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A Needs Analysis

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The goal of this research was to identify the needs of technical editors that could be supported through the development of computer tools. Additionally, our goal was to understand the technical editing context as it is relevant to the design of those tools. Expert technical editors were surveyed to study three issues relevant to the design of computer-aided tools: the editing context, editing tasks and problems, and opportunities for designing computer-based tools. Potential design capabilities were identified. These include a networked document management system along with a "comment" capability that supported accurate text analysis support tools.

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Foreword

This research was conducted within Exploratory Development (Program Element 0602233N, Work Unit 0602233N.RM33T23.04) and sponsored by the Office of Naval Research (Code 461).

The focus of this research is on the design of computer-based writing tools for editors in the technical writing environment. The goal of the research was to identify the needs of technical editors that could be supported through the development of computer tools. Additionally, our goal was to understand the technical editing context as it is relevant to the design of those tools.

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Summary

Introduction and Method

The focus of this research is on the design of computer-based writing tools for use by editors in the technical writing environment. The development of technical documentation is quite different from most other document development environments. The development process requires the coordination of expertise in the subject area and in writing and design skills, as well as detailed knowledge of the audience and job context.

The goal of this research was to identify the needs of technical editors that could be supported through the development of computer tools. Additionally, our goal was to understand the technical editing context as it is relevant to the design of those tools.

This was a survey study, conducted through the mails with 27 technical editors across the U.S., who were considered to be experts by their peers. There were three successive questionnaires mailed to participants. The design of each successive questionnaire was based, in large measure, on the results from the previous questionnaire. Further, a summary of the responses to the previous questionnaire was distributed with the new one.

Results, Discussion, and Conclusions

The Editing Context

The technical editors tend to come from humanities backgrounds with English and journalism majors. The documents they edit tend to be around 250 pages in length and are produced by several writers working as a team. Further, they work on several such documents at the same time.

Editing Tasks and Problems

The editors seem to edit for all levels of detail—from overall coherence to copy editing. They estimate their rate of editing to be about 20 pages per day. The tools they use in the editing process tend to be reference documents with the *Chicago Manual of Style* and the *Government Printing Office Style Manual* the two most frequently cited resources.

The problems the editors identified as most difficult and time consuming are, for the most part, problems in coherence and clarity. These are problems that match well against the expertise they see as essential for effective editing (logical thought and taking the perspective of the user). Hence, it is these problems that they, as editors, seem to focus their expertise on. When asked about the value of computing tools, they consistently devalued the development of tools for use in this area. Rather, the text analysis tools they valued tended to be for copy editing. Online reference tools (i.e., their favorite hardcopy tools placed online) were also valued. A reference tool specifically designed to support technical material was rated as the most important tool. The tools least valued by the editors tended to be syntactic tools—in particular, tools to detect and correct errors of passive voice.

Opportunities for Designing Computer-Based Tools

One of the primary opportunities and needs for text editing is a computer-based editing environment in which the editor can easily attach comments to the document. We suspect that a major reason the editors do not use computer tools in so many cases is that they cannot easily mark the document—making suggestion or changes for the writer to consider. The growing dominance of the graphical user interface and hypermedia technology (especially the ability to link) in recent years certainly presents new opportunities for designing effective editing environments.

A second potential area of support is in the management of documents. On average, the editors describe themselves as working on five or six 250 page documents—each contributed to by several writers. It would seem that some mechanism for helping them to manage this environment might be particularly useful. We might infer that the editors tend to work with writers only when a draft is completed, because of the management difficulty of multiple exchanges of partial documents.

The editors told us that in general they do not work with a writer until a draft is completed. We suspect that the production process would be much more efficient if the editor and writer collaborated early in the writing process so that the writer could seek advice and the writer and editor could agree on design and style (such agreement is necessary even within the confines of specifications). A networked document management system along with a "comment" capability could greatly facilitate this collaboration.

The development of a technical editing comment environment provides the foundation for the use of text analysis support tools. Responses from editors suggest two primary classes of tools: reference documents and text analysis tools to detect basic text errors. The primary reference tool requested was an online dictionary and thesaurus of technical terms.

Technical editors can detect and correct errors in text—that is the nature of their expertise. Thus, the design of text analysis tools should not be viewed as providing a capability that does not exist. Rather, the goal must be to make the activity more efficient than when done by the editor alone. We suspect that this efficiency can be achieved by focusing on detecting rather than correcting errors. The editor would review all automatic changes made by the computer and, hence, it is unlikely that automated changes at other than a basic level would increase efficiency. Further, we suspect that the editors will be able to generate a correction faster than they can evaluate computer proposed modifications—and that the proposed modification would probably have to be modified in many instances. So even suggesting alternatives may be counterproductive. Indeed, the computer tool viewed as least helpful is one that would propose alternatives for the passive voice.

A second essential characteristic of the text analysis tool is that it must be accurate. Editors who worked with two commercially available text analyses tools described them as creating more work because of the errors in detection. Indeed, the editors propose tools that help with the basic tasks that require extensive search and tracking time: sequencing, indexing, formatting, etc. We suspect that the design of a computer interface that will support editors in the use of these types of detection tools would be well received.

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Introduction

In recent years, there has been extensive development of computer-based tools designed to aid writers in creating information that is grammatically correct and easy to comprehend. This work, at its base, amounts to "computerizing" the rules and guidelines in books and specifications. In some cases, the computerization amounts to placing the style guides and other resource materials on-line. The most immediate benefit of this approach is that computer-aided searches greatly facilitate locating information. We see this in the placing of the dictionaries and thesaurus on-line (see, e.g., Rabinovitz, 1991). However, much more than simply improved access is possible. Placing documents on-line provides new opportunities, and often imposes new requirements, for the content and organization of the information (Duffy, Palmer, & Mehlenbacher, 1992). For example, Miller, Beckwith, Fellbaum, Gross, and Miller (1990) have developed a thesaurus system called WordNet[1] that reflects current theories of lexical memory in terms of the nature of the information provided about word relations as well as the way in which that information is displayed.

If the writing guidelines and rules can be represented in a computer program, then, rather than simply providing information to the writer, the computer aid can be used to analyze the text and detect violations of the rules. In recent years, we have seen a proliferation of these text analysis tools. The work began with simple word and sentence counts that could be utilized in readability formulas. (See, for example, Kincaid, Cottrell, Aagard, & Risley, 1981.) However, as computer and programming power has increased, the analysis programs have become more sophisticated. For example, Writer's WorkBench (Frase, Macdonald, & Keenan 1985), Grammatik IV, RightWriter, and other commercially available text analysis tools apply 30 to 60 guidelines to a text analyzing everything from punctuation and word choice to syntax. Kieras (1985) is using artificial intelligence techniques to extend the rules even further into issues of cohesion and focus. For example, as part of the strategy for identify cohesion, Kieras' program identifies sentence topic words that are being introduced for the first time to encourage the writer to see if those words have been defined and properly linked to the preceding text.

Finally, if the computer support for writing is detecting errors, the obvious next step is to "detect and correct." At a basic level (e.g., punctuation rules like the placement of a period in relation to quotes), the task is straight forward, amounting to little more than a string search and replace operation. Miller's WordNet (Miller et al., 1990) also offers the possibility of suggesting word alternatives based on an understanding of the context. However, the task for sentence and higher level changes is considerably more difficult in terms of providing specific advice. Rather, the programs tend to provide links to reference documentation so that the reader can obtain information about the general rule area. For example, when Grammatik IV identifies a passive sentence, the user can request information on passive constructions including both the principle and some examples of passive sentences with active sentence revisions.

The growing sophistication in computing power has resulted in tools which can be tailored by the user to meet the needs of specific writing environments. For example, Grammatik IV permits the user to add or modify the rules in its database to meet specific needs. It also permits the user to designate how long a sentence must be before it is judged to be "wordy." Writer's Workbench

[1]Identification of specific software is for documentation only and does not imply an endorsement.

compares the characteristics of the text it is analyzing with the characteristics of a reference set of texts; that is, a set of texts previously analyzed from which it has calculated the mean and variation in features. The user can establish the "good" documents from his or her working environment as the reference set simply by designating them as such when they are submitted to the program for analysis.

The focus of this research is on the design of computer-based writing tools for use by editors in the technical writing environment. The development of technical documentation is quite different from most other document development environments. The development process requires the coordination of expertise in the subject area and in writing and design skills, as well as detailed knowledge of the audience and job context. Duffy, Post, and Smith (1987) analyzed the production system at five technical manual production houses. Based on that work, we can describe the salient characteristics of the process as follows. Most often, an elaborate specification defines the most important rules and guidelines for the content, format, and style of the manual. This specification can be over 100 pages and can be so detailed as specifying syntactic structures to be used in specific situations. Writing to that specification is typically the responsibility of a team of writers, hired primarily on the basis of their technical knowledge. Writing skills are most often a distant consideration—especially in places producing technical documents for the military. Indeed, the writers reported that the editor is the one who takes care of "wordsmithing." The wordsmithing of the editor also includes ensuring that the writers have met the requirements of the specification for style and format.

Clearly, technical writers can make use of computer-based, text analysis tools. Since they often are not trained as writers, the tools may be especially helpful to them. However, because of this lack of expertise and because of the expectations of the writers as expressed in the preceding paragraph, we can also expect that the editor will have a significant task of wordsmithing the text. Further, since the editor is the final reviewer for the comprehensibility of the text, he or she plays a very significant role in ensuring usability. Thus, our goal is to provide data that will assist in the design of tools that will aid the editor.

Achieving this goal requires an understanding of the kinds of problems editors encounter in editing. What are the kinds of errors that take the most time, are most pervasive, and are most difficult to correct? What can we focus on that will provide the most help? However, it is not a matter of simply identifying the text errors they encounter; we must also understand the tools that they will see as useful in addressing that problem. This requires a broader understanding of the perceived needs of the editors as well as an understanding of the context in which they work. An understanding of the editing environment and process will not only provide information on what tools the editors might accept but will also inform the design of the tool so that it is most usable in that environment.

Method

Design

This was a survey study, conducted through the mails. There were three successive questionnaires mailed to participants. The design of each successive questionnaire was based, in large measure, on the results from the previous questionnaire. Further, a summary of the responses

to the previous questionnaire was distributed with the new one. In these respects, the approach resembles the Delphi technique (Weatherman & Swenson, 1974). The approach was used, consistent with the Delphi rationale, to help respondents take a broader perspective on the issues—a perspective they could obtain from looking at each other's responses. A second reason for using the approach, however, was to help the researchers define the issues and build from the responses of the editors, in order to seek clarification where necessary and to address new issues that arose. Thus, in contrast to the Delphi technique, very few questions were repeated exactly as they were phrased in the previous questionnaire and respondents were never required to come to a consensus.

Participants

We solicited nominations for participants from current and former officers in the Society for Technical Communication and the National Association for Technical Writers and Editors as well as from the *Editorial Eye*, a publication that includes a referral service for technical editors in the Washington DC area. In soliciting nominations, we defined our population as editors who are:

1. Involved in the editing of technical materials for use by technical personnel.
2. Generally considered to be experts in the field or who would be able to identify experts for us.

We explained to the nominators that the content domain in which the editors work and the audience for the documents should be "technical." We indicated that the aerospace, engineering, medical, and computer industries were examples of these domains. We also indicated that the computer industry fitted our criteria as long as the intended end user was technical; for example, a system manager. Our goal in contacting the nominees was to try to represent the full range of technical writing as represented by the nominators, placing particular emphasis on the aerospace industry.

Twenty-four participants were selected using this process. Four military technical editors were added to yield a total of 28 participants. While the military technical editors were not selected through the nominating process just described, they were considered to be very good or expert editors by their supervisors. They were targeted for participation in the study because the development of editing tools in the next phase of this research will be tested in their work environments.

All participants were offered a $50 honorarium for participation; however, some editors were participating during work time, sanctioned by their company, and, hence, were prohibited from accepting remuneration. The participants were guaranteed that no specific response information would be attributed to any particular individual or company. We asked permission, however, to be able to name their company. All but four individuals gave that permission.

One of the 28 participants receiving the first questionnaire failed to complete it; 23 participants completed the second round; and 19 participants completed all three rounds for a total loss of 9 participants over the seven months of the study. All drop-outs were contacted in a follow-up phone call. In one instance, the participant moved his household to another city and was not able to devote the time. In the other cases, the participants indicated that new work demands made it impossible to complete the questionnaire in the time required.

Procedure

Three questionnaires were distributed through the mail over five and one half months. The second questionnaire was mailed two and one half months after the first and the third questionnaire was mailed three months after the second. The content and design of successive questionnaires were based in part on the results obtained in the prior mailing. Thus, the time interval was required to solicit responses, complete a preliminary analysis of these responses, prepare a preliminary report of findings to distribute to participants, and develop a follow-up questionnaire.

Participants were given four weeks from the date of mailing to return the questionnaires. The deadline was specified on both the cover letter and in the instructions attached to the questionnaire. A reminder was mailed to all participants one week prior to the deadline. Follow-up phone contact was made if a questionnaire was not received within one week after the deadline.

Each package mailed included: a cover letter with general instructions, the questionnaire including specific instructions, a stamped, addressed return envelope, and, for the second and third questionnaires, a preliminary report of the findings from the previous questionnaire.

Questionnaires

Many of the items in the questionnaires were lists of items for the subject to rate. Two counterbalanced, random orders of each list were used across the subjects in order to reduce the effects of any position bias in the responses.

Questionnaire 1

Questionnaire 1 (Appendix A) consisted of 22 questions, all but 2 of which were short answer. Questions addressed current employment, education, prior employment, experience, the size and make-up of the production shop, the teams the editor works with, the types of documents edited, the specific editing responsibilities, the importance of content knowledge, and the critical skills and knowledge for an editor. The critical questions, in terms of establishing needs, asked the editors to:

- List the primary editing problems they have.
- Describe and evaluate any job aids they use (computer or not).
- Speculate on a computer-based job aid they would like to see developed.

A final item asked them to list any questions they might like us to pose to the group.

Questionnaire 2

Questionnaire 2 (Appendix B) consisted of 15 questions, many with numerous subquestions. Editors were asked to clarify responses to Questionnaire 1 and to answer new questions based on the earlier responses. The questions addressed the types of editing tasks, the format in which the editors received materials, and the characteristics of the work team.

The editors were asked for the most difficult and the most time-consuming editing problems in each of the following six categories:

- coherence and organization of the overall document,
- comprehensibility and readability (paragraph and sentence level of clarity),
- style and consistency with specification requirements,
- grammar and mechanics,
- technical accuracy,
- consistent use of terminology and graphics.

They were asked to rate the usefulness of 21 computer-based editing tools. This list was compiled from responses to a short answer question (on Questionnaire 1) concerning tools they would like to see developed. The list also included tools we wanted to ask about; for example, the computer-based text analyzers. All items were described in terms of the type of editing task that would be facilitated.

They were asked to rank a list of 39 characteristics or skills identified in the first round as "important" for a technical editor to have. They were asked to rank the five most important and the five least important skills on the list. The importance of subject matter knowledge and the use of computers as an editing tool were also addressed. As in the first questionnaire, a final item asked the respondents to submit any questions they would like us to include in the next questionnaire.

Questionnaire 3

Questionnaire 3 (Appendix C) consisted of eight questions many with lengthy subparts. The editors were asked to rate the 21 computer-based editing tool a second time and to try to come to a consensus, using the mean rating of "usefulness" from Questionnaire 2 as the point of consensus.

Questionnaire 3 presented the list of 38 potential "characteristics of an excellent editor" from Questionnaire 2 with an indication of which were ranked as the least and most important by the editors on that questionnaire. The respondents were asked to rate the items a second time, rethinking their response to see whether they could reach consensus.

Editors were presented with a list of 53 editing tasks in four task categories: grammar and mechanics; accuracy of text and graphics; coherence and organization; and comprehensibility and readability. These items were generated by the responses to the Questionnaire 2. Here, they were asked to rate each problem in terms of: time spent looking for and correcting it, difficulty to correct it, and perceived value of a computer tool that would help in identifying and correcting it. They were also asked to select from the list and to rank the five most important editing problems they encounter.

They were also asked about their editing tasks and to clarify points from previous rounds or questions they had asked us to include.

Results and Discussion

Who are the Editors?

The 27 respondents to the first questionnaire came from 19 different companies representing a wide range of technical writing domains. We classified the editors by the type of company they worked for. The distribution of editors in that classification is shown in Table 1. Clearly, many of the companies are involved in more than one field and, thus, this classification is only an approximation, meant to provide a summary of the variety of fields involved. Editors classified as working for the aerospace industry came from companies that included McDonnell Aircraft Company and General Dynamics. The editors in the nuclear area worked at the Los Alamos and Oak Ridge National Laboratories. The more general engineering firms included Hernandez Engineering. The computer firms included Apple Computer Company, IBM, and The Software Engineering Institute, while the research and development firm was the Center for Naval Analyses. The Department of Defense (DOD) editors worked for the Navy Personnel Research and Development Center and the Naval Education and Training Program Management and Support Activity. The freelance editors worked in a variety of technical areas: one referred to his recent work for the Center for Naval Analyses in answering the questions, while another worked primarily with medical school faculty on medical textbooks.

Table 1

Type of Companies Where the Editors Worked

Subject Matter Area	Number of Editors	Subject Matter Area	Number of Editors
Aerospace	8	Department of Defense	5
Engineering	3	Research and Development	1
Nuclear	2	Computer	5
Free Lance	3		

The respondents were almost all highly experienced editors though a few were identified as excellent editors who did not have extensive experience. The years of experience as an editor ranged from 2 to 37 with a median of 11 years. On average, they spend 87% of their time editing. The most common "other" job activities reported were managing and writing.

As shown in Table 2, the largest proportion of editors (40%) completed a bachelor's degree in some field of the humanities—with English and journalism being the two most frequent majors. Only six of the editors (22%) had a science focus in college. In contrast, technical writers most often come from the technical ranks (Duffy et al., 1987).

Table 2

Level of Education and Educational Focus of the Editors

	Level of Education			
Major or Focus	No College	Some College	Bachelor's Degree	Master's Degree
Humanities		2	10	3
Science		1	2	1
Both science and humanities			1	1
Unknown/none	3	2	1	

What is the Editors' Work Environment?

The editors reported that the document development team they work with, on average, consists of 6.8 (median = 5.0) people, with the size ranging from 1 to 16. Job titles vary considerably from company to company and are not necessarily very descriptive of job duties; thus, it was not possible to fully characterize the makeup of the team. However, the editors did report that the team included, on average, 4.3 (median = 5.75) writers and 1.3 (median = 1.40) editors. The editors work with an average of 5.9 (median = 6.0) such teams at the same time.

The kind of documents our editors work on varied considerably, both for each individual and across individuals. The documents the editors reported spending the most time on were categorized into seven types as shown in Table 3. As shown in the table, the majority of the editors worked on research reports and technical manuals. In most cases those technical manuals were for DOD systems.

Table 3

The Type of Documents the Editors Reported Working on Most Often

Type of Document	Number of Editors
Technical reports/research papers	7
Textbooks	1
System documentation	4
Operation and maintenance manuals	8
Training manuals	4
Planning documents	1
Regulations/procedures	2

We asked the editors about the size of these documents by providing them with a 12-choice scale and asking them to choose the value that best characterized the size of the typical document they edit. The choices were in increments of 100 pages from 50 to 850 and then included the choices of 1,500, 2,000, and 4,000 pages. All but one editor reported document sizes ranging from 50 to 850 pages. The one exception was an editor reporting that his documents were in the range

of 4000 pages. As a consequence the typical size is better represented by the median of 250 pages rather than the mean of 435 pages.

The editors told us that in general they can edit 28.8 pages per day if they are doing a high level edit focusing on comprehensibility, coherence, etc. If they are doing a copy edit, productivity increases to an average of 38.4 pages per day. The estimates for a high level edit ranged from 8 to 60 pages per day, while, with one exception, the estimates for copy editing ranged from 10 to 80 pages per day. If we use the medians to correct for the extreme score, we find that the typical daily productivity is 20.4 and 20.2 pages per day for high level and copy edit respectively.

What is the Editing Process?

We asked the editors to indicate how they distributed their time in working with the writer over the course of document development, using the four phases of the writing process shown in Table 4. As indicated in the table, the majority of the editors' efforts occur in working with the draft document. In essence, they tend to let the rest of the writing team or the specifications determine the organization, design, and rhetorical style of the document. Most importantly, the editors spend little time early in the process working with the writer on his or her style of writing. They do not seem to address any problems the writer may have (e.g., using passive forms or pet phrases) or attempt to coordinate grammatical or style preferences by reviewing the initial pages of the document. Rather, they tend to wait for the complete draft.

Table 4

Mean Proportion of Time (and SD) Editors Report Spending on Each Phase of the Document Development Process

Phase of Document Development	Mean Proportion (and SD) of Editing Effort
Prewriting (planning and proposing)	.075 (.08)
Initial writing	.159 (.19)
Completion of draft of the document or major section	.530 (.27)
Final clean-up/production	.209 (.20)

When the editors receive the document for editing, it is typically available on disk; however, this is not always the case. Two of 19 editors, both working on DOD-related documents, indicated that they only receive hard copy of the document. Another 9 editors (for a total of 57%) indicated that 50% or more of the time they only receive hard copy to edit. These 9 were distributed across all categories of industry except nuclear. We asked this question on two of the questionnaires because we were so surprised by the findings. The second time, the question was stated as follows:

> We really wanted to get at [in the last questionnaire] how you work with the document during editing. Therefore, we are rewording the question as follows: What percentage of the time do you receive documents only in hard-copy form—no computer version is available.

Given this wording, we are confident that the response reflects the format in which the editors receive the document. However, what the question does not address is whether the lack of an on-line version is by the editor's choice. That is, the editor may simply prefer editing on hard copy and

thus does not request an on-line version. In later, informal follow-up, we found this to be the case for at least one of our editors.

We also asked the editors specifically how much of their editing was done on the computer. Five of 23 editors (22%) reported that they did not do any editing on the computer. The job areas (Table 1) represented by these five were: military, aerospace, and free lance. Seventeen of the editors (74%) reported that they did 50% or less of their editing on the computer. However, this is not due to the editors' rejection of computer technology. We asked them to use a 9-point scale to indicate their degree of agreement with the following statement: "I hate computers and cannot conceive of using any computer tools." Only 2 of 23 editors indicated that they somewhat agree with that statement while 16 (70%) indicated they strongly disagreed (a score of 9) and another 3 indicated they somewhat disagreed. As we shall see in a later section, it would seem that at least part of the problem is the lack of access to tools that support the editing activities. Because of the lack of an editing "environment," it is simply easier to edit on paper than it is on a diskette.

As a final question on the editing process, we asked the editors to indicate the proportion of their editing time spent on six types of editing tasks as shown in Table 5. The findings indicate that the editing time is fairly evenly distributed across the various types of editing. We were concerned that these "average" data may simply reflect the blending of different types of editors, rather than reflecting a broad range of editing activities by each editor. However, a more detailed examination of the responses to this question confirmed that most editors did in fact distribute their time fairly evenly across the tasks shown in Table 5. For example, only two editors indicated that zero proportion of their time was devoted to one of the editing tasks (technical accuracy in both cases). Further, only two editors indicated that they spent more than 50% of their time on one of the editing tasks.

Table 5

The Mean Proportion of Time (and SD) Spent by Editors on Different Types of Editing Tasks

Editing Task	Mean Proportion (and SD) of Editing Time
Consistent use of terminology in text and graphics	.144 (.08)
Comprehensibility and readability (paragraph and sentence level clarity)	.198 (.14)
Style and consistency with any specifications	.167 (.09)
Coherence and organization of section or document	.113 (.06)
Technical accuracy of text and graphics	.179 (.14)
Grammar and mechanics	.155 (.10)

What are the Skills and Knowledge Required of an Editor?

On the first questionnaire, we asked the editors to write what they felt were the critical characteristics and skills for editing. The responses yielded a list of 39 reasonably distinct skill and knowledge requirements. In the second questionnaire, we presented this list to the editors and

asked them to rank the five most important and the five least important characteristics that will lead to excellence in an editor.

In scoring the responses, we awarded points to each characteristic based on the ranking it received from a subject. The characteristic ranked most or least critical received + or - 5 points respectively. The next most or least critical characteristic received +4 or -4 points respectively. This continued until +1 or -1 point was given for fifth most or least critical characteristic. Separate positive and negative point totals were then calculated for each characteristic to indicate the overall degree to which it was judged most or least critical.

The eight most critical characteristics and skills are shown in Table 6, while the eight least critical characteristics are presented in Table 7. Tables 6 and 7 also provide the point total for each listed characteristic and the number of editors who listed this characteristic among the five most (or least) important.

Table 6

The Five Characteristics of an Editor Rated as Most Critical by Editors

Most Important Characteristics of an Excellent Editor	Points Awarded for Most Important	Number Ranking it in Top Five
Logical thought	33	8
Ability to read document from the perspective of the user	30	9
Ability to maintain consistency	29	10
Ear for language (clarity and usage)	23	7
Ability to understand unfamiliar material	21	8
Ability to establish a collaborative relationship with the author	20	6
Ability to find and correct errors of grammar, syntax, punctuation, etc.	20	6
Attention to detail	19	7

Table 7

The Five Characteristics of an Editor Rated as Least Critical by Editors

Least Important Characteristics of an Excellent Editor	Points Awarded for Least Important	Number Ranking it in Bottom Five
Expert knowledge of the subject area	-46	13
Management skills	-30	8
Perfectionism	-29	10
Interest in the subject area	-15	4
Teaching skills	-15	5
Ability to not take oneself too seriously	-11	3
Ability to enrich writing style	-11	4
Attention to small, relatively minor detail	-11	6

The two most important characteristics focus on the usability of the document. Combining those two items, we might describe the critical characteristic of an effective editor as the ability to judge whether the information will be logical to the user in the context of the use of the information. Interestingly, the ability to understand unfamiliar information and the ability to take the position of the user were judged as most important, but expert knowledge and interest in the subject matter was seen as least important. Thus, the ability to step into the role of the user and think logically about the material is seen as a generalized, rhetorical skill rather than one steeped in content expertise.

A similar contrast is seen in the language skills of the editor. Ability to attend to detail, to maintain consistency, and to detect errors in grammar, syntax, and punctuation are seen as critical skills. However, this can be overdone, it would seem, since among the least important skills are attention to small relatively minor details and perfectionism.

The importance of technical knowledge is a critical issue in technical writing. How should technical knowledge be balanced against rhetorical skills? The computer industry, in its early days, focused on technical knowledge almost exclusively and assigned programmers to write documentation. A parallel practice is still common in the development of technical manuals in the aerospace industry. However, there is research to suggest that subject matter expertise can hinder effective writing. The writer, due to subject matter knowledge, can read beyond the written text and interpret it. Indeed, the computer industry saw this as the major problem in its document development policy and, in recent years, has shifted to hiring competent writers and providing them with the necessary technical information.

We asked the editors for their views on the importance of technical knowledge on the writing process and we also asked them the same question in terms of the editing process: "What is the effect of expertise (not just basic knowledge) on *editing* [*writing*]." They were asked to use a 9-point scale to indicate the degree to which the knowledge was helpful or a hindrance.

The editors indicated that technical knowledge was very helpful for writers (mean score of 1.69 on a scale from 1 to 9) and somewhat helpful (mean score of 3.22) for editors. This seems to contradict the finding in Table 7 that technical knowledge was the least important skill in identifying an expert editor. Perhaps, however, it is the phrasing of the anchor points on our rating scale: "very helpful" and "very much a hindrance." It may be that content expertise is helpful when the alternative is "a hindrance," but that it is not very important, as the data in Table 7 indicate.

What are the Primary Errors That Editors Find in Text?

A primary focus of this study was to identify the writing errors that editors encounter. In the first questionnaire, we asked the editors to describe the "kinds of errors that cause the greatest problems in editing (e.g., the errors that are most frequent, most difficult to detect or correct)." The responses provided a rich set of examples but also indicated that some editors focused on "difficult" problems while others focused on "frequent" problems. Therefore, in the second questionnaire, we asked two questions: one about the most difficult errors to correct and the other about the errors that are most time consuming to correct.

We felt that frequently occurring problems (e.g., passive sentences), might be time consuming because of their frequency, but not difficult to correct. In contrast, organizational issues or maintaining a user focus may not be frequent problems but when such a problem arises, it may take considerable effort to determine strategies for reorganizing or changing the focus. We attempted to get a richer set of responses from users by asking about the most frequent and most difficult errors in each of six categories of error types. These categories were generated from an analysis of the kinds of errors identified in the first questionnaire:

- grammar and mechanics (copy editing, proofreading),
- technical accuracy of text and graphics,
- coherence and organization of chapter or whole document,
- style and consistency with specific specification requirements,
- comprehensibility and readability (paragraph and sentence level clarity),
- correct and consistent use of terminology in text and graphics.

We used the responses to generate a list of 53 types of errors. We found considerable overlap across some of the error categories used in the second questionnaire and, therefore, in the third questionnaire, the 53 types of errors were presented under four different categories, with 11 to 16 types under each category. The categories with examples of the error types are presented in Table 8.

Table 8

Categories of Text Errors and Examples of Items in Those Categories Presented in Questionnaire 3

Grammar and Mechanics	**Accuracy of Text and Graphics**
• Accuracy of references	• Caption/art agreement with text
• Parallelism in lists	• Accuracy of math formulas
• Use of "that" and "which"	• Consistency in naming objects and processes
• Passive voice	• Paste-up (accuracy of placement)
• Punctuation	
Coherence and Organization of the Chapter or Whole Document	**Comprehensibility and Readability**
• Lack of focus	• Noun strings
• Too many main points	• Ensuring that headings are task oriented
• Consistency of text with outline	• Correcting lifeless, boring prose
• Transition between topics	• Long sentences
• Ensuring a task/user orientation	• Changing inactive and hidden verbs to active verbs

We asked the editors to rate each type of error on three different 5-point scales:

- the amount of time you spend looking for and correcting the type of problem,
- the difficulty in correcting the error once identified,
- how helpful it would be to have a tool that would identify or locate that type of problem.

We also asked the editors to rank the five types of errors of the 53 that they considered to be the biggest problems.

The mean ratings of items in each category on each of the three questions is presented in Table 9. As can be seen in the table, most of the scores centered around the middle score of 3, indicating that it is a typical task in terms of time requirements; it is somewhat difficult to correct; and it is a task where a tool may be useful.

Checking accuracy of text and graphics appears to be the least time consuming task, the average rating being at least a half of a standard deviation higher than any of the other categories (where a high rating indicates that the task was less time consuming). There is basically no difference between the other three categories in terms of the time required to locate those types of errors.

Table 9

The Mean Rating (and SD) on a 5-point Scale of Text-based Errors in Each of Four Categories of Error Types

Types of Errors	Time Searching (SD)	Effort to Correct (SD)	Usefulness of a Tool (SD)
Grammar and mechanics	2.78 (.55)	3.67 (1.54)	3.04 (.53)
Accuracy of text and graphics	3.21 (.56)	3.20 (.51)	2.83 (.51)
Coherence and organization	2.86 (.39)	2.49 (.32)	3.24 (.50)
Comprehensibility and readability	2.90 (.43)	2.92 (.37)	3.18 (.42)

There is a much stronger distinction between the categories in terms of the effort required to correct errors. As we anticipated, errors of coherence and organization require the most effort to correct, while errors of grammar and mechanics are the easiest to correct. Almost three standard deviations separate the mean scores for these two categories

There is less distinction between categories in terms of the editors' judgment of the usefulness of a tool to aid in detecting or correcting the errors. Tools to aid in evaluating accuracy of text and graphics were rated, overall, as being of most potential use, while tools for coherence and organization were seen as least useful. Comments from the editors indicated that their responses to this question were based on a combination of perceived feasibility of developing such a tool as well as the perceived usefulness of a tool to aid in detecting or correcting the particular error. Thus, we suspect the indication that tools for detecting and correcting errors of coherence and organization were rated as less important because the editors could not envision such a tool or feared that the accuracy of such a tool would be so low as to require more rather than less time.

Tables 10, 11, and 12 provide a more detailed examination of the ratings. The tables present the five types of errors that were rated the highest and the five types of errors that were rated the lowest in terms of the time required (Table 10), effort required (Table 11) and the perceived usefulness of a tool to correct or detect the error (Table 12). Across the three tables, we can see that editing the index is one of the most time consuming and difficult tasks and one for which the editors felt a computer aid would be most useful. Issues of coherence were also rated as most difficult and time consuming, but editors did not see a computer aid as being useful. Again, we suspect that they cannot envision an aid that could accurately assess coherence or recommend changes.

Consistent with the data in Tables 10 and 11, the editors rated overall coherence, sentence clarity, and quality of the index as the most important problems. Sixty percent of the editors responding to Questionnaire 3 ranked overall coherence as one of the five most important problems of the 53 potential problems presented.

Table 10

Text-based Errors Rated on a 5-point Scale as Most Time Consuming (1) and Least Time Consuming (5) to Correct

Type of Errors	Rating
Most time required	
Graphics accurately reflect what text describes	1.94
Overall coherence and logical organization of the text	2.21
Rewording sentences to improve clarity	2.21
Quality of the index	2.36
Spelling out acronyms the first time	2.37
Least time required	
Paste-up (accuracy of placement)	3.97
Correcting errors that result from the use of a text analyzer	3.85
Compiling symbol list	3.81
Accuracy of math formulas	3.62
Accuracy of math calculations	3.62

Table 11

Text-based Errors Rated on a 5-point Scale as Most Difficult (1) and Least Difficult (5) to Correct

Type of Errors	Rating
Most effort required	
Overall coherence and logical organization of the text	1.84
Lack of coherence within paragraphs	2.11
Lack of focus	2.26
Rewording sentences to improve clarity	2.27
Quality of the index	2.31
Least effort required	
Subject-verb agreement	4.53
Punctuation	4.36
Consistency of spelling	4.36
Spelling out the acronyms the first time	4.31
Use of "that" and "which"	4.23

Table 12

Text-based Errors Rated on a 5-point Scale as Ones for Which a Tool Would be Most Useful (1) and Least Useful (5) to Aid in Detecting or Correcting a Problem

Type of Errors	Rating
Tool most useful	
Spelling out acronyms the first time	1.89
Consistency of numbering of tables and art	2.00
Consistency of spelling (words and acronyms)	2.05
Quality of the index	2.13
Meeting readability grade level specs for plain English	2.29
Tool least useful	
Failure to build a conclusion	3.84
Parallelism in thought	3.78
Lack of focus	3.74
Ensuring that the headings are task oriented	3.70
Too many main points	3.69

What Tools are Needed to Aid Editing?

We asked the editors to identify the tools they use in editing. We emphasized that we did not care whether or not the tool was computer-based—we simply wanted to understand what they used in doing their job. There was no limit on the number of tools they could list. For each tool they presented, they were asked to rate how helpful the tool was in their job on a 9-point scale, where a rating of 1 indicated that the tool was very helpful and a rating of 9 indicated that it was very much a hindrance. Tables 13 and 14 present the list of hard copy and computer-based tools, respectively, along with the helpfulness ratings. Each rating for a tool is shown in the tables so that the reader can identify both the level of helpfulness and the number of editors who used the tool.

As a comparison of the two tables suggests, there is far wider use of hard copy tools and these hard copy tools, in general, are rated as considerably more helpful than the computer tools. Aside from in-house style guides, the *Chicago Manual of Style* and the *Government Printing Office Style Manual* are the two most widely used resources. Over half of our editors use the *Chicago Manual of Style* and all of them rate the manual very highly.

Except for in-house resources, all but two hard copy resources are rated somewhat helpful, with a score of 3 or better. The mean rating given for all hard copy resources was 2.2 (N = 48). In contrast, the mean rating across all computer-based resources was 3.4 (N = 25). Grammatik IV and RightWriter, two of the popular text analyzers, were both used by two editors. In each case, one rating was somewhat of a hindrance and the other rating was in the area of somewhat acceptable. In essence, these popular writers' tools do not tend to be used by expert editors nor are they particularly favored by those who do use them. One editor commented that the tools force an extra process in the editorial cycle at the cost of time and money. The primary reaction from the users was that the tools have "some good points" but in general the "time it takes to go through those [comments] that are invalid and irrational makes it not worth the time or effort."

Table 13

Hard Copy Tools Editors Reported Using in Their Editing

Hard Copy Tool	Ratings[a]
Chicago Manual of Style	3, 2, 3, 1, 1, 3, 1, 1, 2, 1
Government Printing Office Style Manual	2, 3, 2, 2, 3, 1, 1
A Treasury of Word Lovers (Freeman)	1
Elements of Style (Strunk and White)	1, 2
Modern English Usage (Fowler)	2
Gregg Reference Manual	1
The Careful Writer (Bernstein)	1, 1
The Writing Handbook	3
Roget's International Thesaurus	1
Writer's Guide and Index to English (Ebbitt and Ebbitt)	3, 2
Style Manual of the AMA (American Medical Association)	5
Publication Manual of the American Psychological Association	3, 1
Council of Biology Editors Styles Guide	5
Chicago Guide to Preparing Electronic Documents	3
Math into Type	3
Words into Type (Skillin)	3, 4, 2
In-house style guide	1, 2, 2, 2, 1, 6, 2, 1
In-house glossary	5, 2, 3

Note. Ratings are on a 9-point scale where 1 = very helpful and 9 = very much a hindrance.
[a]Each number is the rating of one editor who reported using that tool.

Word processors, in general, were rated highly as were desk-top publishing packages. DocuComp, a package that prints out two versions of a document, highlighting the changes, received only mediocre ratings from the two editors who use it. The comments of one editor point to the difficult interface issues involved in designing editing tools. This editor noted that DocuComp was fine if there were only a few editorial changes; however, there are typically numerous changes recommended and here the printout from DocuComp becomes unusable.

In Questionnaire 1, we asked the editors to describe "a computer-based editing tool that you would like to see developed. This may be a tool that aids you with a particular task or a particular writing problem." We used the responses to this question to generate a list of 21 different computer tools. In Questionnaire 2, we asked the editors to rate the usefulness of each tool on a 9-point scale (1 = very useful, would surely use it and 9 = not at all useful, wouldn't use it). The potential computer tools are presented in Table 15 ordered from most to least highly rated.

Overall, the editors tend to favor the development of computing tools for all of the tasks—all but one rating received a score below 5.0 (the midpoint). The list includes three reference tools—tools that do not analyze text but simply serve as a resource for the editor. All three reference tools were highly rated. Indeed, the most highly rated tool (mean = 1.96) is an on-line dictionary and thesaurus for technical terms. This was seen as more important than a similar tool for nontechnical terms (mean = 3.14), though it still ranked 8th out of 21 in terms of mean rating. The other reference tool, an on-line version of the *Chicago Manual of Style,* received a mean rating of 2.95, the sixth highest rating.

Table 14

Computer-based Tools That Editors Reported Using in Their Editing Tasks

Computer Tools	Ratings[a]
WordPerfect	3, 1, 1
Microsoft Word spell checker, hyphenation, and word count	4
Spell checker	2
SPELL (VAX/VMS utility)	2
Search key on the computer	1
DocuComp--document comparison software	5, 3
Editorial Advisor--electronic style guide and templates for in-house style sheets	5
Grammatik IV--grammar/syntax checker	7, 3
RightWriter--grammar syntax checker	7, 4
DEC Document--desk-top publishing software	3
Scribe--desk-top publishing software	3
FrameMaker--desk-top publishing software	2
Interleaf--desk-top publishing software	2
Publisher--desk-top publishing software	2
Automated Composition System XYVISION--hardware and software designed to support editing and composing	8
PROOF--Writer's WorkBench--spell checker	1
READABLE--Writer's WorkBench--runs readability formulas	3
REVUFILE--Writer's WorkBench?--annotation and resolution tool	2
CRITIQUE--Writer's WorkBench--grammar and punctuation checker	4, 7

Note. Ratings are on a 9-point scale where 1 = very helpful and 9 = very much a hindrance.
[a]Each number is the rating of one editor who reported using that tool.

Table 15

Mean (and SD) Rating on a 9-point Scale of the Perceived Usefulness of Potential Computer-based Editing Tools

Computer-based Editing Tool	Ratings (SD)
An on-line dictionary and thesaurus of technical terms with capability for adding new terms	1.91 (1.1)
Keep track of sequentially numbered items (tables, figures, etc.).	2.43 (1.8)
Check for consistency of capitalization.	2.50 (2.2)
Support automated formatting of citations, references, and bibliography.	2.59 (2.4)
A tool that aids display of editing comments/changes and has the following features: • additions and deletions marked with one keystroke, • room for comments, • clear indicator of information that has been removed to a new place.	2.86 (2.5)
An on-line version of the *Chicago Manual of Style* (or any style manual) with support for querying and searching (i.e., not just the manual on-line).	2.95 (2.3)
A command that highlights the first occurrence of each references as it appears in the text.	2.96 (2.5)
An on-line dictionary and thesaurus of nontechnical terms with capability for adding new terms.	3.14 (2.4)
Comment space that would not disrupt or clutter page layout.	3.14 (2.5)
Tools to aid copy editing in general (e.g., search for key words that tend to be misused).	3.23 (2.4)
A tool that provides identification of terms and definitions early in the design process.	3.43 (2.6)
Punctuation checker.	3.46 (2.9)
Identify errors of agreement between subject and verb and between pronoun and antecedent.	3.50 (2.8)
Features of RightWriter along with a technical dictionary of words, acronyms, and abbreviations.	3.71 (2.1)
A system that would permit automatic changing of formats.	3.77 (2.8)
Identify split infinitives and dangling participles	4.09 (2.9)
A tailorable tool that would check for particular style difficulties.	4.10 (3.7)
Provide the spatial control of pages that one has with hard copy (side by side, etc.) with search capabilities.	4.32 (2.9)
Checker for sentences that are passive or too long.	4.64 (2.8)
Identify potential problem paragraphs in the same way tools now identify potential problem sentences.	4.68 (2.4)
Suggestions for how to correct passive sentences that are identified.	5.45 (2.9)

The three most highly rated text analysis tools are ones that would support copy editing: tracking numbering of tables, checking consistency of punctuation, and automated formatting of references. Tools that analyze syntax tended to be rated lowest. Indeed, tools to identify a passive sentence and suggest alternatives for passive constructions were two of the three lowest rated (mean ratings of 4.64 and 5.45, respectively).

Only one tool for managing editing comments was included in the list; however, that tool, a system for displaying editor comments, received the fifth highest mean rating (2.86).

In sum, the most highly rated tool are reference resources, text analyzers related to copy editing, and a system for displaying editor comments. The lowest rated tools are ones that analyze syntax and style.

Summary and Conclusions

The goal of this research was to identify the needs of technical editors that could be supported through the development of computer tools. Additionally, our goal was to understand the technical editing context as it is relevant to the design of those tools. In this general discussion, we will consider the major context and task issues relevant to the design of computer-aided tools.

The Editing Context

The technical editors we surveyed tend to come from humanities backgrounds with English and journalism majors. The documents they edit tend to be around 250 pages in length and are produced by several writers working as a team. Further, they work on several such documents at the same time.

In working on these documents, the editors typically do not take part in planning but enter the process when the author has completed a draft of a major segment. Most importantly, these editors, while not adverse to computer technology, tend to work on hard copy rather than an on-line version of the documents. Indeed, either by choice or availability, they often do not receive an on-line copy of the text.

The qualities that the editors appear to prize in themselves (their rating of important characteristics of an excellent editor) are their analytical skills: logical thought, taking a user's perspective, an ear for language.

Editing Tasks and Problems

The editors seem to edit for all levels of detail—from overall coherence to copy editing. They estimate their rate of editing to be about 20 pages per day. The tools they use in the editing process tend to be reference documents with the *Chicago Manual of Style* and the *Government Printing Office Style Manual* the two most frequently cited resources.

The problems the editors identified as most difficult and time consuming are, for the most part, problems in coherence and clarity. These are problems that match well against the expertise they see as essential for effective editing (logical thought and taking the perspective of the user). Hence, it is these problems that they, as editors, seem to focus their expertise on. When asked about the value of computing tools, they consistently devalued the development of tools for use in this area. Rather, the text analysis tools they valued tended to be for copy editing. On-line reference tools (i.e., their favorite hard copy tools placed on-line) were also valued. A reference tool specifically designed to support technical material was rated as the most important tool. The tools least valued by the editors tended to be syntactic tools—in particular, tools to detect and correct errors of passive voice.

Opportunities for Designing Computer-Based Tools

One of the primary opportunities and needs for text editing is a computer-based editing environment in which the editor can easily attach comments to the document. We suspect that a major reason the editors do not use computer tools in so many cases is that they cannot easily mark the document—making suggestion or changes for the writer to consider. The only such tool mentioned by the writers was DocuComp, but that proved inadequate when there were many changes being proposed. We suspect other similar tools are available (see, e.g., Duffy et al., 1987); however, the growing dominance of the graphical user interface and hypermedia technology (especially the ability to link) in recent years certainly presents new opportunities for designing effective editing environments.

A second potential area of support is in the management of documents. On average, the editors describe themselves as working on five or six 250-page documents—each contributed to by several writers. It would seem that some mechanism for helping them to manage this environment might be particularly useful. We might infer that the editors tend to work with writers only when a draft is completed, because of the management difficulty of multiple exchanges of partial documents.

An environment such as KMS (Akscyn, McCracken, & Yoder, 1988) or Concordia (Walker, 1989) offers particular potential for meeting both the management goal and the need for space for editors' comments. Both tools have been specifically designed to support the document development process, both the collaborative environment between writer and editor and the document management environment. In terms of practicality, however, they both, at the moment, require a workstation environment that exceeds the capabilities of most technical manual production environments.

The technical editors reported that very often they do not receive the document on disk and they do not edit on the computer. This, of course, makes it particularly difficult to provide computer-aided editing tools that they would be able to use. Most certainly the writing is being done on computer—all technical writing environments make use of word processors. Our inference is that the lack of basic functionality required in editing—a commenting space in particular—keeps them from using the computer.

The editors told us that in general they do not work with a writer until a draft is completed. We suspect that the production process would be much more efficient if the editor and writer collaborated early in the writing process so that the writer could seek advice and the writer and editor could agree on design and style. (Such agreement is necessary even within the confines of specifications; see, e.g., Duffy et al., 1987.) A networked document management system along with a "comment" capability could greatly facilitate this collaboration.

The development of a technical editing comment environment provides the foundation for the use of text analysis support tools. Responses from editors suggest two primary classes of tools: reference documents and text analysis tools to detect basic text errors. The primary reference tool requested was an on-line dictionary and thesaurus of technical terms. A variety of this class of tools is available for general text editing. The work of Miller and his colleagues (Miller et al., 1990) in the design of WordNet is particularly relevant to the design of a technical thesaurus that would be context sensitive.

Technical editors can detect and correct errors in text—that is the nature of their expertise. Thus, the design of text analysis tools should not be viewed as providing a capability that does not

exist. Rather, the goal must be to make the activity more efficient than when done by the editor alone. We suspect that this efficiency can be achieved by focusing on detecting rather than correcting errors. The editor would review all automatic changes made by the computer and, hence, it is unlikely that automated changes at other than a basic level would increase efficiency. Further, we suspect that the editors will be able to generate a correction faster than they can evaluate computer proposed modifications—and that the proposed modification would probably have to be modified in many instances. So even suggesting alternatives may be counterproductive. Indeed, the computer tool viewed as least helpful is one that would propose alternatives for the passive voice.

A second essential characteristic of the text analysis tool is that it must be accurate. Editors who worked with RightWriter and Grammatik described them as creating more work because of the errors in detection. Indeed, the editors propose tools that help with the basic tasks that require extensive search and tracking time: sequencing, indexing, formatting, etc. We suspect that the design of a computer interface that will support editors in the use of these types of detection tools would be well received.

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Appendix A

Assessment of Editing Practice Problems
Round 1

Please return no later than November 18

Assessment of Editing Practices and Problems

Round 1

prepared by

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Instructions

The purpose of this questionnaire is to learn from technical editors like your self what kind of support you need and in particular what type (if any) of text analysis tools would be most helpful. Our long range goal is to develop computer aids for text editors. In particular we are interested in text analysis aids. Please feel free to add notes of explanation whenever you feel it would be useful.

Please use a word processor if possible in answering the essay items. If you write your responses please try to write clearly.

We will always present summaries of the data; however, at no time will any of your responses be attributed to you While we may use specific comments to illustrate, we will never attribute them to a particular individual. Similarly, your participation in the study will not be revealed without your permission.
This questionnaire should be placed in return mail no later than November 18. We must tabulate all responses before sending the next questionnaire. Hence your timely reply is essential.

1. Your place of employment:

2. Phone number(s) at which we can we reach you:

3. Complete mailing address:.

4. Do you have college experience? If so, what is the highest degree and what was your major?

5. What is your specific job title and, if appropriate, your grade level.

6. How long have you been in that position? If less than a year, please describe your previous position?

7. Please describe your primary responsibilities in editing -- include the kind of editing you do.

8. Years experience as an editor:

9. Years experience as a writer, before your assumed editing duties:

10. What was your background prior to becoming a writer or editor?.

11. During the past four years, what percentage of your time was devoted to editing?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12 What are the primary types of documents you have edited during the last four years?

Type of manual /document	User	Equipment it supports	Average size and range of sizes	% of your editing	your editing responsibility

13. How large is your document production shop?

- Total Number of people _____
- Number of writers _____
- Number of editors _____

- Break editors out by type, if possible:

Type	Number

14. Describe your editing situation (if you have just changed jobs you may want to reference your last position):

- Who are the members of a document preparation team

- What is the size of a team. _____
- Number of teams you support. _____
- Organization of the editors (editor roles):

15. Discuss how editing occurs in relation to writing.

a). When do you first interact with the writer? How often or frequently do you interact with the writer? What is your goal (what is the editing focus) in these meetings? Is the timing or purpose of the meetings formalized, e.g., governed by milestones?

b) Is there another type of editor who also interacts with the writer? If so, identify them by job type and answer the same questions for them.

16. What are the critical skills particular to editing? List in order of importance up to five characteristics or skills that you feel are most critical to being a successful editor (beyond the skills of a good writer).

17. Use the scale below to indicate your view of the effects of familiarity with the specific content on the ability to edit. Explain your rating and please be clear as to what kind of editing you are referring to..

1	2	3	4	5	6	7	8	9
very helpful		somewhat helpful		eh!		somewhat of a hindrance		very much a hindrance

18. We would like to understand the kinds of errors that cause the greatest problems in editing (e.g., errors that are most frequent, most difficult to detect or correct). If you could get rid of one editing problem, what would it be? It is very important that we collect real examples of the editing problem, so please provide a photocopy of a portion of a document you recently edited that contains an example of the problem Please be sure to include enough of the document so that we can understand the problem.

19. I suspect you have available, have imposed, and have tried a variety of tools to aid the editing process (for example, a variety of computer based editing tools and analysis tools, or style guides and guide books). Please identify, as clearly as possible, the aids you use or have tried, indicate how much they help or hinder in you in editing effectively and explain the basis for your rating. Remember, be as explicit as possible in naming the tools. If it is an in-house tool (e.g., an in-house style guide or customized software) then please try to explain what it does. Append a sheet if you need more space for explanation.

Use this Rating Scale

1	2	3	4	5	6	7	8	9
very helpful		somewhat helpful		eh!		somewhat of a hindrance		very much a hindrance

Tool -- Name and Description	Use (U) Tried(T)	Rating (see above)	Explanation of Rating

20. We are interested in designing computer based editing tools to help you with your job. Please offer us some advice. Please describe a computer based editing support tool you would like to see developed. This may be a tool that aids you with a particular task or in correcting a particular writing problem. What will be the key to its effectiveness or success?

21. When we present the findings from this work we would like to identify and thank the participants. However, we will not do so without your permission. Note that regardless of whether or not you give us permission to identify you or the company, we will not attribute any particular data to you or the company. Everyone will remain anonymous in terms of the specifics of the data. With that in mind:

	yes	no	don't care
May we acknowledge your participation			
May we acknowledge your company			

22. We want everyone to try to address issues and provide information that is relevant to you. Therefore please indicate any questions or topics you would like us to include in the next mailing to you.

Appendix B

Assessment of Editing Practice Problems
Round 2

Please place in the mail no later than 7 February

Assessment of Editing Practices and Problems

Round 2

prepared by

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Instructions

The questions we present here build your answers to the first questionnaire. There are four types of questions:

- Rephrasing of questions. Some of our questions led to different interpretations than we intended and so we are trying a new wording.
- Sorting questions. Most of our questions led to an interesting array of answers. Here we are sharing the answers to those questions and asking you to identify the perspective or answer that is most important or relevant to you.
- Building questions. Many of the answers led to new insights and new questions. Hence we are asking many questions that build on and extend what we learned in the first round.
- You questions. We asked you what questions you would like us to ask the group and many of you responded with excellent items. They are included here.

In the first round some of you felt that your answers had to be relevant to the use of computers in editing. Let us emphasize that that is not true. We are trying to understand the technical editing process and hence we are interested in how you -- an expert technical editor -- go about your business. While we are particularly interested in developing computers aids, we can only be effective in our work if we understand the editing process as it exists regardless of whether or not any computer aids are now being used.

We might also note that we have searched the literature and there is no published work that we can find in which the description of technical editing is based on data from technical editors. That is, no effort like this one has ever been undertaken. Hence our results will be of considerable interest to anyone working in an area related to technical writing. For example, we have no doubt that the results of this work will be very relevant to the training of technical writers. So please, when you answer the questions remember that you are helping to paint an understanding of the technical editing profession and it is important to clearly represent what it is you do.

Again, please use a word processor if possible in answering the short answer items. If you write your responses please try to write clearly. If you have established email contact with us, please feel free to respond through email. You may also wish to fax your responses. All possible means of contacting us are listed on the cover page of this questionnaire.

We will always present summaries of the data; however, at no time will any of your responses be attributed to you While we may use specific comments to illustrate, we will never attribute them to a particular individual. Similarly, your participation in the study will not be revealed without your permission.

This questionnaire should be placed in return mail no later than 7 February. We must tabulate all responses before sending the next (and last) questionnaire. Hence your timely reply is essential.

Once again, thanks for your help.

1. Your name: _____

2. What percentage of your time spent editing is spent on each of these tasks. Note that your time should add up to 100%.

A. consistent use of terminology in text and graphics _____

B. comprehensibility and readability (paragraph and sentence level clarity) _____

C. style and consistency with specific spec requirements _____

D. coherence and organization of chapter or whole document _____

E. technical accuracy of text and graphics _____

F. grammar and mechanics (copy editing; proofreading) _____

G. (other)_____ _____

3. Of the choices below circle the one which best characterizes the size (number of pages) of the document that you typically work on:

50 150 250 350 450 550 650 750 850 1,500 2,000 4,000

4. Please identify the typical number of people working on a typical document development project -- please give only one number for each item If there are two distinct types of teams then indicate two numbers -- one that is typical for each type of team. If you are a consultant, describe the size of the typical team involved in the documents you work on.

Total size of team _____
Number of writers _____
Number of editors _____

Number of different documents/teams you typically work on at the same time: _____

5. What percentage of the time do you receive documents in hard copy (typed on paper as opposed to on-line)?

0 10 20 30 40 50 60 70 80 90 100

In Round 1 we asked you to identify the types of errors that gave you the greatest problems in editing. The responses we received are listed below. The next two questions ask for more specific information on your problems in editing -- we want you to identify the major problem for each of six levels of editing. Further, we want you to identify the errors that are most time consuming (question 5) and those that are most difficult to correct (question 6). Do not feel constrained by this list when answering questions 5 and 6 -- it is meant only to provide some examples of the kinds of errors people were thinking of.

- state conclusions rather than lead to conclusion
- too many conditions listed (if/then)
- accuracy of # on tables and in text
- equations/greek/math symbols
- incoherent/disorganized writing
- abbreviations/acronyms not spelled out the first time used
- failure to use interim summation
- changing tenses
- use of that vs which
- inconsistency in spelling
- cross reference
- improving paragraph organization and structure
- wrong use of punctuation
- lack of focus
- too many main points
- dangling constructions
- vague pronoun reference
- incomplete idioms
- subject/verb agreement
- prose too complex
- overuse of passive voice
- incorrect punctuation
- dangling infinitive & participles
- wrong use of possessive
- capitalization and compounds
- incorrect references
- cross reference between text and tables
- correcting/maintaining audience focus
- linking ideas

5. We want to know the types of editing problems that you spend most of your time on. For each type of editing task listed below please describe as accurately as possible the kind of editing problem that you spend most of your time on . Give an example if possible. Use an extra sheet of paper if necessary. PLEASE DESCRIBE ONLY ONE PROBLEM (THE MOST TIME CONSUMING PROBELM) FOR EACH CATEGORY.

A. grammar and mechanics (copy editing; proofreading)

B. technical accuracy of text and graphics

C. coherence and organization of chapter or whole document

D. style and consistency with specific spec requirements

E. comprehensibility and readability (paragraph and sentence level clarity)

F. consistent use of terminology in text and graphics

G. (Other) _____

6. For each type of editing task listed below please describe as accurately as possible the kind of editing problem that you find most difficult to correct. Give an example if possible. Use an extra sheet of paper if necessary. (Note, the focus here is on the most difficult task whereas in item five we asked about the most time consuming editing problem. If the answer is the same then just indicate "same as 3" for that editing task. PLEASE DESCRIBE ONLY ONE PROBLEM (THE PROBLEM THAT IS MOST DIFFICULT TO CORRECT) FOR EACH CATEGORY.

A. grammar and mechanics (copy editing; proofreading)

B. technical accuracy of text and graphics

C. coherence and organization of chapter or whole document

D. style and consistency with specific spec requirements

E. comprehensibility and readability (paragraph and sentence level clarity)

F. consistent use of terminology in text and graphics

G. (Other) _____

7. Assume you were hiring an editor and had a pool of candidates who were all basically pretty good (they have basic competency in all of the skills listed below). In what skills would the person you hire excel? That is, what are the most critical characteristics that will lead to excellence? In the list below number the five most important characteristics (1 to 5 with "1" being most important) and the five least important characteristics (35 to 40 with 40 being the least important)

___ ability to establish collaborative relationship with writer
___ knowledge of organizational and/or rhetorical possibilities
___ knowledge of software tools
___ confidence in one's ability
___ attention to small, relatively minor details

___ ability to understand unfamiliar material
___ ability to cover large amount of material quickly
___ linguistic analytical skills (ability to analyze sentence)
___ ability to enrich writing style
___ experience as technical writer

___ broad range of writing experiences
___ ability to paraphrase
___ ability to maintain consistency
___ tolerance for individual differences in correct grammar and syntax usage
___ ability to not take oneself too seriously

___ ability to follow project through from draft to publication with author.
___ teaching skills
___ management skills
___ ability to visualize procedure never seen.

___ negotiating skills
___ basic understanding of subject matter
___ logical thought
___ knowledge of production process
___ ability to find and correct errors of grammar, syntax, punctuation, etc

___ attention to detail
___ respect for author's "pet phrases" and style
___ ability to detect organizational problems
___ good listener
___ ear for language (clarity & usage)

___ expert knowledge of subject area
___ ability to synthesize inputs consisting of various styles
___ interest in subject area
___ ability to interpret rather than just apply rules and guidelines
___ perfectionism

___ ability to plan and coordinate
___ ability to read document from position of user
___ tactful communication skills
___ ability to diagnose problems based on one's own understanding
___ sensitivity to shades of meaning

___ other_____

___ other_____

8. Over the course of a typical job, how is your time distributed? Indicate the percentage of your total time that is spent on each of these phases of document development (note that the percentage should total 100%).

_____ Prewriting (planning/proposing)

_____ Initial writing

_____ Revision of drafts of the document or major sections of the document

_____ Final clean/up/Production

9. We assume that basic domain knowledge is essential to both writing and editing (if you disagree with this assumption then please indicate so and explain). However, what is the effect of expertise in the subject matte?

a.) What is the effect of expertise (not just basic knowledge) on **editing** for coherence, style, and comprehensibility Use the scale below to indicate your view.

1	2	3	4	5	6	7	8	9
very helpful		somewhat helpful		eh!		somewhat a hindrance		very much a hindrance

b.) What is the effect of expertise (not just basic knowledge) on **writing**. Use the scale below to indicate your view.

1	2	3	4	5	6	7	8	9
very helpful		somewhat helpful		eh!		somewhat a hindrance		very much a hindrance

10. What percentage of your editing is done on a computer.

0 10 20 30 40 50 60 70 80 90 100

If you edit on a computer how do you manage the strain that arises from looking at a screen (or do you not feel the strain)?

If you edit on the computer, what kind of editing do you find the computer most useful for; least useful for?

11.Please indicate the degree to which you agree with the following statement (just for the fun of it). "I hate computers and cannot conceive of using any computer tools."

1	2	3	4	5	6	7	8	9
strongly agree		somewhat agree		unsure		somewhat disagree		strongly disagree

12. In Round 1 we asked you to describe the computer based editing tool you would like to see developed. the answers we received are listed below. Please rate each item as to how likely it is that you would use such a tool if it was available (i.e., would you find such a tool useful). Use the following scale

1	2	3	4	5	6	7	8	9
very useful would surely use it		somewhat useful, would try it		uncertain		probably not very useful might try		not at all useful, wouldn't use

In answering this question please make the following assumptions:
-- you have a computer
-- the tool works with reasonable speed and accuracy (it is not inordinately slow or inaccurate but then again it is not perfect).
-- *think of these as new tools* and do not rate them in terms of your knowledge of existing tools (in particular , assume that we can correct many of the inadequacies of any existing tool that is similar to one described below.

Finally, please feel free to add tools that you would like to see built. In Round 3 we will ask a question that follows up on any proposals, suggestions or comments you make here.

____ Suggestions for how to correct passive sentences that are identified.

____ Identify errors of agreement between subject and verb and between pronoun and antecedent.

____ Check for consistency of capitalization

____ Identify dangling infinities and participial phrases

____ A tailorable tool that would check for particular style difficulties (respondents in Round 2, when you rate this please add what you consider to be an important style difficulty you would use this tool to check.

____ A tool that that aids display of editing comments/changes and has the following features:
- additions and deletions marked with one keystroke
- room for comments
- clear indicator of information that has been moved to a new place.

____ Provide spatial control of pages that I have with hardcopy (side by side etc) with search capabilities.

____ Comment space that would not clutter or disrupt layout of page

____ Keep track of sequentially numbered items (tables, figures, etc.)

____ Features of RightWriter along with a technical dictionary of words, acronyms and abbreviations.

____ Tools to aid copyediting in general -- e.g., searching for keywords that tend to be misused.

(continued next page)

____ Identify potentially problem paragraphs in the same way tools now identify potentially problem sentences.

____ Support for automatic formatting of citations, references, and bibliographies.

____ An online dictionary and Thesaurus of nontechnical terms with capability for adding new terms.

____ A tool that provides identification of terms and definition early in the design process.

____ An automatic formatting system that would permit automatic changing of formats

____ Punctuation checker

____ Checker for sentences that are passive or too long.

____ An online version of the Chicago Manual of Style (or any other style manual) with support for querying and searching (i.e., not just the manual online)

____ An online dictionary and Thesaurus of technical terms with capability for adding new terms.

____ A command that highlights the first occurrence of each reference as it appears in the text.

____ add any other tool_____

____ add any other tool_____

13. What is your productivity rate?

	TYPICAL	RANGE
• pages/day for copy or detailed edit	_____	_____
• pages/day for a high level edit	_____	_____
• panels/screens per day for online information	_____	_____

14. On the summary report from Round 1 we list the variety of tools (computer and text) that you reported using in editing along with your evaluation of them. Please look at that list and find the tools you use. Do you wish to comment on the ratings or comments? Do you wish to change your rating (if so, indicate what your rating/comment was and how to change it)?

15. Use the space below to present any questions you would like for us to ask on the next and final questionnaire.

Appendix C

Assessment of Editing Practice Problems
Round 3

Please place in the mail no later than 1 May

Assessment of Editing Practices and Problems

Round 3

prepared by

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Instructions

The questions we present here build your answers to the first two questionnaires. One goal is to try to build consensus among use as to a reasonable representation of the technical editing profession. Hence in this round we are presenting some of the lists a second time along with the answers we got last time. We want you to see if you can agree with the the average response from last time. If you can't that is okay, simply fill in the responses you feel most accurately reflect your views. This characterizes Questions 1 and 2.

Question 4 expands upon the items in the last round. Here we are simply sharing the items others indicated as important and asking you to rate how important you feel each item is.

Question 3 simply asks for a clarification of one question from Round 2. Finally, questions 5 to 7 are questions raised by one or more of you.

Please do read the instructions carefully and provide your best judgements.

This questionnaire should be placed in return mail no later than 1 May.

Once again, thanks for your help.

Your Name_____

Question 1.
In Round 2 we asked you to rate a variety of potential computer tools in terms of the degree to which you felt that you would use them if you had the necessary computer support. The mean rating of the potential tools is shown below, ordered from those rated as most useful to those that are seen to be least useful.

In general you were a very accommodating group, indicating that you would at least try all but two of the tools. However, we should note that all but three items received a score of 9 from at least one editor and all items received a score of one from at least one editor. Hence there are extreme disagreements.

Looking at the relative scores, it would seem that the things that you most want to see are tools that support your access to reference information and support you in marking or searching the text. In contrast, the tools that seem least important to you are tools that perform analyses of text, identifying particular syntactic or semantic structures.

We would like to assess the degree of agreement with these ratings and hence we are asking you to rate them once again. We hope that we can reach a consensus, so if you agree with the mean rating from the prior round, simply enter that rating once again. However, if you feel a particular item should be rated differently, then by all means indicate your assessment. We are repeating the scale here to help you reassess your ratings.

1	2	3	4	5	6	7	8	9
very useful would surely use it		somewhat useful, would try it		uncertain		probably not very useful might try		not at all useful, wouldn't use

• Confirm your agreement with mean rating or enter your new rating in the left hand column

your new rating	Mean from Rd 2	Tool
	2.11	An online dictionary and thesaurus of technical terms with the capability for adding terms
	2.84	Tools to aid copyediting in general -- e.g., searching for keywords that tend to be misused.
	3.05	An online version of the Chicago Manual of Style (or any other style manual) with support for querying and searching (i.e., not just the manual online)
	3.11	Support for automatic formatting of citations, references, and bibliographies.
	3.21	Keep track of sequentially numbered items (tables, etc._)

Question 1 contd.

your new rating	Mean from Rd 2	Tool
	3.21	A command that highlights the first occurrence of each reference as it appears in the text
	3.30	A tool that provides identification of terms and definition early in the design process.
	3.37	Punctuation checker
	3.47	Identify errors of agreement between subject and verb and between pronoun and antecedent.
	3.63	A tool that that aids display of editing comments/changes and has the following features: - additions and deletions marked with one keystroke - room for comments - clear indicator of information that has been moved to a new place.
	3.68	An automatic formatting system that would permit automatic changing of formats
	3.74	A tailorable tool that would check for particular style difficulties.
	3.79	An online dictionary and thesaurus of nontechnical terms with capability for adding new words
	3.83	Check for consistency of capitalization
	4.05	Comment space that would not clutter or disrupt layout of page
	4.06	Identify dangling infinitive and participial phrases
	4.10	Features of RightWriter along with a technical dictionary of words, acronyms and abbreviations.
	4.33	Provide spatial control of pages that I have with hardcopy (side by side etc) with search capabilities.
	4.53	Checker for sentences that are passive or too long.
	5.0	Identify potentially problem paragraphs in the same way tools now identify potentially problem sentences.
	5.35	Suggestions for how to correct passive sentences that are identified.

Question 2
On the next page are the potential characteristics of an editor that you generated n round 1 along with the characteristics you ranked most and least important in Round 2. We would like to reach consensus on these characteristics. Hence, we want you to do the rating again. Rank the most important 1 to 5 and the least important 44 to 48. If you find the ratings from Round 2 reasonable, then rate the items the same way (we want to achieve consensus if these ratings are reasonable). If you disagree with the rankings, then of course indicate which items you consider to be most or least important.

Rank the five most important (1-5) and least important (44-48) characteristics

Rating from Rd 2	your rating	Characteristic of an Excellent Editor
	___	negotiating skills
	___	basic understanding of subject matter
1	___	logical thought
45	___	teaching skills
	___	knowledge of production process
	___	ability to find and correct errors of grammar, syntax, punctuation, etc
4	___	attention to detail
	___	respect for author's "pet phrases" and style
	___	ability to detect organizational problems
	___	good listener
	___	ear for language (clarity & usage)
48	___	expert knowledge of subject area
	___	ability to synthesize inputs consisting of various styles
	___	interest in subject area
	___	ability to interpret rather than just apply rules and guidelines
47	___	perfectionism
	___	ability to plan and coordinate
2	___	ability to read document from position of user
	___	tactful communication skills
	___	ability to diagnose problems based on one's own understanding
	___	sensitivity to shades of meaning
	___	ability to establish collaborative relationship with writer
	___	knowledge of organizational and/or rhetorical possibilities
	___	knowledge of software tools
	___	confidence in one's ability
	___	ability to visualize procedure never seen
3	___	ability to understand unfamiliar material
	___	ability to cover large amount of material quickly
	___	linguistic analytical skills (ability to analyze sentence)
	___	ability to enrich writing style

contd on next page

Question 2 contd.

Rating from Rd 2	your rating	Characteristic of an Excellent Editor
	___	experience as technical writer
	___	broad range of writing experiences
	___	ability to paraphrase
5	___	ability to maintain consistency
	___	tolerance for individual differences in correct grammar and syntax
44	___	ability to not take oneself too seriously
	___	ability to follow project through from draft to publication with author.
46	___	management skill

Question 3.

In Round 2 we asked you the following question. "What percentage of the time do you receive documents in hard copy (typed on paper as opposed to online)". We really wanted to get at how you work with the document during editing. Therefore, we are rewording the question as follows.

What percentage of the time do you receive documents only in hardcopy form -- no computer version is available.

0 10 20 30 40 50 60 70 80 90 100

Question 4

In Round 2 we asked you to tell us the most difficult and time consuming tasks involved in editing. What follows is the list we compiled from your answers. We would like you to provide four responses for each item.

a) Rate each item for the amount of time you spend looking for and correcting the type of problem.

1	2	3	4	5
one of the most time consuming		a typical task		spend little or no time

b) Rate each item in terms of the difficulty in correcting the error once identified.

1	2	3	4	5
one of the most difficult to correct		somewhat difficult		simple to correct

c) Rate each item in terms of how helpful it would be to have a tool that would identify or locate that type of a problem.

1	2	3	4	5
extremely useful		may be useful		would not be useful

d) Out of the entire list identify the five problems that you consider to be the biggest problems. Put a 1 in the left hand column for the biggest problem, a 2 for the next biggest, and so forth to 5.

Editing Task	(a) Time searching	(b) effort to correct	(c) value of computer	(d) five most important
Grammar and mechanics	---	---	---	---
Accuracy of references				
Consistency in Tense				
Punctuation				
Parallelism in Thought				
Parallelism in Lists				
Subject-verb agreement				
Vague pronoun and adverb referents				
Vague referents of terms (other than pronoun/adverb)				
Consistency of spelling (words and acronyms)				
Dangling constructions				
Spelling out acronyms the first time				
Use of "that" and "which"				

Question 3 contd.

Editing Task	(a) Time searching	(b) effort to correct	(c) value of computer	(d) five most important
Passive voice				
Proofreading for words spell checker won't catch (.e.,g from-form, there-their)				
Ambiguous constructions				
Jargon				
Accuracy of text and graphics				
Graphic accurately reflects what text describes (in detail).				
Deviation of art from most recent source data (engineering, architect, computer screen, etc.)				
Deviation of text from most recent source data				
Paste-up (accuracy of placement)				
Caption/art agreement with text wording				
Inconsistent or vague use of unit abbreviations				
Consistency in numbering of tables and art				
Compiling symbol list				
Accuracy of math formulas				
Accuracy of mathematical calculations				
Consistency in naming objects and processes				
Maintaining proportionality of elements across art work.				
Coherence and organization of the chapter or whole document				
Lack of focus				
Too many main points				
Failure to build to conclusion (begin with conclusion)				
Verifying adequacy of the hierarchical organization headings/subheadings)				
Quality of index				
Overall coherence and logical organization of text				
Coherence and logical organization of the outline				
Consistency of text with the outline				

Question 3 contd.

Editing Task	(a) Time searching	(b) effort to correct	(c) value of computer	(d) five most important
Transition between topics				
Ensuring a task/user orientation				
Lack of coherence within paragraphs				
Comprehensibility and Readability				
Ensuring that headings are task oriented				
Text taken from other sources -- changing style to make it consistent with rest of text.				
Completeness of the expression (writer assumes too much knowledge on part of reader)				
Meeting readability grade level specs for plain English				
Long sentences				
Rewording sentences to improve clarity				
Cohesion between sentences				
Ensuring that voice of text addresses the reader				
Use of active and passive voice				
Correcting errors that result from use of a text analyzer, e.g., RightWriter, Grammatik, ETC				
Noun strings				
Determining what information is unnecessary and can be deleted.				
Correcting lifeless/boring prose				
Changing inactive and hidden verbs to active verbs				

Question 5.
Have you been an editor for hypertext (computer based, nonlinear) materials.

Yes_____ N0_____

If yes, what is the major difference in editing these kinds of materials and what impact does that have on your editing strategy?

_____

Question 6.
Do you edit for editors not in your physical location?

Yes_____ No_____

If yes, what strategy do you find works best for maintaining a good editor-writer relationship?

_____

Question 7.
Are you familiar with ""closure" as a specific goal or task of editing?

Yes_____ No_____

If yes, do you use it and how central is it to your editing?

Question 8.
May we list your companies name as a participant in this study. It will only be mentioned as part of a list -- there will be no linkage to any of the findings.

Yes_____ No_____

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