Information Needs, Acceptability of Risk, Trust, and Reliance: The Case of National Predictive Services Customers

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Abstract

Making complex risk-related decisions involves a degree of uncertainty. How that uncertainty is addressed or presented in reports or data tables can be tailored to meet information users' needs and preferences. Involving the recipients of risk-related information in the design of information to be delivered (including the types of information delivered, format, and approach to risk) follows Fischoff's (1995) recommendation for involving the recipients of risk information in the crafting of the risk message. Here, we describe a study conducted with people who use risk-related information. We contacted users and potential users of National Predictive Services, an information clearinghouse for people who work with prescribed and wildland fire. Specifically, this service supplies information to fire managers and associated personnel that will help them make short-term (30-day) decisions regarding fire personnel and resource deployment. Each potential user is a member of the fire-management community, including fire management officers, meteorologists, information officers or public affairs personnel, and members of various fire-management teams. The information users focused on in this study were employed within Federal agencies. Respondents completed a self-administered survey via a Web-based service. Findings examine the types of information users need, preferred formats for information delivery, and the likelihood of applying information from Predictive Services in decisions made about fire. Of interest to this paper's risk management/risk communication focus are the reported views on acceptability of risk and tolerance for errors, implications of risk, and trust and confidence in the information delivered through Predictive Services. Barriers and facilitators to utilization of Predictive Services are illuminated.

Keywords: Information needs, National Predictive Services, reliance, trust, user-needs assessment.

Introduction

A Needs-Assessment Approach to Evaluation

A framework for program evaluation is found in needs assessment. According to Rossi and others (1999), in a needs assessment, a program is assessed in light of the presenting conditions that make the program necessary. Current and prospective service recipients may be surveyed to explore such pertinent issues as target audience for the services or program, service utilization, services desired, shortcomings of existing services, and barriers to service utilization. Additional items of interest in a user-needs assessment are (1) a detailed examination of the characteristics of the target audience (e.g., gender or time in position of employment); (2) need for specific products and services; (3) program design, including preferred delivery systems (e.g., the Internet, in-person briefings) and delivery styles (e.g., maps and graphs); and (4) program operations (i.e., whether potential Predictive Services clients are actually using the products and services, and if not, why not). A careful examination from the perspective of key informants (users and potential users) facilitates a formative evaluation process. This process includes adjustment of existing products and services to better meet user needs and development of new products identified as necessary but not currently offered. The evaluation can result in a negative appraisal of a program, causing some consternation among program sponsors and enthusiasts. However, findings of a careful needs assessment that result in subsequent adjustment can help increase program value and effectiveness. Such a process might be taken in stride as part and parcel to setting up a program designed to meet a specific need or set of needs, and growing pains in adjusting and further developing a program through its life. Undertaking a user-needs assessment represents an openness and a commitment to service. Evaluation should be a part of every serious risk communication effort (Slovic and others 1990).

Crafting of Risk Messages to Meet Users' Needs— Access to information is crucial to effective management of risk. Information available prior to a risk-related event can assist in advance planning, including allocating and distributing resources. Information available during a risk-related event could help determine how severe the event might become, adequacy of management resources, and the type and degree of intervention that is needed to protect human, structural, and natural resources. Information following a risk-related event might be used to aid recovery efforts and conduct analysis directed toward future risk-related responses. Wildfire is one example of a risk-related event; fires represent threat and potential harm to natural, structural, and human resources.

Factors That Affect Acceptability and Use of Risk Information—
Not all audience members targeted for risk-related information will have the same information needs or interests; thus, variability in message content is an important consideration in crafting risk-related messages. Multiple factors have been demonstrated to influence perceptions of risk and risk-related decisions, including gender (Finucane and others 2000, Satterfield and others 2004, Siegrist 2000), age (Otani and others 1992), time in decisionmaking role, and degree of experience with risk situation (Payne and others 1992, Reyna 2004), educational level (Vaughan and Nordenstam 1991), expertise in the topic area (including expert vs. layperson views) (Fischoff and others 1984, Plough and Krimsky 1987, Slovic 2000), and individual worldviews (e.g., culture, attitudes, and values) (Slovic and Peters 1998, Vaughan and Nordenstam 1991, Weber and others 1998). Contextual and situational factors further influence risk perceptions and decisionmaking (see, for example, Kneeshaw and others 2004).

In addition, trust in an information source and confidence in the information received have been repeatedly demonstrated as essential to how information will be perceived, responded to, and accepted (Borrie and others 2002, Cvetkovich and Winter 2003, Siegrist 2000, Siegrist and others 2000) and has direct applications to fire-management issues (Cvetkovich and Winter 2004; Shindler and others 2004; Winter and others 2002, 2004). Trust in the information source tends to foster greater acceptance and belief in the risk-related message.

The Present Study

This analysis presents findings from a study initiated in 2005 through request from the National Predictive Services Group (NPSG), a group chartered under the National Fire and Aviation Executive Board (NFAEB) that provides oversight, leadership, and strategic direction to the Predictive Services program. The NPSG identified a user-needs assessment as one of its program-related goals, and they have played a central role in execution of the assessment. The assessment examines the Predictive Services program, which offers products and services through Web sites, briefings, and emails administered through the National Interagency Fire Center (NIFC) and the Geographic Area Coordination Centers (GACCS). The main purpose of this service is to integrate climate, weather, situation, resources status, and fuels information into products that will enhance the ability of managers to make sound short- and long-term strategic planning and resource allocation decisions and to ensure the safety of firefighting and emergency personnel. Predictive Services is a multiagency effort, with support from the USDA Forest Service, the USDI Bureau of Land Management, National Park Service, Fish and Wildlife Service, Bureau of Indian Affairs, and the National Weather Service. Products are aimed at the fire management community in each of these agencies as well as State and county agencies.

The NPSG requested assistance from the authors to conduct a user-needs assessment; to gain information toward improvement of current products and services, if necessary; and to identify additional products and services that might be offered. Evaluation results are more likely to be utilized if they directly address the information needs of decisionmakers (Patton 1986). Thus, the survey and sample were constructed in close collaboration with the NPSG in order to ensure the assessment met their needs. Respondents included fire management officers, fire weather meteorologists, suppression personnel, dispatchers, fire behavior analysts, fuels specialists, fire researchers, incident

management team members, fire use team members, multiagency coordinators, aviation personnel, and public affairs personnel. Study findings may interest other agencies and individuals examining dimensions of risk management, including fire and threat information needs.

Method

Respondents—

A sample of email addresses representing users and potential users of Predictive Services products and services was compiled using key contact and snowball approaches. Sources of addresses included the NPSG, a list of incident information officers, the National Wildland Fire Management Directory, contacts at various Federal agencies, and online directories. We compiled a national list of 2,999 Federal contacts. This initial list was composed of Federal sector fire management personnel within the selected agencies (see respondent description below) with a focus on assuring that fire management officers, fire behavior analysts, incident meteorologists, GACC managers, regional coordinators, public affairs and information officers, dispatchers, incident management team members, fire use personnel, and aviation personnel were included. A census listing was not available through any of the agencies, so a compilation from email lists containing fire management types, a training record, and other preestablished lists and directories was used. Because the Predictive Services group wanted as many respondents as possible, we used all members in our list whose email addresses could be obtained. The sample was intended to be as comprehensive as possible given the lack of a census listing.

Beyond those included in the sample, an additional number of individuals responded as volunteers. Two circumstances prompted volunteering. The first occurred when initial contacts forwarded the survey link to others after completing it themselves. In some cases, initial contacts felt they were not the best person to complete the survey and forwarded it to another contact within their agency.

The respondents included 1,078 individuals (including 63 volunteers or 5.8 percent of the sample). The majority (69.1 percent) were male, employed with the USDA Forest Service (53.3 percent), National Oceanic and Atmospheric Administration and the National Weather Service (14.3 percent), Bureau of Land Management (12.6 percent), the National Park Service (10.0 percent), U.S. Fish and Wildlife Service (4.7 percent), and Bureau of Indian Affairs (3.5 percent). The remainder were employed within a Federal interagency group (0.6 percent) and various other Federal agencies (0.9 percent). Respondents had typically been in their current job for 3 years (median response). We had a final response rate of 36.5 percent with less than 1 percent of the sample refusing to participate (12 individuals). A random sample of nonrespondents was contacted by telephone and asked to complete a brief phone survey covering reasons for nonresponse, use of various GACC Web sites, and familiarity with products and services. The main reasons for nonresponse were lack of familiarity with the program and lack of time during the study period. Nonrespondents were similar to respondents in geographic location and agency of employment.

A comparison of the sample respondents and volunteers revealed that the volunteers were twice as likely to be employed within the Bureau of Indian Affairs (7.9 versus 3.3 percent of each sample) and Bureau of Land Management (22.2 versus 12 percent), and were less likely to be from the USDA Forest Service (31.7 versus 54.7 percent). The average length of employment was significantly different, with volunteers reporting fewer years (2.9 years for volunteers and 6.2 years for the original sample, $t = 3.326$, $p = 0.001$). Gender distribution was similar for the two groups. The volunteers and original sample members are combined for the purposes of this paper because further analyses showed that there were few differences between these two groups.

The Survey—

Topics addressed in the survey included sociodemographics (e.g., employing agency, years in current position, and gender), who the Predictive Services audience should be, preferred information formats, preferred products and services, acceptability of risk and tolerance for errors, implications of risk in making decisions, trust and confidence in the products, reliance on Predictive Services products, reliance on other information, and facilitators and barriers to using

Predictive Services information. The survey included closed-ended (including semantic differentials, checklists, and other formats) and open-ended questions. Some survey items were modeled after recent studies conducted by another Federal agency to allow for comparison, whereas others were developed specifically for this study's purposes. A draft instrument was submitted through peer review and review of the Predictive Services group commissioning the study. The instrument was pretested with a random sample of respondents, and adjustments were made to items that seemed unclear or were described as confusing by pretest participants. The survey was posted on the Web service Question Pro (http://www.questionpro.com). A Web-based survey was desirable because of the significant cost reduction achieved by eliminating printing and mailing costs, greater availability of email addresses than mailing addresses for the sample members, and increased familiarity of Web-based instruments among Federal personnel. Failed addresses were typically bounced back within minutes rather than days, allowing for attempted correction and remailing, or, when appropriate, elimination from the sample.

Procedure—

Respondents were emailed an invitation and brief letter describing the study, along with a link to the survey site. Three reminders were sent over the course of the data collection period, with a total of 42 days allowed for response. The first reminder was sent 10 days after the initial mailing, the second was sent 14 days after the first reminder, and the last was sent 10 days after the second mailing, 1 week prior to the close of the survey site. Each of the reminders contained a brief message and the link to the survey site. Reminders were sent to sample members who had not completed the survey as well as those who had not been removed from the sample owing to email failures.

Results

Identified Audiences—

Respondents were asked whom Predictive Services should include as the primary audience for their products. The primary audiences selected by the majority were local and district fire managers (75.8 percent), regional and State fire managers (75.3 percent), and national fire managers (65.5 percent). Nonfire land managers were listed as a primary audience by about one-third (33.5 percent), and the public was listed by about one-fourth of the respondents (27 percent; note that percents do not sum to 100 because respondents could provide multiple answers on this item).

Information Used and Utility of Information—

Preferred Formats

Respondents were asked to indicate how useful each of 11 styles and formats of presenting information was to them. The average ratings of all items except one fell above 3 (the neutral point on the scale). From greatest to least, the most useful formats were regional or national maps ($\chi = 3.91$, sd = 1.03, n = 879), satellite maps ($\chi = 3.76$, sd = 1.15, n = 870), brief executive summaries of data ($\chi = 3.75$, sd = 1.08, n = 858), brief annotations that accompany data ($\chi = 3.56$, sd = 1.02, n = 850), radar maps ($\chi = 3.53$, sd = 1.19, n = 857), data in table form ($\chi = 3.53$, sd = 1.05, n = 863), bar charts or figures that summarize data ($\chi = 3.37$, sd = 1.09, n = 856), data in text form ($\chi = 3.33$, sd = 1.03, n = 849), Web-based ArcIMS maps with user-defined layers and scales ($\chi = 3.31$, sd = 1.23, n = 832), and data in spreadsheet form ($\chi = 3.21$, sd = 1.10, n = 853). Least useful to respondents was non-Web-based Geo database files ($\chi = 2.62$, sd = 1.12, n = 793).

Preferred Products and Services

Thirty-eight products and services were listed in the survey. Some of these products are available elsewhere as well and are provided as a courtesy to the Web site users. For each item, respondents were to indicate if they had not used the product, and, if they had, to rate the usefulness of that product. Several of the products stood out because at least 70 percent of the respondents had used the products and rated them as useful or very useful. They included daily fire weather forecasts, red flag warnings (this term is used by fire weather forecasters to alert users to an ongoing or imminent critical fire weather pattern, http://www.nwcg.gov/pms/pubs/glossary/index.htm), Incident Management Situation reports, drought information, and Interagency Situation reports. A number of products were used by a majority (at least 50 percent), although ratings of usefulness varied. A few items offered through Predictive Services had

been used by a minority of respondents and were not rated as very useful by those who had used them. Among the products in this category were regional monsoon updates, upper air soundings, Predictive Services forms, and state-of-the-fuels reports.

Suggestions for Improved Formats and Products

Respondents gave several suggestions for improvement in response to open-ended questions. In terms of format, there were several suggestions for improving Web site performance, including making sure that GACC and Predictive Services employees could direct people to the right location, streamlining information searches by allowing users to bookmark relevant information, having a professional Web designer improve the sites' navigability, and removing information that is no longer accurate. In terms of expanding products and services, there is a desire for more location-specific products and more two-way conversations between Predictive Services and people who work on the local level. This communication would support local decisionmaking and possibly increase the relevance and quality of information provided by Predictive Services. People working in off-season or prescribed burning capacities, or both, suggested more year-round coverage. Additional topics for Web site content were offered including information on smoke management, fuel moisture, safety, real-time information, and current fire behavior.

Acceptability of Risk and Issues of Accuracy—

Respondents were asked to choose the statement that best fit their preference regarding error in predicting risk. The majority (67.3 percent) chose "Statements of danger or risk be issued with a greater margin of error allowing for an early response, knowing that this may lead to unnecessary alarms and response (better safe than sorry)" over "Statements of danger or risk should only be given with certainty, knowing that this may allow a few dangerous events to emerge that were not anticipated (don't cry wolf)" (chosen by 23.9 percent of respondents). In other words, the majority preferred erring on the side of caution when reporting on fire danger and high fire potential.

Open-ended responses pointed to concerns surrounding information accuracy. Among the topics of concern were the need for clear statements of the limitations of the data and known degrees of accuracy (for example, some would like to see confidence intervals reported along with data). There was also an interest in sources and assumptions used in creating the products offered.

Implications of Risk in Decisionmaking—

The perceived impacts of inaccurate information were examined. To address this concept, two items were used. The first was "Inaccurate Predictive Services information would decrease my ability to predict fire behavior" rated on a scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). The majority leaned toward slight agreement with this statement ($\chi = 3.36$, sd = 1.16, n = 712) with 12 percent indicating strong agreement and another 20 percent indicating agreement. Another 18.2 percent neither agreed nor disagreed with this statement.

The second item was "Inaccurate Predictive Services used in my decisionmaking may adversely impact firefighter or public safety" again rated on the 1 to 5 scale. The majority leaned toward slight agreement on this statement as well ($\chi = 3.48$, sd = 1.18, n = 744), with 20.3 percent indicating agreement and 16.0 percent indicating strong agreement; 17.8 percent neither agreed nor disagreed with this statement.

Written comments pointed to concerns surrounding accuracy in data gathered to make predictions and communication issues. These comments revealed a disconnection between Predictive Services and local field units. Comments indicated that Predictive Services might benefit from a better awareness of local weather and fire problems. Communication-related comments addressed concerns over the need for consistency in content, streamlining of information, and concentration on materials directly relevant to fire-use decisions.

Trust, Confidence, and Reliance—

Trust and confidence in the information provided by Predictive Services were assessed in a general item "How much trust and confidence do you have in the information provided by Predictive Services?" rated on a scale from 1 to 5 (1 = none at all, 5 = a great deal). Very few respondents selected 1 (none at all, 8.8 percent) or 2 (5.3 percent) on this

item. About one-fourth (25.7 percent) indicated some trust and confidence, whereas almost half selected either 4 (35.4 percent) or 5 (12.8 percent), indicating a majority of respondents had trust and confidence in the information provided.

In addition, when asked about three specific trust-related issues that might be barriers to using Predictive Services, very few indicated that trust was an issue. Only 3.5 percent indicated that they did not trust the products and services, 1.4 percent indicated a lack of trust in advice about using the products, and less than one percent indicated a lack of trust in information produced by multiple agencies. These specific items suggest that most had trust in the information provided.

Comments specific to trust and confidence included the desire among respondents to have a working relationship with the people who provide the information, as exemplified by this quote: "The local weather service offices continue to provide one-on-one support for weather products. The level of trust in a forecast product is directly related to the personal conversations I have had with the forecasters." In spite of some trust, to a great deal of trust expressed by the majority of respondents, the majority do not rely on Predictive Services in decisionmaking. About 10 percent (9.6) relied on Predictive Services a great deal (a rating of 5 on a 1 to 5 scale, 1 = none at all, 5 = a great deal). About one-fifth (21.2 percent) provided a rating of 4, and about one-third indicated little to no reliance on Predictive Services information (12.5 percent gave a rating of 2; 21.5 percent a rating of 1).

When asked how true the statement "I rely on other sources more heavily than the products and services provided by Predictive Services," the majority indicated that this statement was somewhat to very true (51.1 percent), whereas 16.8 percent indicated the statement was not at all true. The likelihood of taking action based on Predictive Services information received or gathered from a Web site suggested respondents were somewhat likely to take action ($\chi = 2.96$, sd = 1.23, n = 979, on a 1 to 5 scale, 1 = not at all likely, 5 = very likely).

Facilitators and Barriers to Utilization— Two facilitators to utilization were queried based on accessibility and utility. The first of these was "I can access and apply Predictive Services information as part of my job duties." Almost half (46.3 percent) agreed or strongly agreed with this statement. Approximately another fifth were neutral (18.9 percent), and almost one-third did not supply a response (27.7 percent). The second item related to utilization facilitators was "Predictive Services information helps me perform my job with greater precision," with which 13.7 percent agreed, whereas almost one-third (31.4 percent) disagreed or strongly disagreed. About one-third (32.5 percent) did not respond to this item.

Barriers to utilization were explored through a general item related to uniqueness of the information "I think there is overlap in the type of information that I can obtain from Predictive Services and other sources." More than half (56.5 percent) indicated that this statement was somewhat to very true. Respondents noted overlap between the products and services offered by Predictive Services and other sources, particularly the National Weather Service. Some suggested a closer coordination between the two providers in order to reduce or eliminate redundancies.

Specific barriers to utilization not related to trust of the information (already presented above) were examined. The most frequent barrier selected was "I never thought about it," (indicated by 26.9 percent). Other barriers selected by at least one-tenth of the respondents included "My current management practices don't require the types of information provided by Predictive Services," (14.7 percent); "I don't know how to use these products," (14.1 percent); and "I need information that is site specific" (13.5 percent). Some respondents also mentioned a lack of resources as a barrier (lack of time mentioned by 9.3 percent; lack of technology by 4.0 percent; and lack of money at 1.4 percent).

Open-ended responses offer additional insights into barriers in using Predictive Services including levels of awareness and access. Some respondents were either unaware of the products and services or indicated a limited knowledge of the array of available information and its potential uses. Respondents made several suggestions that would address this situation, including advertising to targeted markets, annual notices of new and existing products and services, and developing Web-based orientation or training, or both, to familiarize potential users with the

Table 1—Regression results for predicting reliance on Predictive Services information

Independent variable	β	t	$sr^{2\ 1}$
Trust and confidence	0.687	29.266	0.460
Years in current position	-.021	-.903	<.001
Gender	-.099	-4.264	<.001
Education	-.031	-1.351	<.001

[1] Squared semipartial correlation is a measure of the unique contribution of the independent variable to the amount of variance explained within that set of independent variables. According to the numbers shown, trust and confidence is the only variable contributing a substantial unique variance beyond the other independent variables (Tabachnik and Fidell 2001)

Table 2—Regression results for taking action based on Predictive Services information

Independent variable	β	t	$sr^{2\ 1}$
Trust and confidence	0.677	28.303	0.449
Years in current position	-.042	-1.767	<.001
Gender	-.079	-3.329	<.001
Education	-.020	-.841	<.001

[1] Squared semipartial correlation is a measure of the unique contribution of the independent variable to the amount of variance explained within that set of independent variables. According to the numbers shown, trust and confidence is the only variable contributing a substantial unique variance beyond the other independent variables (Tabachnik and Fidell 2001)

products. Respondents also suggested presenting information in lay terms, including a glossary of acronyms to further enhance understanding, and creating a Web feature that allows users to earmark their most relevant Web links. Respondents suggested that improved graphics might ease information utilization.

Predicting Reliance and Use of Predictive Services Information—

The ability to predict reliance on Predictive Services information, and the likelihood of taking action were examined through simultaneous multiple regression. Approximately 50 percent of the variance ($R^{2\ adj.} = 0.50$, $F_{4, 927} = 234.16$, $p < 0.001$) in "How much do you rely on the information provided by Predictive Services to assist in decisionmaking" was predicted by trust and confidence in the information provided, gender, years in current position, and educational level (Table 1).

Male respondents were significantly more likely to rely on Predictive Services information ($t = 6.36$, $df = 483.68$, $p < 0.001$, males $\chi = 3.00$, females $\chi = 2.42$). Reliance had an inverse relationship with years in position in job ($r = –0.086$, $p = 0.006$, $n = 1,003$); federal employees with longer tenure were less likely to rely on Predictive Services information. Those expressing greater trust and confidence in Predictive Services were far more likely to rely on the information in decisionmaking ($r = 0.704$, $p < 0.001$, $n = 944$). There was not a significant linear relationship between reliance and education.

Approximately 48 percent of the variance ($R^{2\ adj.} = 0.481$, $F_{4, 922} = 215.71$, $p < 0.001$) in "How likely are you to take action based on Predictive Services information that you gather or receive from a Web site" was predicted by trust and confidence in the information provided, gender, years in current position, and educational level (Table 2).

Male respondents were significantly more likely to take action based on Predictive Services information ($t = 4.57$, $df = 429.25$, $p < 0.001$, males $\chi = 3.08$, females $\chi = 2.66$). Taking action had an inverse relationship with years in position ($r = –0.120$, $p < 0.001$, $n = 979$). Those expressing greater trust and confidence in Predictive Services were far more likely to take action based on the information ($r = 0.688$, $p < 0.001$, $n = 939$). There was not a significant linear relationship between reliance and education.

Conclusions and Discussion

Current and Desired Services and Format: Where Are the Gaps?

In keeping with Rossi and others (1999) recommendations for a user-needs assessment, we explored the issue of target audience. According to our key informants, users and potential users of Predictive Services, fire managers at the local, district, regional, State, and national levels should be the primary target audience for products and services. Although the public was listed by about one-fourth of respondents as an audience, serving this target audience presents challenges. There is ample evidence that the public differ in their degree of knowledge about risk and, in particular, fire (see, for example, Winter and Cvetkovich 2003). Whereas experts might want technically relevant and appropriate information, the public may want culturally relevant

and value-based information (Fischoff and others 1984, Plough and Krimsky 1987). Serving the layperson through the products and services would have different implications than serving the fire management community. For example, executive summaries or annotations attached to data presentations may be of greater interest to lay people. Some of our key informants from the fire-management community expressed an interest in this type of summary information.

The overlap between data offered through Predictive Services and other resources (such as National Weather Service) may need to be re-examined by Predictive Services. Overlap was sometimes viewed as a redundancy and, perhaps, a misallocation of resources. The daily fire weather forecasts, red flag warnings, Incident Management Situation reports, drought information, and interagency reports all seemed to be on target as products currently offered that are of high utility to our respondents. To augment these services, the Web sites might be adjusted to streamline information searches and to have more real-time updates (including removal of information that is no longer accurate or timely). Products that seemed of little interest and might be deleted included regional monsoon updates, upper air soundings, Predictive Services forms, and state-of-the-fuels reports. However, before these are dropped entirely, it might be helpful for the NPSG to explore with some key contacts what the intended purpose and barriers to use are. It may be that the information is of interest and would be useful in a different form. Some products are offered regionally rather than nationally, so consideration of availability is essential to interpreting low levels of use among these nationally distributed respondents.

A number of respondents seemed to have little awareness of the products and services offered and expressed a desire for more information on Predictive Services. Communication aimed at the fire management community to gain increased awareness of Predictive Services seems in order. In addition, respondents expressed a desire for a Web-based orientation or training, and a glossary to assist the user. These comments suggest that respondents who are currently aware of Predictive Services see benefit in imbedding more user support into the products to facilitate utilization of the products as well as to ease comprehension of the products.

Lessons From Acceptability of Risk

Our respondents expressed a clear desire for accurate and timely information. When uncertainty was characteristic of the data, some indicated a desire to have a clear disclosure of the information's limitations and constraints. When respondents were asked to choose between erring on the side of caution when uncertainty might be involved in reporting, the majority leaned toward a cautious approach. However, we did not present detailed narratives or scenarios with tangible situations in our questions (see, for example, Kneeshaw and others 2004), which may have yielded a more complex picture of risk-reporting preferences. Specifically, if one had asked the respondent to contrast uncertainty in risk estimates for fires involving human life versus those burning in uninhabited areas, the results might have been different.

The Role of Trust and Confidence in Reliance

Most respondents expressed trust and confidence in the information provided by Predictive Services. Few respondents selected trust-related barriers as impediments to utilization. A few comments suggested that a personal working relationship with Predictive Services personnel would be essential to building and maintaining trust. In spite of this expressed trust, respondents tended toward not relying on Predictive Services in decisionmaking. A majority indicated they rely more on other sources than Predictive Services and were somewhat likely to take action based on Predictive Services. The regressions predicting reliance and taking action suggest that trust and confidence is the significant predictor in both cases (with gender, years in position, and level of education contributing to the overall equation, but not as individual significant contributors). This finding affirms the importance of trust and confidence in the delivery of Predictive Services products and services. The inverse relationship between years in current position and reliance and taking action support Reyna's (2004) finding that more experienced decisionmakers tend to capture the gist of factors leading up to a decision, rather than relying

heavily on technical details. Expertise leads to a different way of information processing, most likely reflected here. This also falls in line with the work of Siegrist and colleagues (2000) that shows an inverse relationship between the level of knowledge about a topic and the importance of trust. According to this line of research, those who know more about an issue tend to rely less on trust in making determinations about issues than do those with less knowledge.

Lessons for Risk Communications and Information in Threat Management

Our findings offer some lessons for risk communications and information in threat management. The importance of marketing the products and services to potential users was reflected in a desire among many respondents to know more about what Predictive Services offers. Additionally, risk information could be of greater value if Predictive Services provided tools to facilitate comprehension (e.g., appendices, glossaries, executive summaries). Stating constraints or assumptions used to gather, analyze, and report data could facilitate utilization further. This information would allow the user to better understand and make informed decisions about using the information presented. Although Reyna (2004) found a tendency to use the gist of information in arriving at decisions, she also found that decisionmakers prefer to distill information and arrive at this gist or fuzzy information on their own. Therefore, we do not recommend that a distilled approach be the only method of information presentation. The perception that there is an undesirable overlap between resources available from Predictive Services and other sources was an interesting revelation. Whereas overlap is intentional in this case, the driving force for it was user convenience. It may be that establishing Predictive Services as a unique niche for information would be preferred. Then links to other reliable sources for distinctly different information could be presented. This would eliminate overlap, but point the user to where they could find other information of interest.

Opportunities to Enhance Risk Communication

Respondents indicated that building relationships, dialogue with those providing the data, and assistance with interpretation and underlying assumptions might facilitate their use of Predictive Services. Because trust and confidence influence both users' reliance on products and services and their likelihood of taking action, more of a direct connection to the fire-management community might be desired. This could be facilitated through the Geographic Coordination Centers and might be addressed through a hosted chat link or a hotline that users could call for assistance. Face-to-face briefings might also facilitate familiarity and relationships.

Tools to Move Us Forward

This user-needs assessment highlighted products used by fire personnel and factors that might be facilitators and barriers to Predictive Services usage. It helped clarify informant views on reliance on the products and services and the role of trust in that reliance. Ideas for refinement were offered that might help improve the existing products. These include considering the target audience when developing communication strategies, addressing overlap in available products and services, providing accurate and timely information that discloses assumptions and limitations, and developing Web-based tools that facilitate use. Study results also demonstrated the importance of trust in respondents' decisions to use Predictive Services information. Fostering relationships with users by involving them in the development and maintenance of products and services might increase user trust and usage of Predictive Services.

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