

What Users Say They Want in Documentation

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ABSTRACT

While earlier work provided a partial view of users' preferences about manuals, for most users in most work contexts the important question remains open: What do users want in documentation? This paper presents the results of a study in which a diverse cross-section of 25 users was interviewed in depth about their needs and preferences with respect to software help systems, whether printed or on-line, that they use at work. The study's participants indicated that they preferred documentation, whether online or printed, that is easy to navigate, provides explanations at an appropriate level of technical detail, enables finding as well as solving problems through examples and scenarios, and is complete and correct. These preferences give rise to difficult issues, including a possibly inherent tension between coverage and precision, and variation among users with respect to desired level of technical complexity of explanation.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Evaluation/methodology, training, help, and documentation.

General Terms

Documentation, Human Factors, Measurement

Keywords

Help systems, user requirements, user preferences

1. INTRODUCTION

Consistent with the conventional wisdom [e.g., 7], empirical research has largely found that users do not read documentation [1, 4, 3]. Instead, they usually first try other possible methods of finding solutions [9, 3, 6]. This suggests that current approaches to developing and delivering documentation may not be providing the solution paths that users seek. While some earlier work [5] has provided a partial view of users' preferences, for most users in most work contexts the central question remains open: What do users want in documentation?

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In answering this question, this paper reviews related research, particularly with respect to categorizations of users' preferences in documentation; explains the study's methodology, which involved in-depth interviews of 25 participants across a variety of occupations; presents the study's results; and briefly discusses limitations and future work. In the interviews, we asked users to describe what they saw as the characteristics of good online documentation, bad online documentation, good printed documentation, and bad printed documentation. Their answers, organized into five common themes, provide insights that may help guide developers of documentation to produce help systems and publications that are more user-centered.

2. RELATED WORK

Mitchell [5] reported the results of a comprehensive study conducted by IBM in October, 1992. The study had three research thrusts: supporting issues that influence attitudes toward technical documentation, attitudes toward documentation itself, and importance of and satisfaction with key documentation attributes. The research team conducted eleven focus group sessions, eight in the U.S. and three in Europe, and, based on the results of these sessions, conducted a quantitative survey that had over 1,500 questionnaires returned. The study categorized attributes of documentation in terms of (1) the importance users placed on the attributes and (2) the users' current levels of satisfaction with those attributes. For example, users placed a high level of importance on clarity but had a low level of satisfaction for the clarity of documentation they currently used. Table 1 summarizes these results. The study also found that users were very irritated with a lack of concrete examples, difficulty in understanding the documentation, a lack of relevant information, problems finding the information they need, and failure to address the why and how of a specific task. Mitchell concluded that users want information that is clear, accurate, and loaded with examples and scenarios.

		Importance	
		High	Low
Satisfaction	High	Accuracy Completeness Organization	Writing Style Design & Packaging
	Low	Retrievability Clarity Examples & Scenarios	Task Orientation Language Translation

Table 1. Importance of and satisfaction with attributes of documentation as identified by Mitchell [5].

The implication of these results was that the attributes of documentation that most needed additional effort were retrievability, clarity, and examples and scenarios.

Mitchell's study, while both pioneering and almost incredibly extensive, has suffered with the passage of time:

- The study focused on documentation for operating systems and database management systems, which were then the core of IBM's software business. More recent surveys [e.g., 3, 6] have suggested that today's typical users of computing systems primarily use (or need documentation for) business applications software.
- While the study included PC users, most of the participants worked with mainframe and "midrange" computers. The study's conclusions thus apply less directly to the typical business computing user of 2006.
- Apparently the study focused on and was limited to printed manuals. Given that users now rarely use printed manuals [1, 4], the study has limited applicability.
- In 1993, the World Wide Web was just being launched. Many users now find help from publishers' Web sites and via search engines [6].
- The study as published presented results at a high level of abstraction (e.g., clarity is important). It did not address in detail what these attributes mean in practice (e.g., what makes for clarity).

A new look at users' preferences for documentation could address these limitations, providing an updated and more detailed account. Of course, looking at and responding to users' preferences with respect to documentation might not necessarily lead to more effective or efficient use of the documentation. It might be the case that users' perceptions of what makes for good documentation do not lead to documentation that is actually good. However, understanding users' preferences remains useful for three reasons. First, user satisfaction is an independently valuable component of usability; satisfaction is not a significant correlate of effectiveness or efficiency [2]. Second, developers and technical support providers appear to hold systematically incorrect views of users [3]; deeper and more complete accounts of users' preferences may ameliorate problems arising from these mistaken intuitions. Third, the continuing high incidence of software usability problems and resulting frustration [1, 4] suggests that it may be worthwhile to explore new areas of the design space for the documentation intended to solve these usability problems. Accordingly, our goal in this study is to illuminate the parts of the design space of documentation that users themselves prefer.

3. METHODOLOGY

The information we sought on user preferences for documentation was obtained as a phase of the interviews conducted for a companion study [6] into usability problems and solutions. Because our specific goal for this phase of the study was to address the kinds of factors that limited the usefulness of Mitchell's 1993 study [5], we used a methodology oriented toward depth rather than breadth. Over three months, we conducted a series of interviews with 25 computer users representing a cross-section of uses in work settings. The study

contrasts with Mitchell's in that we focused on the users' primary applications, which turned out to be business applications such as word processing and e-mail rather than operating systems and databases. Our study's 25 participants all used PCs; none directly used a mainframe or minicomputer, although some PCs accessed files on servers. Rather than limiting our study to printed manuals, we looked at both printed and on-line documentation; the on-line help included documentation provided with the application, documentation from the Web sites of software providers, and third-party information found through search engines like Google. And because our study emphasized depth over survey responses from large numbers of participants, we were able to address in greater detail how to achieve the users' high-level goals for the documentation they use.

Eight men and 17 women participated in the study. Their ages ranged from 19 to 60, with an average age of 44. Only one subject was under the age of 30. Eight were between 30 and 40, five were between 40 and 50, and eleven were over 50. Two participants had some college, ten had a bachelor's degree, nine had a master's degree, and four had a Ph.D. Sixteen of the participants lived in El Paso, TX, and nine lived in the metropolitan area of Portland, OR.

Twenty-two of the participants used Microsoft Windows as their principal operating system at work, while two used OS X and one used Unix. The participants all routinely used computers in their work. Eight served as managers in educational or other non-profit institutions, seven worked in professional or technical occupations, four worked in developing human resources (either in corporate human resources or in academic advising), three owned businesses, two worked as administrative assistants, and one was a college student. The applications most frequently used by the participants were Microsoft Word, Excel, Outlook and PowerPoint. The participants also used database systems, Web browsers, and a variety of other applications. On a scale of 1 to 5, where 1 was novice and 5 was expert, the participants' mean self-assessment of their proficiency with these applications was 3.37. The application for which the participants reported the most frustration episodes was Microsoft Word, but this is probably a consequence of Word's rank as their most-used application. The mean level of frustration for problems with Word was 3.23 (on a scale from 1 to 5, where 5 was high), which was lower than the mean for the frustration levels across all the applications, 3.36.

Fifteen of the interviews were conducted in person at the participant's place of employment. The remaining ten interviews were conducted by telephone. The interviewers followed an outline-form interview guide, seeking additional information or clarification as appropriate. In this phase of the study, the interviews focused what the users saw as the characteristics of good and of bad online documentation and of good and bad printed manuals. The interviews concluded with a request for any other comments of the participants with respect to the topics covered and a request for names and contact information for further participants. The interviews were typically completed in about 40 minutes. The interviewers entered notes as the interview progressed, using the interview guide as a template. The full set of interviews was then compiled and analyzed.

4. RESULTS

Based on the 25 interviews, we identified five themes that characterize the qualities of documentation for which the participants expressed a preference. Not all participants offered descriptions of all types of documentation, and because the interviews were non-directive we did not require that participants address each of the themes that were identified subsequently in the responses. Most participants offered several comments on some themes and did not address others at all. For this reason, we present our findings in terms of the numbers of participants who addressed a theme at least once, regardless of the numbers of points that were made relating to that theme. We note that no conclusions can be drawn concerning the opinions of participants who were silent on a particular issue.

For both printed and on-line documentation, the participants expressed preferences that could be classified into five common themes, which are listed in Table 2 along with the number of participants who provided a comment related to that theme.

Online	Theme	Printed
20 (80%)	Navigation	17 (68%)
18 (72%)	Appropriateness of Explanations	15 (60%)
13 (52%)	Problem-Oriented Organization	14 (56%)
11 (44%)	Presentation	20 (80%)
12 (48%)	Completeness and Correctness	2 (8%)

Table 2. Number and percentages of participants commenting on themes common to online and printed documentation.

The categories we deduced from the users' comments can be compared with those articulated by Mitchell [5]. In our study, the theme of navigation garnered the most comments from the participants; this theme appears to be similar to the organization and retrievability attributes identified by Mitchell. However, our participants' next-most-frequent theme concerned appropriateness of explanations; this did not emerge as a key issue for Mitchell. Her study, however, dealt with a highly trained set of users: system and network administrators and programmers. From a communication standpoint, their backgrounds and level of understanding would have been relatively homogenous compared with the range of expertise for users of, say, Microsoft Word.

Our next theme, problem-oriented organization, is roughly analogous to Mitchell's attribute of examples and scenarios. But the users in Mitchell's study saw examples and scenarios as the helpful information to be provided, while the users in our study also saw examples and scenarios as aiding in problem identification. Again, this may be explained by differences in the training and background of the documentation users in these two studies. Mitchell's software professionals would have had a much richer base of technological training to draw upon in identifying the probable source of problems. In the current study, only two of the participants were current or former software professionals; others were professionals in other fields using software only as a support tool to their primary tasks.

Our theme of presentation corresponds roughly to Mitchell's themes of clarity. And our final theme, completeness and correctness, corresponds well to Mitchell's themes of completeness and accuracy.

Much has changed in the 14 years since Mitchell's study, both in computing and in the workplace. The vast majority of application users are not the trained software professionals surveyed by Mitchell. The users surveyed for this study placed a greater emphasis in the importance of attributes of documentation toward (a) navigability and (b) appropriateness of explanations, and (c) the use of problems and scenarios both in problem identification as well as problem solution.

We now turn to a detailed analysis of the five main themes emerging from the comments of the participants in our study. We explore each of these themes for both online and printed documentation.

4.1 Navigation

For online documentation, navigation was a recurring theme in these interviews. Twenty of the participants (80 percent) offered one or more comments relating to ways in which good help systems make it possible to locate solutions to problems quickly and easily, or ways in which bad help systems fail to do this. The most common issues mentioned related to keyword search facilities and search terms, alternatives to keyword search, organization of documentation, and precision of search results.

Six participants (24 percent) mentioned the importance of having a keyword search facility available, but participants also noted that keyword searches often fail. Eight participants (32 percent) spoke of having difficulty finding useful search terms; one person described the problem as being due to her not knowing how to "search correctly." Other participants directed their annoyance to the search facility; they wanted the keywords to include a rich set of alternative terms and synonyms, especially terms that might be used by novice users who are not familiar with the terminology used by the application. They complained that they could not find what seemed to them to be obvious terms like "blind carbon copy." These participants wanted the help facilities to show them plausible "near miss" terms as well, so that if they come up with a term that is "close" semantically then they will find the material they seek. For example, one suggested, the keyword "margin" might bring up a link to guidance on changing paragraph indentations as well as on setting document margins.

A total of 12 participants (48 percent) also wanted to have alternatives to keyword search. Eight participants wanted to be able to browse an index or table of contents. They noted that it may be faster to locate and read the section of the documentation likely to contain the information they seek than to waste time trying to find a useful keyword. Three of these (12 percent) liked being able to ask questions, and three more thought that help facilities ought to be sensitive to the context in which the user is working.

Poor organization of the documentation and of search results were also mentioned as sources of frustration: seven participants (28 percent) spoke of such difficulties as being unable to determine the structure of the online information, of going in circles through cross-referenced entries, having to scroll or click a lot while searching for the needed information, and of not being able to locate the information that they believe is there. Three more (12 percent) were frustrated at having to search sequentially though overly broad, unordered search results. As one participant complained, she "types in one word and gets 100 lines of unordered index entries," adding that she does not have time to

follow each entry individually to determine whether any of them are useful. And one participant noted that sometimes the help facility itself can be hard to locate, especially when the application provides both local documentation and access to the publisher's Web site.

With respect to printed documentation, 17 participants (68 percent) offered comments relating to ways in which paper documentation makes it either possible or difficult to locate information quickly. In addition to a comprehensive index and detailed table of contents (14 participants, or 56 percent), twelve participants (48 percent) cited good organization of the information, including good section headings and few forward references. Two participants noted that frequently consulted material such as commands and error references should be alphabetized. Complex applications sometimes produce multi-volume paper references, which one participant identified as being particularly frustrating: one has to consult an index to figure out which manual to use. Another participant expressed frustration with the difficulty in locating information in manuals organized as tutorials.

4.2 Appropriateness of Explanations

For online documentation, 18 participants in this study (72 percent) spoke of wanting explanations at a length and level of complexity that is appropriate to the user's level of expertise.

As might be expected, participants differed in their opinions as to whether documentation typically is too basic or too advanced. Ten participants (40 percent) thought that documentation tends to be too complex for novice users. These participants spoke of the online documentation being prone to unfamiliar technical jargon and extraneous information that doesn't help solve the problem. "Vocabulary is everything!" one emphasized.

Conversely, four participants (16 percent) thought that documentation tends to be too simple or general, simply "regurgitating what is already in the program." One person commented that some of the help documentation is so basic that he wondered "does anyone really need to read that?" and added that he often bypasses the search functions in favor of an index precisely because he finds it is easier to locate the more advanced material that he needs.

Three participants (12 percent) made the point that it should be possible to get help at an appropriate level whether one is expert or novice. The online documentation assumes that all users are at the same level, one participant complained, so the information is either too high-level or too basic. As another participant suggested when speaking of paper manuals, the documentation should be "age-specific;" it should be appropriate to one's professional "age" in using a computer.

Five participants (20 percent) urged that the writing be clear, concise, and to the point. One person, a college professor, praised the Microsoft Excel documentation for providing brief background information on statistics functions; he liked seeing additional information on advanced topics. Another participant was more typical in complaining about "extraneous" information that does not help solve the immediate problem.

Comments about printed documentation for the theme of offering explanations appropriate to the user were similar to those seen for

online documentation. One person, who reported that he began using a computer only 18 months ago, complained plaintively that he was looking for "Run, Spot, run," and the documentation was giving him Solzhenitsyn. Another suggested that directions like "open a file box" were not specific enough. A total of 15 participants (60 percent) offered comments on this theme.

4.3 Problem-Oriented Organization

People generally access documentation to solve problems, and thirteen participants (52 percent) said that online help systems should present information in terms of solutions to problems in preference to a topic-oriented presentation. Thus, six participants (24 percent) wanted to see help respond to a query with a list of symptoms or problems or frequently asked questions associated with that search term. Six participants called for step-by-step instructions for solving the problem, preferably with screen shots or animations showing the user what should be visible at each step. One person wanted instructions that "shows which button to push, assumes you're a dummy." Six asked for plenty of specific, concrete examples.

Participants said that printed documentation, like the online help, should present solutions to problems in preference to topics: step-by-step instructions, a trouble-shooting section, and examples. When discussing paper manuals, however, four participants (16 percent) added a glossary and one suggested a quick reference. One participant observed that paper manuals are primarily of use for the initial installation of the software, when the application's online documentation is not yet available, so installation information should be included.

4.4 Presentation

Eleven participants (44 percent) commented upon the presentation of help information. The help facility itself should be convenient, readily available, and easy to find (identified as an issue by five participants or 20 percent). Five (20 percent) spoke of frustration with help displays that make it difficult to both read and carry out the instructions at the same time: instructions should not cover or be covered by the application window, for example. One person used the term "aggravating" to describe a help system that minimizes when one starts trying to follow the instructions. Several participants mentioned that they often print the online help information so that it is easier to refer to while solving the problem. Four participants (16 percent) preferred visual explanations such as screen shots and pictures to textual explanations. For example, one said, the screen shot can show clearly what is meant by "menu bar." One cited the Microsoft PowerPoint's visual index of templates as a particularly effective example of this approach: it shows a thumbnail of the template instead of listing a meaningless template name.

Twenty of the 25 participants (80 percent) offered comments about presentation of paper documentation. This theme differed most sharply from its online counterpart, possibly reflecting concerns that presentation is particularly problematic in the case of paper. Thirteen participants (52 percent) preferred visual explanations such as screen shots and pictures to textual explanations (compared with 16 percent for online help). Their comments indicated a particular dislike for extensive blocks of text uninterrupted by pictures. Two suggested that bullet lists are easier to read than paragraphs. One person suggested cartoons for a nice, friendly tone. One person said that he didn't want "all the

cool features” hidden in the fine print. Another said that if he had to wade through text or a long list of textual links (for the online version), he was likely to give up.

Three participants (12 percent) indicated that they liked the physical characteristics and readability of paper, but ten participants (40 percent) stated that paper manuals should be small and concise, not bulky and wordy. Two participants also raised the issue of poor translations, something that no participant mentioned in the case of online documentation.

4.5 Completeness and Correctness

For online documentation, twelve participants (48 percent) raised the issue of the documentation being complete, correct and comprehensive. Seven (28 percent) spoke specifically of not being confident that the answer to their problem was in the documentation. As one person put it, “you get results and they don’t address your problem.” Another spoke of “finding what you are looking for but there isn’t enough information.” Another commented that he can get close, but he does not find exactly what he’s looking for and he’s never sure whether it is due to a terminology problem or because the information is not there at all.

Seven participants indicated that good online documentation should include pointers to additional sources of information such as web sites or a phone number for human assistance. Three (12 percent) mentioned e-mail support as being too slow to be useful for application-level problems. Another participant, who lives inconveniently far from the metropolitan area, was frustrated by suggestions to visit a store for more assistance. As another person said firmly, “I need an answer now!”

Only two participants commented on the issue of completeness and correctness for paper manuals. Their comments were similar to those seen for online help: everything should be available, and the documentation should include pointers to additional sources of information. The small number of participants commenting on this issue may reflect the success of technical writing: users have sufficient confidence in the content of manuals that they no longer think of completeness and correctness as important concerns.

4.6 Summary

In describing good and bad online documentation, participants emphasized that good online documentation makes it possible to locate answers to questions quickly. Navigation was the issue most commonly mentioned, but participants also spoke of wanting visual, problem-oriented information presented at a level appropriate to the reader. The documentation should be comprehensive and correct, including pointers to additional sources of information.

Generally, the issues identified in describing good and bad paper manuals were similar to those seen for online documentation. A greater variety of concerns was seen in discussing issues of presentation, including poor translations and the physical size of the paper manual. Participants expressed dislike for long blocks of unbroken text, a dislike also seen for online documentation but mentioned by only half as many.

More notably, three participants responded to the request to describe a good paper manual with the assertion that they could not conceive of such a thing. One other participant described a bad paper manual as being a waste of paper. Taken with the low

rates of use for paper documentation, this attitude suggests that at least some users avoid paper documentation because they regard it as likely to be useless.

Table 3 summarizes users’ preferences with respect to each of the themes, for both online and printed documentation. We note that, due to the nondirective nature of the interviews, the absence of comments on the convenience of availability and use of printed documentation may not fully reflect the participants’ views. While no participant explicitly indicated that availability of printed manuals was an issue, in other phases of the interviews they occasionally mentioned missing, losing or misplacing manuals. Conversely, Table 3 notes the issue “able to read while using application” for printed documentation as not applicable, because printed manuals do not have the physical problem of sharing area on the computer’s screen. Indeed, some participants mentioned that they solved this problem for online help by printing the documentation. The only comment to the contrary was from the college student, who disliked using paper because she found it difficult to go back and forth between paper and screen.

Theme	Online	Printed
Navigation		
Keyword search	6 (24%)	n/a
Rich set of alternative keywords	8 (32%)	n/a
Alternatives to keyword search	12 (48%)	14 (56%)
Organization of documentation	7 (28%)	12 (48%)
Overly broad, unordered search results	3 (12%)	n/a
Appropriateness of Explanations		
Help too complex for novice user	10 (40%)	13 (52%)
Help not complex enough for advanced user	4 (16%)	2 (8%)
Writing clear and to the point	5 (20%)	5 (20%)
Problem-Oriented Organization		
Symptoms, FAQs, troubleshooting lists	6 (24%)	6 (24%)
Step-by-step instructions	6 (24%)	4 (16%)
Specific examples	6 (24%)	4 (16%)
Glossary	0	4 (16%)
Presentation		
Convenient, easy to find, available	5 (20%)	0
Able to read while using application	5 (20%)	n/a
Visual explanations, screen shots	4 (16%)	13 (52%)
Concise, small	0	10 (40%)
Focused writing	0	4 (16%)
Writing quality, translation	0	3 (12%)
Completeness and Correctness		
Able to find answers	7 (28%)	1 (4%)
Pointers to additional sources	7 (28%)	1 (4%)

Table 3. Number and percentages of participants commenting on major issues within each theme

5. DISCUSSION

Although we cannot draw conclusions about the attitudes of participants who failed to mention a particular issue or theme, we saw several themes and issues that inspired comments from many of our respondents. These issues included problems with keyword searches, users' tasks as diagnosis rather than solution, and the level of technical expertise in explanations. We consider each of these issues below.

5.1 Keyword Searches

Users do not always know the application terminology, so they want keyword searches to support a rich set of synonyms and non-technical terms (32 percent)—but not too many. We see a tension between users wanting a rich and forgiving set of cross-reference terms and then being annoyed when too many results are returned: users want to be able to make approximate queries but get exact results. When too many results are returned, users may be reluctant to invest time in searching a large list of unordered links. This reluctance may be more prevalent in this population than in the college student population reported in [1]. One participant suggested that there may be a generational difference in willingness to wade through a long list of repetitive "chat-room" postings to find one that might be useful, but we speculate that this reluctance may be attributed instead to the perceived value of the user's time. Busy executives or college professors may be more likely to feel that they do not have time to waste in finding the best way to use a piece of software; if they cannot find a solution immediately, they may be inclined to abandon the documentation and simply work around the problem—and grumble about the application and its documentation.

Keyword searches often fail, so the documentation should support alternate paths into the documentation (48 percent). Users are often unsure as to whether the information they seek is in the documentation or not and, if it is, what search terms will guide them there. A well-annotated table of contents and index can help guide them to the appropriate section of the documentation.

5.2 Users' Tasks

Users refer to documentation when they are trying to solve problems, so keywords and links and information presentation should be in terms of diagnosing and resolving problems (52 percent). Unlike the software professionals who were the subjects of Mitchell's study [5], these non-technical professionals looked for help in diagnosing the problem and not just in solving an already-identified problem. Trouble-shooting lists, frequently asked questions, and lists of problems associated with common symptoms were seen as important to over half of our participants. Furthermore, they thought that explanations referring to graphical user interfaces should emphasize visual explanations over textual explanations (52 percent) and should include screen shots or animations that help users orient themselves to the interface.

5.3 Technical Level

The explanations offered in documentation often fail to meet the needs of their intended audience. The majority of our participants (72 percent) thought that the documentation often was either too complex or too general to answer their questions successfully. While users overwhelmingly want explanations that are expressed at the "right" level of technical expertise, the disagreement among

users as to the nature of that right level remains a profoundly difficult issue. There does not appear to be an easy classification of users into groups that connect desired levels of technical explanation with the user's level of technical expertise. From the participants comments about their documentation preferences, we classified each participant's preferred level of technical explanation as simple (N=13), neutral (N=3), or detailed (N=9). We then looked at the data from [6] with respect to self-assessment of proficiency. Analysis of these data indicates that the correlation of participants' level of proficiency with their preference for more detailed technical explanations is extremely weak. However, we also looked at the preferences of the four participants whom we independently classified, regardless of self-assessment of proficiency, as involved in a technical occupation. All four of these participants expressed a preference for technically detailed documentation. So although the data are insufficient to sustain a statistically significant conclusion, they do suggest that preference for technical sophistication is related to the user's own technical sophistication.

6. CONCLUSION

We conducted in-depth interviews with 25 professionals who use computer applications in their work, asking about their use of and preferences for documentation and help for those applications that they use frequently. Their responses reflect an ambivalent attitude toward documentation. Their dissatisfaction with paper manuals was clear but, as one respondent said, "we do still need a manual."

This study also suggests that research based on the documentation use of college students [1] or software professionals [5] may not generalize well to the busy professionals who buy and use general-purpose applications. Whether it reflects a generational preference, as speculated by one of the participants in this study, or an age-independent assessment of the value of one's time, the persons interviewed for this study generally were reluctant to rely on experimentation and exploration to solve their problems in using an application.

6.1 Implications

Other research has shown that users usually try other solution methods before turning to the documentation [3, 9]. This progression in the user's solution process has consequences for the kind of navigation and information that documentation should be offering. If asking a colleague for help does not solve the user's problem, then the problem is one that either is not currently faced by others in the immediate organization or for which a solution is not known. Thus the problem is likely to be obscure, at least relative to the level of expertise of the user and his or her colleagues, and navigation or retrievability becomes the key attribute for the documentation. In this situation, the user may find tutorial-style documentation frustrating ("too basic") but find reference-manual style documentation overwhelming ("too technical"). The problem may have arisen because the user is missing a relatively basic piece of information that makes detailed reference information too detailed. A top-down, decision-tree approach might seem promising under the circumstances, but the user's misconception or missing knowledge might lead him or her to choose a wrong path in the decision tree, leading to additional frustration. A more promising approach might be to understand

how users typically describe their problem, and then tie possible solutions to their descriptions.

The study's results highlighted the tension between participants seeking "simple" documentation and those seeking more technically advanced documentation. Documentation must serve the needs of both novice and advanced users without inundating either type with material inappropriate to their level of understanding. Users who turn to a general search engine such as Google may be trying to find an explanation written in terms appropriate to their understanding. Ideally, though, the help system would be able to adjust to the particular user. In interpreting and responding to questions in conversation, humans draw upon their knowledge of the background and of their prior interaction with the person with whom they are speaking [8]. Furthermore, a human conversant gives feedback by asking for clarification or additional details about the material just presented. We can envisage an online help system that makes use of techniques such as these to adapt to a particular user. For example, the help presentations could include buttons to allow users to give feedback while refining their requests: "too basic, give me more detail" or "too advanced, give me the basics" or "not what I wanted, try some related topics" or "just right, remember this." This feedback could be used to build up a topic-specific estimation of the user's level of understanding and tolerance for application terminology while giving the user a more productive alternative to simply trying a different search term. In this way, a help system could maintain a record of previously requested information and the terms that were used in navigating to it, recognizing that people may wish to reconsult documentation on new functionality until they have used it enough to remember it. The help system thus would tend to learn the user's vocabulary instead of insisting that the user learn its terms.

Another way to address the level-matching problem might be through new direct-manipulation controls in the help system's user interface. We can envisage a user interface for a help system in which the presentation of information is easily tunable. For example, the interface might include a slider bar, the movement of which would change the level of detail. The dynamic addition and subtraction of layers of information would be contemporaneously apparent to users, enabling them to find the point of balance in detail that best met their preferences. Other controls could adjust the presentation of, for example, cross-references. In this way, developers of documentation would not have to anticipate and write separate versions for the myriad combinations of user preferences.

6.2 Limitations

While our study addressed many of the weaknesses of the Mitchell study [5], it had some limitations of its own. These limitations include a relatively small sample size, partial data on solution processes, lack of data on user preferences for means of help other than traditional printed or online documentation, and difficulty validating users' self-reports with respect to actual practices.

Our approach of using in-depth interviews helped illuminate user preferences with respect to documentation. But this depth came at the cost of the effort required for the interviews. The study's relatively small number of participants limits the strength of its

results. Some issues, like alternatives to keyword search for printed manuals, were raised by over half of the participants, and are thus likely to reflect preferences among users more generally. Other issues, such as help not being complex enough for some users, were raised by only a few participants. The fact that an issue was raised by more than one participant among a sample of 25 suggests, though, that the issue is likely to be shared as a concern by many more people in the general population of users of business software.

Because our initial interest lay in the distribution of solutions to usability problems, we were able to collect only partial data on the order in which the participants tried alternative solution methods. While the study's limited process data confirm prior research results that users typically try other solutions before looking at documentation, our data did not support strong conclusions on the nature of this process.

In conducting the interviews, we learned that online help comes in distinctly different forms (e.g., traditional online help, publisher's Web site, Web search), and that the participants sometimes used other less-traditional forms of help. As this insight came during the study, the study's design did not support collection of user preferences with respect to some of the alternative approaches to documentation or help.

Our interview methodology enabled us to probe the participants' responses to questions. But the methodology did not enable us to validate these self-reports against a more empirical account of the users' computing practices. Direct observation of users, and comparison of the results of the direct observation and the self-reports, would have provided a stronger basis for the study's results.

6.3 Future Work

We are addressing these limitations in a new study, now underway. We expect to conduct approximately 60 new interviews and then conduct protocol studies of some of the participants. The interviews will focus on process more than on distribution of solutions, for which the current study's results appear to be reliable. The interviews will also extend collection of user preferences to more specific forms of help, including non-traditional help, based on the current study's findings. The protocol studies will involve direct, non-engaging observation of the users. The observers will note usability problems and solution methods, thus providing a basis for validating the results of the interviews and providing a second form of information for understanding user's choices of solution methods.

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