpha = .01$, two-tailed), significant relationships were found between specific content and preparatory and recovery items, as well as between specific content and text items. In addition, significant relationships were found between broad content and general information, direct relief, and composite links, as well as broad content and number of links.

Content Specificity — Domains

In comparing domains, .edu measured the greatest amount of specific content, and .org had close to equal amounts of general and specific information. The .com and .gov sites contained predominantly general content. The .edu and .org sites measured greater proportions of precise preparatory, relief, and recovery content than did .gov and .com.

Characteristics between domains' amount of specific disaster relief content and broad content are illustrated in Figure 2. No significant correlations were found between domain and content specificity or type of item (text or link); however, analysis of variance (ANOVA) tests using the mean and standard deviation statistics that were calculated for each category of item between domains suggest that significant relationships do exist between domain and content specificity (Table 2). A significant difference was also found between the mean amount of broad text content of .edu and .gov domains.

Content Variety — Web Sites

In regard to variety of content between Web sites, North Carolina State University, University of Illinois, FEMA, Nerd World, RedR, Disaster Relief, Disaster Finder, and The American Red Cross contained six or more categories within their site. The Disaster Center had five and CINDI had four, but on both of those sites, three of their five featured categories were combined; they still made up less than 10% of the total content. Cornell and Disaster Message Service featured information from only three categories.

Significant relationships between general content and composite links, preparatory and recovery content, and direct relief and

Table 1
Coding Scheme

Specific Content

Preparatory	Direct Relief	Recovery
<ul style="list-style-type: none"> * Information aimed toward the preparation and education of individuals not yet affected by disaster <ul style="list-style-type: none"> - how to store and prepare food during power-outages; places to seek shelter, insurance policies, emergency contacts - how to secure belongings, when to evacuate. - pre-disaster installation and building techniques, contents for emergency supply kits - safety and illness prevention 	<ul style="list-style-type: none"> * Information specifically tailored to disaster victims in need of immediate assistance, hotline information, location of emergency shelters, donated goods, emergency housing or medical assistance 	<ul style="list-style-type: none"> * Rebuilding procedures/guidelines * Stress management * Grief counseling * Cleaning Up * Financial Recovery * Disaster relief "Updates" * Weather and health warnings elicited by the disaster * Public Service Announcements * Sanitation guidelines
	Indirect Relief	
	<ul style="list-style-type: none"> * Where/How to send monetary donations * What/where/how to send donated goods * How/where to volunteer services * "How to help", etc. 	

Broad Content

General	Features	Composite Links
<ul style="list-style-type: none"> * Economic, meteorological, geological, or geographical information * characteristics of natural disasters, general objectives of disaster relief programs, topics, and projects * "Fact sheets" and contacts and sources for information * Management and professional guidelines for businesses 	<ul style="list-style-type: none"> * Articles carried by national news publications or wire services * Photos & photo galleries * Articles about events 	<ul style="list-style-type: none"> * Agencies and Organizations * Handbooks and guides * Publications * "Resources" * Chat rooms and bulletin boards * Link trees and site maps

composite links ($\alpha = .01$, two-tailed) were found. Significant relationships between general and direct relief content were found at the .05 level.

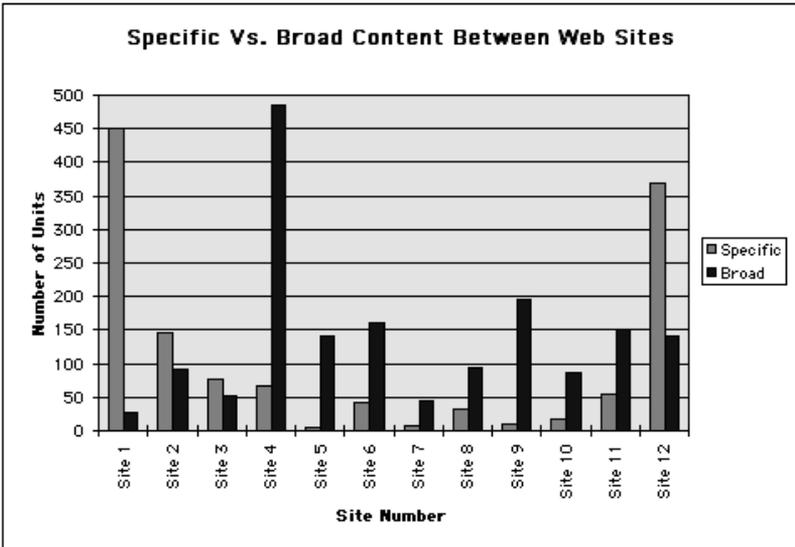


Figure 1. Specific Versus Broad Content Between Web Sites.

Content Variety - Domains

Prevalent were the differences in variety in content between domains: .com and .gov sites contained a predominantly large percentage of general information, while .edu and .org sites had the most preparatory information and recovery information (Table 3). The .com sites had the greatest number of composite links of the four domains as well. The most features content was found in .org sites, along with the largest proportion of direct and indirect relief content. No significant correlations or relationships were found between domain and content category.

Content Volume — Web Sites

The volume of coded content (Table 4), or total amount of links and paragraphs contained within each Web site ranged from 53 (Disaster Message Service) to 545 (The Disaster Service). One half of the Web sites contained three-quarters of the total amount of content that was coded (2936 text and link items combined).

Content Volume - Domains

With the exception of .com Web sites, which contained only 13.08% of the coded content, volume was fairly consistent. The .gov Web sites contained the most with 30.48%; however, .edu (28.54%) and .org (27.90%) also contained close to 30% of the coded content.

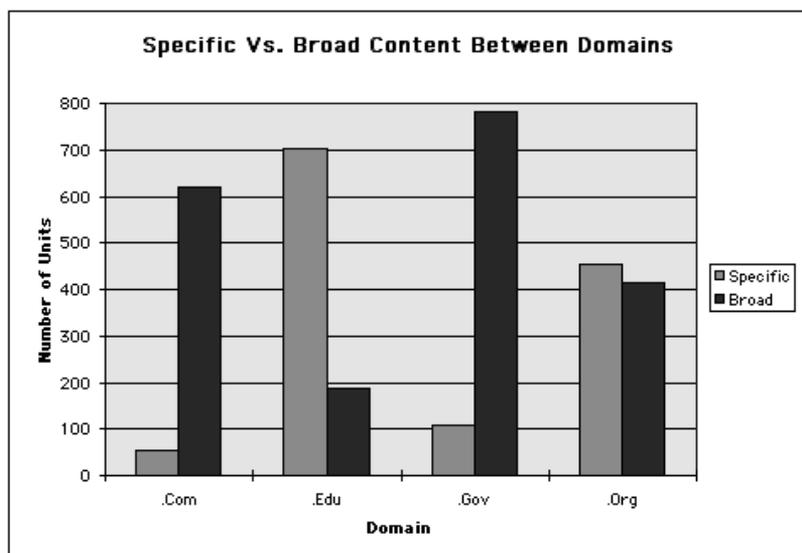


Figure 2. Specific Vs. Broad Content Between Domains.

Domain	Broad Text (N=464)	Broad Links (N=1201)	Specific Text (N=757)	Specific Links (N=514)
<i>.com</i>				
Mean	28.33	83	8.33	8.33
St.Dev	15.53	69.86	12.74	.58
N (384)	85	249	25	25
<i>.edu</i>				
Mean	14.00	43.00	152.00	70.33
St.Dev	10.54	36.76	237.76	47.75
N (838)	42	129	456	211
<i>.gov</i>				
Mean	67.67	192.67	2.00	36.00
St.Dev	8.14	193.34	2.65	31.05
N (895)	203	578	6	108
<i>.org</i>				
Mean	44.67	81.67	90.00	56.67
St.Dev	23.86	16.26	140.58	52.17
N (819)	134	245	270	170

When total items on the page were taken into account, .org contained the most overall content (32.85%) and .edu the least (24.19%). The .com domain contained the fewest amount of items overall (15.93%).

Discussion

Although these results are not necessarily generalizable to the entire population of disaster relief Web sites, among the sites sampled in this study, eight of the 12 Web sites measured contained a disproportionate amount of general, broad content. Only two showed a predominant amount of specific information. This indicates that perhaps there are many sites that have less interest in providing practical, specific information, and viewers looking for such material, at least in respect to these sites, may first begin first with .edu and .org domains, paying particularly close attention to the pages on those Web sites that contain a lot of printed material. Those with a more general interest in natural disasters may want to peruse .com or .gov sites, looking over the links that the web sites contain.

One could speculate several reasons for such differences. The .edu sites had a notably larger amount of specific information than those in the other domains. This may potentially fail to fulfill a need

Table 3
Content Variety of Domains

Content (Total Items=2936)	.com		.edu		.gov		.org	
	N	%	N	%	N	%	N	%
	384	100%	838	100%	895	100%	819	100%
General Text (352)	70	18.23	42	5.01	159	17.77	81	9.89
General Links (790)	204	53.13	66	7.88	377	42.12	143	17.70
Preparatory Text (441)	2	0.52	249	29.71	6	0.67	184	22.47
Preparatory Links (236)	13	3.39	91	10.86	60	6.70	72	8.79
Direct Relief Text (4)	1	0.26	0	0	0	0	3	0.37
Direct Relief Links (21)	2	0.52	2	0.24	13	1.45	4	0.49
Indirect Relief Text (30)	6	1.56	4	0.47	0	0	20	2.44
Indirect Relief Links (85)	5	1.30	6	0.71	2	0.22	72	8.79
Recovery Text (282)	16	4.17	203	24.22	0	0	63	7.69
Recovery Links (172)	5	1.30	112	13.37	33	3.69	22	2.69
Features Text (112)	15	3.91	0	0	44	4.92	53	6.47
Features Links (136)	31	8.07	8	0.95	39	4.36	58	7.08
Composite Links (275)	14	3.65	55	6.56	162	18.10	44	5.37

for a more diverse interest in natural disasters. As an educational institution, however, increasing site traffic or attracting new visitors through this particular venue may not be necessary for sites to be maintained. Since educational institutions are often funded by government and research grants, the focus on research projects may very well keep the content on .edu Web sites fairly specific when it comes to disaster relief.

In some cases, however, specific information may be more likely to become outdated in a short amount of time. It is much easier for information to become outdated, given the pace at which site content is potentially able to be adjusted to changes in events and audiences. Confounding this problem is the notion that maintenance can become much more difficult if an institution has a limited budget for its Web site, particularly if other agencies with similar web sites are more financially capable of supporting a site that is constantly adjusted and updated in accordance with its audience's needs.

Website (Pages Coded-126)	Coded Items		Excluded Items		Total Items	
	N	%	N	%	N	%
	2936 (100%)		586 (100%)		3522 (100%)	
.com sites (33)	384 (13.08%)		177 (30.20%)		561 (15.93%)	
Disaster Message Service (11)	53 (1.80%)		15 (2.56%)		68 (1.93%)	
Nerd WorldMedia (11)	125 (4.26%)		81 (13.82%)		206 (5.85%)	
The Disaster Center (11)	206 (7.02%)		81 (13.82%)		287 (8.11%)	
.edu sites (30)	838 (28.54%)		14 (2.39%)		85 (24.19%)	
North Carolina State (11)	474 (16.14%)		2 (0.03%)		476 (13.52%)	
University of Illinois (11)	237 (8.07%)		2 (0.03%)		239 (6.78%)	
Cornell (8)	127 (4.33%)		10 (1.71%)		137 (3.89%)	
.gov sites (30)	895 (30.48%)		57 (9.73%)		952 (27.03%)	
The Disaster Finder (11)	545 (18.56%)		37 (6.31%)		582 (16.52%)	
CINDI (8)	146 (4.97%)		10 (1.71%)		156 (4.43%)	
FBMA (11)	204 (6.95%)		10 (1.71%)		214 (6.08%)	
.org sites (33)	819 (27.90%)		338 (57.68%)		1157 (32.85%)	
RedR (11)	105 (3.58%)		3 (0.05%)		108 (3.07%)	
Disaster ReliefOrg (11)	206 (7.02%)		11 (1.88%)		217 (6.16%)	
American Red Cross (11)	508 (17.30%)		324 (55.29%)*		832 (23.62%)	
* 256 Items excluded were on the web site directory. Most focused on social issues.						

Unlike educational institutions, commercial Web sites have the burden of generating revenue through advertising for financial support. Although banners and other advertisements can often generate enough revenue to keep the site going, they can also create a conflict of interests between site visitors and potential advertisers when it comes to content variety. Advertisers may find Web sites with a wide variety of topics and a broad appeal a more attractive place to put their advertising dollars; however, the utility of the site can sometimes suffer for those visitors with a more focused interest. For example, a large variety of links can seem appealing if one is trying to appeal to a broad range of interests; however, if, subsequently, link descriptions are then brief, they often give a site visitor only a vague notion of where they may be going, making it more difficult for those looking for specific information to navigate through the site.

The nonprofit organizations featured in the .org domain have a diminished need to appeal to the interests of advertisers, and perhaps as a result seem to provide a more useful variety of general information and a healthier balance of specificity. In this domain, however, a heavy reliance on features and news coverage could be the tool used to solicit donations, as opposed to the use of advertisements to generate revenue. Volunteers and donors may want to know what kinds of relief efforts and events are supported by the organization to which they are making donations. The difference is that in this case, the tools used to solicit funding are most often directly related to disaster relief, not the sale of products or services.

Despite differences between sites that may be rooted in variations in objectives and target, two-thirds of the sites sampled contained at least six or more categories of information. Further, all domains contained each of the seven content categories in one or more of their respective Web sites. However, containing a variety of content does not predict the volume of any particular category; differences may exist regarding the amount of information from each category that is included. A site containing six or more categories of information may have a large amount of information in one category and scant amounts of others. Examining the influence that revenue or sponsorship sources may have on this phenomenon may be one interesting direction for future research.

The volume of content coded was somewhat inconsistent between Web sites. The two Web sites with only eight pages did not contain the least information of all the Web sites. It was a site largely dependent on its message boards, Disaster Message Service, that contained the least amount of both coded and total items overall.

Intended use (in this case, general interests) and specificity of target (in this case, anyone on line) may have influenced the amount of information on this site. Perhaps if the message service were promoted by a relief agency to serve as a meeting place for the victims of a specific disaster, however, there would be more material on the message boards. Regardless, it should be concluded that although sites with smaller numbers of pages may have fewer items containing disaster information, this should not be immediately presumed. Target audiences and their needs, in relation to a Web site's objectives, often influence the amount and type of content contributing to the size of a site.

Conclusions and Recommendations

The data produced in this study indicate that not all 12 Web sites that were offered as sources for disaster information were created equal. Differences in specificity, variety, and volume could be important factors in assessing the objectives and purpose of these and other disaster relief sites and warrant further investigation. Moreover, the data suggest that a site's domain may in some ways be indicative of certain content characteristics. However, obvious limitations such as the use of search engines, sample size, and limited number of pages selected within sites all present veritable challenges to the broad application of any information offered in this study. Although conclusions should not be drawn explicitly from these results, future research could undertake more specialized and scientific studies of these relationships by observing ways in which a site's source of funding, whether it be advertisements, government funding, or donations, may influence its content.

Research also should continue to develop ways in which objective, quantitative content analyses can be conducted on Internet disaster resources, so that more generalizable results may be found. Those with adequate resources may consider a larger sample size of disaster-relief Web sites and an analysis of how Web site visitors actually use different types of content, and how the objectives, patterns, and results of their use relates to the typology developed in this study.

Research on disaster resource information should also continue to investigate appropriate typologies for content with which to assess the quality and credibility of the sources of disaster information. Specifically, general content and excluded items could be sub-categorized in order to provide a more detailed look at these categories and reassess their relationships to other categories, content specificity, information variety, and domains. Such a typology, provided that

solid usage patterns could be identified, may lead to more effective ways for Web producers to understand their audience's needs and structure their communication, and in turn develop more powerful roles for disaster relief Web sites in domains where they may be underrepresented or overlooked.

Key Words

Disaster relief, internet, content analysis, world wide web, natural disasters.

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