Wilderness on the Internet: Identifying Wilderness Information Domains

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Abstract—Data collected from an online needs assessment revealed that Web site visitors with an interest in wilderness seek several different types of information. In order to gain further insight into the process of Web use for wilderness information, a follow-up analysis was conducted. This analysis was exploratory in nature, with the goal of identifying information domains of interest to potential audiences and to determine why certain groups of individuals have different information needs. The data were factor analyzed to determine logical information domains. Six information domains were revealed that could be used as a guide for creating structure for a Web site containing wilderness information. Subsequent analysis to determine factors that contribute to cluster membership was inconclusive.

The Internet and specifically the World Wide Web, or the Web as it is commonly known, have grown dramatically since their inception in the early 1990's. One study showed that in 1997, 43 percent of Americans lived in a household with one or more working computers, and 16 percent had access to the Internet in their home (National Science Board 1998). The number of people with access is predicted to triple by the year 2002 (Jupiter Communications 1996).

The wilderness community understood the great potential of the Internet as a medium for wilderness information exchange. In 1996, a task force of federal agency representatives including staff from the Arthur Carhart National Wilderness Training Center, the Aldo Leopold Wilderness Research Institute and faculty and staff from the University of Montana, convened to address the need for a comprehensive online wilderness information resource. The proposed target audience for this resource included wilderness managers, educators, researchers, advocates and the general public. Driving the need was a lack of online resources for the "Wilderness Management by Distance Education" courses that the University of Montana recently started offering. In addition, it was noted that wilderness information found online was often inaccurate. A unified effort to correct these problems could develop an information resource of great value.

The task force identified a number of initial steps to be taken before the new Web site could become operational. Among these was a needs assessment to identify potential audiences for wilderness information and determine their information needs. Without a clear picture of the potential audience for this new Web site, it was necessary to brainstorm a long list of information categories, in the hope that most respondents would find at least one area of interest. The medium chosen for the needs assessment was an online Web-based survey.

Methods

The survey was conducted online through the Wilderness.Net (http://www.wilderness.net) Web site from January to November 1997. The goal of the needs assessment was to determine information needs, characteristics of current Web users and their perceptions of the Web. Useable responses were collected 184 from wilderness managers, students, researchers and the general public.

Although utilizing a Web-based format for survey has several drawbacks—for example, it is very difficult to obtain a random sample, and there are no assurances that Web site visitors who submit the survey will do so only once—it was chosen not only to collect data about information needs, but to explore the potential of the Web. In addition, it was determined that this method would allow a much broader audience to provide feedback about the development of this resource, an important first step in building an online wilderness community. Alternative needs assessment methods, such as mail-back and phone surveys, were not pursued due to the lack of financial resources necessary to collect the data.

Potential types of wilderness information were collected through interviews with wilderness educators, researchers and land managers. Thirty-five (table 1) wilderness information topics (such as fire, recreation management, etc.) were presented to respondents. Each respondent was asked to rate these information topics in terms of their perceived benefit if made available online. Coding involved assigning a number based on the respondent's benefit level shown for each item. The respondent could choose from three benefit levels ranging from "Very Beneficial" (1) to "No Benefit" (3). As anyone could complete the survey on the Web site, it should be considered a convenience sample. Respondents who listed their age as less than 18 were not considered in this study, in keeping with the guidelines set by the University of Montana's Human Subjects review board.

Results

Of the 184 useable responses to the online survey, 24 percent were female and 76 percent male. Respondents ranged in age from 19 to 65 years old, with a mean of 38. The

Table 1—Information needs included in online survey.

Recreation behavior research	Bulletin Board to post notices
Social conflict research	Management issues and potential solutions
Recreation use trends	Maps of wilderness areas
Solitude/crowding research	Rules and regulations for specific wilderness areas
Recreation impacts/ecology research	Current conditions (i.e. weather, fire, trail etc.) for specific wilderness areas
Agency management plans	Leave No Trace program information
Positions of major environmental groups	Ecological research
Discussion area for various wilderness issues	Wilderness ecology issues
Wilderness management training materials	Monitoring issues/procedures
Wilderness education college courses by correspondence	Interactive databases
Wilderness curriculum guide for all grade levels	Geographic Information Systems of specific wilderness areas
Wilderness curriculum from various universities (degree programs, syllabi)	Wilderness/nature writing
Wilderness management training materials	Wilderness history
Site restoration techniques	Wilderness philosophy
Current events in wilderness	Fire management issues
Wilderness Study Area issues	Wilderness management policies of agencies and tribes
Wilderness related legislation	Economic impact research
International wilderness areas, systems and issues	

largest percentage of respondents identified themselves as affiliated with educational institutions as either teachers or students (36%). The second highest employment category was federal agency personnel (30%). Of the agency personnel, the U.S. Forest Service contributed the most, with 51%. The U.S. Fish and Wildlife Service contributed 8% (figure 1). The additional 44% of respondents identified themselves in employment categories not easily grouped.

In the second step, a factor analysis of the responses to the 35 wilderness information topics was conducted. Factor analysis was first introduced by Thurstone (1931) and is conducted to reduce the number of variables and to detect structure in the relationships between them. Factor analysis is primarily applied as a data reduction tool. In the present study, it was applied to find domains of wilderness information from the list of 35 presented to respondents.

Determining the correct number of factors to include in an analysis is a matter of judgment. However, there are some guidelines commonly used. The criterion proposed by Kaiser
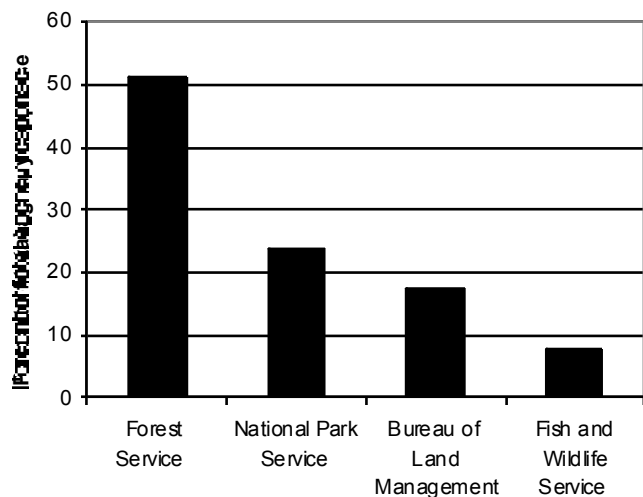
Figure 1—Federal agency affiliation of respondents.

(1960) states that only factors with eigenvalues greater than one should be retained. Using this criterion, nine factors (principal components) would be retained. A graphical method is the *scree* test first proposed by Cattell (1966), who suggested identifying the inflection point in the line where eigenvalues appear to level off to the right of the plot. According to this criterion, four factors would be retained.

Using the Kaiser criterion and the scree tests to frame the limits on the number of factors provided an upper limit of nine factors and a lower limit of four. In order to finalize the number of factors, the next step was to determine a set of factors that were interpretable. A four-factor solution did not provide enough categories to demonstrate the variability in information types, and nine factors provided too much detail that was not useful. After examining variable placements with several different factor numbers, six were chosen as the appropriate number of factors that placed variables of similar type together.

The next step in the analysis was to construct factor scales. Scales containing each of the variables were analyzed by extracting variables until the maximum Cronbach's Alpha was achieved. The resulting list of variables was decreased from the original 35 to 26. The total variability explained by the factor solution is 54.98%.

Factor names resulted from the characteristics of the variables within each factor. Each new factor scale resulted from totaling the values from all of the variables making up that factor and dividing this total by the number of variables. The variables making up factor one dealt with human impacts and use levels in wilderness and was called "Impacts/Social." Factor two variables included training, curriculum and other aspects of education and was named, "Education/Training." Factor three variables consisted of current events in wilderness, wilderness legislation, and management issues and potential solutions, etc. This factor was named, "General." Factor four variables consisted of information about specific wilderness areas including rules and regulations, maps and current conditions. This factor was named, "Specific." Factor five involved ecological research, wilderness ecology issues and monitoring

issues/procedures and was named "Ecological." Factor six variables were associated with higher education, history, philosophy and writing. This factor was named, "Academic." Table 2 shows the factor scales and the Cronbach's Alpha for each scale.

The next step in the analysis requires a clustering of the respondents into homogenous groups based on the information factor scales. Cluster analysis (first used by Tryon 1939) is a technique used to organize observed data into meaningful structures. In this study, it was utilized as a means to classify individual respondents into groups based on their information needs.

After deciding on the appropriate number of clusters (three), each case was identified by its cluster membership. Table 3 shows the mean scores of each cluster for each factor.

The clusters were named based on the domains to which they assigned high importance. Cluster one placed high importance on the visitor and general information domains and was named "Visitor-Oriented." Cluster two placed high importance on the management and impacts/social domain and was named "Resource Oriented." Cluster three placed relatively high importance on all of the benefit factors and was thus named "Information Enthusiasts."

The next step in the analysis was to determine factors that contribute to cluster membership. Three types of variables were examined, including sociodemographic variables about respondents, mass-media resources used by respondents and respondent attitudes about the Web (quality, speed, efficiency, etc.). Several independent variables were cross-tabulated with the new variable, "cluster membership," but

Table 2—The information items making up each factor and Cronbach's reliability coefficients for the factor scale.

Factor Name	Item	Scale Reliability
Impacts/Social	Social conflict research Solitude/crowding research Recreation behavior research Recreation use trends Recreation impacts/ecology research Wilderness management policies of agencies and tribes	.8137
Education/Training	Wilderness management training materials Wilderness education college courses by correspondence Wilderness curriculum guide for all grade levels Wilderness curriculum from various universities Wilderness training calendar	.7538
General	Wilderness Study Area issues Current events in wilderness Wilderness legislation International wilderness areas, systems and issues Bulletin Board to post notices Management issues and potential solutions	.7028
Specific	Current conditions (i.e. weather, fire, trail etc.) for specific areas Rules and regulations for specific wilderness areas Maps of wilderness areas	.7206
Ecological	Ecological research Wilderness ecology issues Monitoring issues/procedures	.6036
Academic	Wilderness/nature writing Wilderness history Wilderness philosophy	.6938

Table 3—Mean cluster scores for each information domain (factor).

	Factors					
	Ecological	Impacts/Social	Education/Training	General	Specific	Academic
Clusters						
Visitor-Oriented	2.03	2.00	1.97	2.11	2.76	1.93
Resource-Oriented	2.40	2.31	1.86	2.16	1.55	1.68
Information Enthusiasts	2.67	2.69	2.44	2.59	2.45	2.51

Table 4—Respondents who read professional journals by cluster.*

| | | Cluster | | | |
		Visitor Oriented	Resource Oriented	Information Enthusiasts	Total
No	Count	18	5	13	36
	% within Cluster	35.3%	11.6%	14.4%	19.6%
Yes	Count	33	38	77	148
	% within Cluster	64.7%	88.4%	85.6%	80.4%
Total	Count	51	43	90	184
	% within Cluster	100.0%	100.0%	100.0%	100.0%

*Pearson Chi-Square = .004.

Table 5—Respondents who read recreation-oriented magazines by cluster.*

| | | Cluster | | | |
		Visitor Oriented	Resource Oriented	Information Enthusiasts	Total
No	Count	2	8	9	19
	% within Cluster	3.9%	18.6%	10.0%	10.3%
Yes	Count	49	35	81	165
	% within Cluster	96.1%	81.4%	90.0%	89.7%
Total	Count	5143	90	184	
	% within Cluster	100.0%	100.0%	100.0%	100.0%

*Pearson Chi-Square = .065.

none of the subsequent analyses uncovered interpretable results that would help explain cluster membership.

Variables measuring sociodemographic examined included gender, age and employment category. None of these analyses uncovered statistically significant results.

Both professional journal (table 4) and recreation-oriented magazine readership (table 5) demonstrated statistically significant relationships when cross-tabulated with cluster membership. As would be expected, both the resource-oriented and information enthusiasts clusters reported that they have read professional journals in the past year, and both the visitor-oriented and information enthusiasts clusters reported reading recreation-oriented magazines in the past year. The statistically significant results shown in these two tables should be interpreted with caution because of the instances where cells contain five or fewer cases.

Several variables measuring respondent Web use and attitudes toward the Web were cross-tabulated with cluster membership. Two statistically significant relationships were uncovered through this analysis: attitudes about the quality of information found on the Web (table 6) and preferences about digital information versus other types of information (table 7). In both of these examples, the relationship between attitude and cluster membership is unclear and is further clouded by high counts in the "Neutral" category.

Table 6—Respondents who believe the information found on the web is of greater quality than other information sources by cluster.*

| | | Cluster | | | |
		Visitor Oriented	Resource Oriented	Information Enthusiasts	Total
Disagree	Count	12	22	27	61
	% within Cluster	25.5%	55.0%	32.9%	36.1%
Neutral	Count	25	12	33	70
	% within Cluster	53.2%	30.0%	40.2%	41.4%
Agree	Count	10	6	22	38
	% within Cluster	21.3%	15.0%	26.8%	22.5%
Total	Count	47	40	82	169
	% within Cluster	100.0%	100.0%	100.0%	100.0%

*Pearson Chi-Square = .037.

		Cluster			
		Visitor Oriented	Resource Oriented	Information Enthusiasts	Total
Disagree	Count	7	12	22	41
	% within Cluster	14.3%	28.6%	24.7%	22.8%
Neutral	Count	18	15	41	74
	% within Cluster	36.7%	35.7%	46.1%	41.1%
Agree	Count	18	12	13	43
	% within Cluster	36.7%	28.6%	14.6%	23.9%
Strongly Agree	Count	6	3	22	
	% within Cluster	12.2%	7.1%	14.6%	12.2%
Total	Count	49	42	89	180
	% within Cluster	100.0%	100.0%	100.0%	100.0%

*In response to the statement, "I prefer my information in digital form rather than paper format."

**Pearson Chi-Square = .070.

Discussion

The study was conducted with two goals in mind: 1) to determine if there were logical domains of wilderness information whose use was correlated with each other, and 2) to determine what factors contributed to respondent information needs. The following section will address the extent to which the study contributed to a further understanding of the study goals.

These results of this study are very useful in terms of the continued development of the Wilderness.Net site, as it revealed six distinct information domains, or groupings of information types that can be used as a guide for creating structure for the site. Specifically, the identified information domains can be used as organizational categories for navigation. Hopefully, utilizing empirically derived relationships will enable visitors to the Web site to locate information faster and easier. This in turn could produce more repeat visitation and enhance the information-retrieval process.

Subsequent analysis to determine factors that contribute to cluster membership was inconclusive. Relationships were examined between self-reported sociodemographic information and attitudes toward the Web. Analysis revealed four independent variables that were associated with cluster membership, but these results did not offer any meaningful conclusions. The results of the analysis demonstrated that mass-media readership plays a role in predicting the type of information sought, but no other demographic data were correlated. These findings, however, do not offer enough evidence to draw any conclusions about cluster membership.

One conclusion that could be drawn from these results is that the act of seeking wilderness information on the Web is not related to specific demographic data about an individual. Regardless of age, gender, or income, etc. respondents were equally attracted to various information topics about wilderness.

The final list of wilderness information included 26 different types after conducting the factor analysis. Because the list of wilderness information types was so broad, there may

have been temporal factors that would decrease the ability of clustering to properly segment the individuals into usable clusters. By relying on a broad list of wilderness information to categorize persons in an overall way, we may have inadvertently missed the fact that people have different information needs at different times. For example, scientists may need ecological research as part of their job, and they may need both rules and regulations and maps for a specific wilderness area for a planned backpacking trip. The present study did not measure this important variable, information use. The temporal distinctions mentioned above point to the need for further investigation about the intended use of the specific wilderness information.

The present study identified several wilderness information domains that should be verified through a follow-up survey to test their reliability. Future attempts to segment individuals in terms of their wilderness information needs should rely upon a univariate measure that allows respondents to choose a category from a list (research-oriented, management-oriented, education-oriented, etc.). In order to overcome the temporal problems in the present study, future research should ask respondents to rate their information needs based on its intended use. For example, when respondents first view the survey instrument, they could be asked to identify themselves by one of the following roles: student, scientist, teacher, land manager, backpacker, environmental activist, etc. They would then be instructed to rate the information types in terms of their benefit to the role they just selected and to that role only. This method of respondent categorization would probably increase the likelihood of determining factors that contribute to individual information needs.

Wilderness information on the Internet will continue to play an important role into the future as more and more people go online and the global demand for information increases. The results of this study demonstrate that the following wilderness topics are important to many audiences: impacts/social, education/training, general, specific, ecological and academic. These information topics appear to

be useful to all audiences regardless of gender, age, occupation or mass-media reliance. Furthermore, it appears as though most individuals are not solely interested in one aspect of wilderness; rather, they seek several different types. It is important to note that the sample this study is based on is limited and probably has a higher than average interest in wilderness. Nevertheless, the implications of this are far reaching. If an informed constituency, or even the potential for an informed constituency, can make it easier for policy-makers and advocates to accomplish their goals, then the value of resources like Wilderness.Net is tremendous.

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