

SUMMARY

- ◆ Presents results of a sample survey on why, how, and to what extent technical communicators use computers to edit
- ◆ Suggests that electronic editing is becoming a common editing mode

Electronic Editing in Technical Communication: A Survey of Practices and Attitudes

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INTRODUCTION: THE REAPPRAISAL OF PAPER

Two decades ago, naive conceptions of computer technology spawned predictions that digital tools and procedures would drastically reduce the need for paper. Exactly the opposite has happened. The consumption of paper for printing workplace documents has risen consistently despite the conversion of most knowledge work from paper-based to digital technologies. Only now are we beginning to understand why.

In *The myth of the paperless office*, Abigail Sellen and Richard Harper draw together what they learned from years of empirical research into the ways that knowledge workers use paper in their daily routines. The following passage sums up Sellen and Harper's balanced appreciation of paper-based and digital procedures as a result of their research.

... people tend to turn to the computer when they need flexible tools for a writing task and turn to paper when they need flexible support for a reading task. Very often, they use both together when doing combined reading and writing tasks. People at some level recognize the affordances of the resources they have to hand and choose the best tools for the particular jobs they need to do. As a result, paper-based tools tend to find their place within some kinds of tasks and not within others. Similarly, certain kinds of digital tools find their own niche for certain kinds of tasks and not others. (p. 202)

What Sellen and Harper found to be true for a wide variety of knowledge workers, I discovered to be true for technical communicators when they edit others. My research, funded by a grant from the STC, culminated in a

doctoral dissertation at Texas Tech University (www.spsu.edu/htc/dayton/dissertation). In this, the first of three articles condensing the results of that work, I summarize the findings of a sample survey of STC members administered in 1999. In a follow-up article, I will report what I learned by examining electronic editing (e-editing) practices and attitudes in specific workplace contexts. In the culminating article, I will discuss my findings within the framework of a multidisciplinary theory developed to explain the extreme variability in technology adoption and diffusion.

These are the most important findings from the survey results:

- ◆ Editing has become a de-specialized, distributed function in most technical communication workplaces. About three quarters of the survey's 580 respondents indicated that editing others was an important, though not necessarily primary, job function. Only 4% identified themselves as working in jobs dedicated exclusively to editing others.
- ◆ The 444 respondents who edited others were about evenly divided between those who used hard-copy markup alone as their primary editing method and those who keyboarded changes and annotations directly into computer files.
- ◆ Most editing respondents used both hard-copy and electronic editing, alternately or together. About two-thirds used some form of electronic procedures at least occasionally, and most of these used hard copy

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to mark up or to proofread as part of their usual electronic-editing process.

- ◆ Peer-editing writers had the highest proportion of hard-copy loyalists, whereas writer-editors had the highest proportion using electronic methods as their primary edit mode. The small group identifying themselves as doing only editing were about evenly split in their choice of primary edit mode. However, this small group of editing specialists showed the highest percentage of all the job role groups in the two highest e-editing frequency categories (often and very frequently). Peer-editing writers, on the other hand, had the lowest percentages, by far, in those e-editing frequency categories.
- ◆ Predictably, the two variables showing the strongest association with primary edit mode were the usual method of receiving documents to be edited and physical distance from the person being edited. Those in the e-editing group were much more likely to be working remotely from those they edited and to receive documents only electronically. Other clearly influential factors associated with primary edit mode and e-editing frequency were a respondent's attitudes toward electronic editing and the degree to which his or her job role emphasized editing.
- ◆ I found no statistically significant association between primary edit mode (whether electronic or paper based) and these variables: gender, age group, type of industry, type of document, and type of editing. Frequently editing online documents had a statistically significant but weak positive association with electronic editing.
- ◆ The most used electronic method reported by editing respondents was automatic change-tracking (11%). Almost as many indicated that their usual method involved a hard-copy markup along with changes to an electronic file (10%). Next in popularity were two methods that do not track edits with the rigor required by the traditional editor-author relationship in technical communication: editing a file without tracking or reporting changes (8%) and providing only a summary of changes (8%).
- ◆ About one in six survey respondents reported that they had been diagnosed at some time with a repetitive strain injury associated with computer use. About one in three had suffered upper-extremity pain to such an extent that they had taken time off from work or consulted a health professional. Statistical analysis showed a significant association between most of the more editing-focused job roles and reports of serious eye strain.

BACKGROUND AND JUSTIFICATION

Between 1984 and 1996, a dozen substantive articles and books by technical communication practitioners and scholars discussed the benefits and drawbacks of using the computer to edit (see Table 1). This literature often depicted technical editors as lagging behind in adopting electronic methods because many editors believed that computer tools were not well suited to editing tasks. Most technical editors seemed to believe that editing soft copy did not allow interaction with texts and authors to occur with the same speed, efficiency, and accountability as paper-based markup.

In a detailed analytical review of this literature, I have questioned the widespread assumption that technology improvements would soon make the computer as widely used a tool for editing as it is for writing (Dayton 1998). Adopting the analytical perspective elaborated by Christina Haas (1996), I have argued that many editors might well perceive the interactive responsiveness and tangibility of hard-copy editing to possess inherent advantages over reading and interacting with screen-based text.

Carolyn Rude and Elizabeth Smith (1992) conducted an extensive survey in 1990 of electronic editing practices among STC members self-identified as editors. They found that about three out of five used the computer for at least some editing tasks, but a mere 15% performed "the full range of editorial tasks" on the computer, "and even those editors frequently use hard copy for initial review and for copyediting" (Rude and Smith 1992, p. 341). Editors in Rude and Smith's survey perceived several important drawbacks to editing on screen: the lack of adequate options for marking errors and querying authors, the restricted view of the document, the difficulty of catching errors, and difficulty in navigating quickly and efficiently within long documents.

In the years immediately following Rude and Smith's survey, the software and hardware for writing and editing improved, organizations connected information workers through computer networks, and the advent of the World Wide Web greatly increased the online publication of technical information. In light of those developments, it was generally assumed that technical communicators would adopt electronic procedures to edit others in far greater numbers than they had before. My research gathered extensive evidence to test that assumption.

DEFINING ELECTRONIC EDITING

When I began to investigate how technical communicators use computers to edit others in 1998, I called the object of my study "online editing." Because that term is sometimes taken to mean editing documents designed for online delivery, I switched to using the term "electronic editing."

The most common notion of electronic editing pictures a process that combines on-screen reading with soft-copy

TABLE 1: TECHNICAL COMMUNICATION LITERATURE REPORTING RESEARCH AND VIEWS ON ELECTRONIC EDITING, 1984-1996

Year	Author(s)	Summary
1984	Jean Lutz	Compared revising/editing using a word processor with pen-and-paper methods. Subjects disliked editing another's text on a word processor when they could use only on-screen copy. Subjects made more higher-order changes when using pen and paper.
1986	Charles Fenno	Informal survey of technical editors found a "misfit between the editor's task and the editor's [computer] tools" (p. 148). Editors complained that they lacked a convenient way to perform on-screen markup and annotation.
1987	Charles Velte	Argued that editorial ethics required technical editors to resist electronic editing implemented as "silent editing" of soft copy. Conceded that e-editing could be acceptable if on-screen markup and annotation tools could preserve author's "ownership."
1987	David Farkas	Highlighted three problems with e-editing: <ol style="list-style-type: none"> 1. Ergonomic problems 2. Visualization and navigation problems 3. Lack of a suitable form of electronic markup and annotation
1988	Shirley Ackerman and William Turechek	Described in-house software at IBM that enabled editors to enter and mark provisional changes in soft copy, which authors could later review one by one and accept or reject. The tool also let editors embed comments that could be read on screen.
1991	Eric Stroo	Compared paper editing with revision-marking tool in Microsoft Word version 5.5 (equivalent to Word for Windows 1.1). Made a strong case for the advantages of using computers to edit but also discussed a number of drawbacks.
1992	Carolyn D. Rude and Elizabeth Smith	Surveyed 94 technical editors and found that 63% used computers to edit documents by others, but only a small minority of these used on-screen markup, and two-thirds still depended on hard copy, especially for long documents and substantive editing. "Only 15% of editors use computers for the full range of editorial tasks, and even those editors frequently use hard copy for initial review and for copyediting" (p. 341).
1995	Thomas Duffy	Surveyed 27 expert technical editors and found that most of the time they worked only with hard copy, though four out of five expressed positive attitudes toward using computers to edit. Most believed that better e-editing tools were needed.
1996	Brown and others	Related editors' accounts of how their publications groups switched from mainly print to mainly online manuals, highlighting their discovery that hard copy was easier to work with than on-screen text for both the initial editing pass and the second editing pass. During the final stage, they did conduct quality assurance checks of the e-books online.

TABLE 1: Continued

Year	Author(s)	Summary
1996	Carolyn Rude	Reported results of an informal online survey, finding evidence that the use of computers to edit had become more widespread than in 1990 but that hard copy was still essential to most technical editors' work routines.
1996	David Farkas and Steven Poltrock	Argued that e-editing would become widely adopted by technical communicators because of advantages in turn-around, version control, document archiving, systems integration, and productivity. Emphasized improvements in hardware and software that would obviate problems most often cited by editors as reasons for preferring hard-copy editing. Reviewed three markup models for electronic editing tools and advocated development of a fourth—the implementation in electronic form of the traditional system of copyediting symbols.
1996	Christina Haas	Analysis of interview-based, observational, and quasi-experimental studies suggested that problems with electronic editing were not amenable to a technical fix. Theorized that such problems stemmed from inherent differences in the materiality one experiences when working with pen and paper versus working with a text-editing program on a computer.

markup. I began my study with that definition of electronic editing, assuming a clear distinction between editing hard copy and editing soft copy. I quickly discovered, however, that the practice of many technical communicators is somewhere between those apparent opposites. A sizable percentage regularly use a hard-copy markup of another's text to record edits they then make to the corresponding electronic file. Many others make changes to the soft copy on the fly, without precise and detailed change tracking.

For the purposes of my study, I decided to define electronic editing as any method of suggesting, showing, or making changes to an electronic copy of a text authored by someone else. This definition includes, at the one extreme of a continuum, editing an electronic text without any record of the changes, and at the other extreme, rigorously recording every change made to soft copy on a paper copy of the document. By this definition, then, electronic editing always includes on-screen editing, but it may or may not include tracking the edits, and if a change-tracking or change-summarizing method is used, it can be mediated either by hard copy or by computer file.

RESEARCH QUESTIONS

I designed my survey to provide data that would shed light on the following research questions.

- ◆ How much of the editing done by technical communicators is done electronically?
- ◆ What electronic editing methods and tools are tech-

nical communicators using most frequently?

- ◆ To what extent do technical communicators blend hard-copy and electronic editing procedures, and why do they report doing this?
- ◆ How do technical communicators' attitudes toward electronic editing compare with their attitudes toward traditional hard-copy editing?
- ◆ What work-situation and personal factors promote or constrain the use of electronic editing in technical communication?
- ◆ Does using a computer to edit contribute to health problems associated with ergonomic stress and repetitive motion strain?
- ◆ How does using a computer to edit affect the role of technical editors in technical communication workplaces and the value that organizations place on their work?

THE SURVEY METHODOLOGY

I worked on designing and testing the survey for over a year (for details, refer to chapters 3, 6, and 7 of my dissertation). In April and May 1999, I sent the final version of the survey to a random sample of STC members self-identified as belonging in the writer-editor category. Using a method for mixed-mode surveys suggested by Schaeffer and Dillman (1998), I e-mailed both plain text and HTML versions of the questionnaire form to 661 STC members and used regular mail to deliver a paper version to 328 others.

Seven survey forms were returned as undeliverable, leaving a total sample of 982.

I received 436 completed questionnaires from the electronic group, for a response rate of 66% in that mode. I received 134 completed postal surveys; in addition, 10 people receiving the postal survey opted to fill out the questionnaire on the World Wide Web. The response rate for the postal survey, then, was 45%, based on a total of 144 returned survey forms out of 321 potential respondents. The final combined response rate for the survey was 59% (580 completed forms out of 982 potential respondents). A response rate of nearly six out of ten is generally considered sufficiently high to give us confidence that the data can be generalized to the population from which the random sample was drawn. In this case, the sample represented the writer-editor category of the STC membership in 1999.

Analysis of survey mode effects

The 580 respondents all completed the same questionnaire, but in one of three different forms. A little over half completed an HTML form (53%), whereas about one in four filled out the questionnaire as a plain-text e-mail message (24%). The remaining respondents (23%) filled out an eight-page paper booklet. These different modes of completing the survey were associated with statistically significant differences in the data for nine of 69 variables. After analyzing these variables carefully, I concluded that only the primary dependent variable that I used for inferential statistical analyses had implications for the validity of the survey results. That variable was edit mode, indicating whether a respondent most often used hard-copy markup or an electronic method when editing others.

Almost two-thirds of the editing respondents who returned the postal survey reported that hard-copy markup was their usual editing procedure (65%), whereas respondents returning the survey electronically were evenly split between the hard-copy and electronic groups. This finding substantiates my assumption that STC members for whom I did not have a valid e-mail address should not be dropped from the sampling frame because they might be less inclined to use and approve of electronic editing than members I could reach by e-mail. By including such members in the sampling frame, I strengthened the validity of the survey results. However, the response rate for the postal mode was significantly lower than that for the electronic modes (45% versus 65%). This fact suggests that the survey results slightly under-represent the proportion of STC members in 1999 who primarily used hard copy to edit the work of others.

Eight other variables produced significant measures of association with at least one of the survey modes. Some of these I had to consider anomalies because I could not see

any possible explanation for the differences. For example, compared with both the HTML and postal survey groups, the e-mail survey group had a much lower proportion who answered that they never or rarely used an online thesaurus. Conjectures regarding differences in other variables did not seem compelling and indicated no impact on the validity of the survey results. Chapter 7 of my dissertation (Dayton 2001) discusses in detail all the variables producing survey-mode effects that I concluded were inconsequential.

Statistical analysis: Software and procedures

I used the Statistical Package for the Social Sciences (SPSS) version 8.0 for Windows to analyze the survey data. My standard procedure for investigating associations between variables was to produce a cross-tabulation and examine the results of Fisher's *p* test for two-by-two tables; Pearson's chi-square test for larger, nominal by nominal tables; and, if appropriate, the Mantel-Haenszel chi-square test for ordinal by ordinal tables. If the probability values for these tests were less than or equal to 0.05, I rejected the null hypothesis and concluded that the data for the variables in question contained differences not likely to have been caused by chance.

When I concluded on the basis of statistical testing that the differences were not the result of chance, I relied on an appropriate measure of association to determine the magnitude of the statistical relationship. For nominal data in two-by-two tables, I considered the phi statistic and the odds ratio. For larger nominal-by-nominal tables, I considered the values of lambda and Cramer's *V*. For larger ordinal-by-ordinal tables, I considered Somers' *d* and gamma.

RESULTS AND DISCUSSION

This section begins by reporting the background and demographic data from my survey respondents. I then summarize the data that allowed me to categorize respondents by primary job role with regard to editing. Finally, I answer the research questions listed previously, summarizing the data relevant to each.

Demographic and background information

Table 2 summarizes the data provided by survey respondents on their education level, sex, age, and years of experience in professional/technical communication.

Although respondents worked for many different types of employers, five industries accounted for more than two-thirds of the respondents:

- ◆ Computer industry (44%)
- ◆ General business (8%)
- ◆ Telecommunications (7%)
- ◆ General manufacturing (5%)
- ◆ Banking and finance (5%)

TABLE 2: BACKGROUND AND DEMOGRAPHIC DATA

Variable	Percent (N = 580)	Variable	Percent (N = 580)
Education Level		Age Group	
< 4 years college	13	20–29	11
Bachelor's degree	58	30–39	3
Master's degree	25	40–49	28
Doctorate	4	50 years and over	23
Sex		Years Experience	
Female	64	< 5 years	18
Male	36	5–10 years	37
		11 or more	45

Almost one in ten respondents (9%) was self-employed.

I compared the demographic information from my respondents to similar data from the STC's 1999 salary survey (Society for Technical Communication 1999). Although the proportions for equivalent demographic categories were very similar, a chi-square goodness-of-fit test found the differences to be statistically significant. My survey respondents as a group were a little older and had more years of experience in technical communication. The proportion of men answering my survey was also 5% higher than the proportion of men answering the salary survey, a result not likely to have been caused by chance.

It is not possible to determine which survey was more representative of the 1999 STC membership in the writer-editor category. The STC salary survey had a lower response rate than my survey (44% versus 59%). Lacking information on the nonrespondents to both surveys, we cannot rule out the possibility that one or both were affected in a statistically significant way by nonresponse error.

Editing responsibilities across job categories

Aware that the STC membership category labeled "writer-editor" includes many writers who have little or no responsibility for editing others, I asked survey respondents to categorize themselves into carefully defined work roles related to editing. Table 3 presents the percentages of respondents who classified themselves in each of the seven job categories.

One-third of the respondents put themselves in the writer-editor category, defined as a job routinely requiring both drafting original text and serving as an editor for others. One-fourth classified themselves as writers who routinely participated in peer editing. One in ten respondents reported that they had significant editing duties as part of their managerial function. Only 4% of the respondents reported that they were working exclusively in the role of editor.

A total of 136 respondents (23%) indicated that editing others was not an important job function. These respondents skipped the two sections of the survey about editing practices and went directly to the final section of demographic and background questions. The survey results on editing practices, then, were returned by the 444 respondents who put themselves in one of five job roles with editing responsibilities: editor, writer-editor, peer-editing writer, manager/editor, and an "other" category for any other job in which editing others is an important, though not a primary, responsibility.

Extent of electronic editing

The survey asked respondents how frequently they edited others electronically. The 444 editing respondents divided on this question into three groups of similar size:

- ◆ Those who never or rarely used electronic procedures (30%)
- ◆ Those who used such procedures occasionally (32%)

TABLE 3: RESPONDENTS SELF-CLASSIFIED BY EDITING-RELATED JOB CATEGORY

Job Category	Percent (N = 580)
Writer-editor	33
Writer, peer editing	26
Manager/editor	10
Writer, no peer editing	18
Editor	4
Other: little/no editing others	6
Other: editing others important	3

◆ Those who reported e-editing others often or very frequently (38%)

Table 4 presents the distribution of percentages across the five points of the e-editing frequency scale from which respondents chose their answer.

Respondents who reported rarely or never editing others electronically marked YES or NO for each of six reasons offered to them in a follow-up question. Table 5 summarizes the results. Three out of four of these 132 respondents indicated that their personal preference for hard-copy editing at least partially explained why they did little or no electronic editing. Three out of five indicated that the kinds of documents they had to edit influenced their decision not to use electronic procedures, and almost as many reported that the writers they edited preferred hard-copy editing.

Electronic editing methods and tools

STC members were using a wide variety of electronic editing methods in 1999 (see Table 6). Using automatic change-tracking in software was the most common method (11%). Almost as many (10%) indicated that their usual method involved a hard-copy markup along with changes to an electronic file. The two e-editing methods that came next in popularity do not track edits with the rigor required by the traditional editor-author relationship in technical communication: editing a file without tracking or reporting the changes (8%) and providing only a summary of changes (8%).

About three out of four editing respondents (77%) reported that they were satisfied with the editing method they most often used. Among the dissatisfied, about one in

TABLE 4: REPORTED FREQUENCY OF E-EDITING

Frequency of e-editing	Percent (N = 444)
Never	7
Rarely	23
Occasionally	32
Often	25
Very frequently	13

six (17%) in the hard-copy group reported that they wanted to make their primary method electronic, whereas in the e-editing group, only one in 14 (7%) wanted to make hard-copy markup their main editing method.

Hard-copy still the dominant editing mode. For the sake of simplifying the snapshot of editing practices in Table 6, I sorted editing respondents into two categories, counting as electronic editing the blended hard-copy and electronic methods. In this less-cluttered picture, 54% percent of the editing respondents usually edit on hard copy, whereas 46% usually make changes to the electronic file, with or without tracking and reporting the changes. Because the 95% confidence interval for these proportions and a sample size of 444 is $\pm 6\%$, these results constitute a statistical dead heat.

Clearly, electronic editing has made significant inroads into the work routines of technical communicators. In 1999, however, it was still a long way from displacing hard-copy markup as the most-used procedure. We must keep in mind, too, that e-editing methods are diverse; there was no *standard* electronic method. And about one in five of those I counted in the group primarily using electronic editing routinely performed a hard-copy markup first. These respondents adopted e-editing as an addition to hard-copy procedures, not as a replacement.

Substantial use of macros for editing. About two-thirds of the editing respondents reported that they had used macros or custom-made software at least occasionally to automate editing tasks, and about one in five indicated that they had done this often or very frequently. About 44% reported that they had created their own macros or custom-made software for editing.

TABLE 5: REASONS FOR DOING LITTLE OR NO ELECTRONIC EDITING

Reason Indicated by Fixed-Choice Answer	Percent (N = 132)
Mainly because I prefer hard-copy editing.	74
The kinds of documents/information products I edit are better edited on paper.	59
Mainly because the writers I edit prefer hard-copy editing.	54
Software/platform incompatibilities make electronic editing impractical.	16
My workplace has a policy against electronic editing.	5
Insufficient/inadequate computers available.	2

TABLE 6: METHOD MOST OFTEN USED TO SHOW/SUGGEST EDITS

Method	Percent (N = 444)
Hard-copy markup	54
E-edit using automatic change-tracking	11
E-edit along with hard-copy markup	10
E-edit with summary of changes	8
E-edit with no tracking	8
E-edit with manual change marking	3
E-edit using miscellaneous other methods	4
E-edit using only change bars	2
Other: both or combined elec/hc methods	1
E-edit with doc compare program	0.2

Electronic tools for non-markup editing tasks. The survey asked respondents how frequently they used the following software tools: spelling checker, grammar checker, online dictionary, online thesaurus, and online style guide. Almost 9 out of 10 of the editing respondents said they used the spelling checker often or very fre-

quently. The online thesaurus was the next most popular tool. A little over half of the editing respondents used an online thesaurus at least occasionally. The proportions for the grammar checker, online dictionary, and online style guide were 44%, 41%, and 35%, respectively. The least used tool was the readability analyzer, with only 15% reporting they used it at least occasionally, whereas two-thirds said they never used it.

Software applications used by all respondents. The word processor was far and away the most frequently used document production tool by the survey's editing respondents. Three out of four reported using it very frequently, and another 20% at least occasionally. Document composition programs such as FrameMaker and PageMaker were the second most frequently used tool in this category, with 42% reporting very frequent use, and 31% often or occasionally. An equal proportion used Adobe Acrobat's suite of tools at least occasionally, but a substantially smaller proportion (24%) used it very frequently.

Editing respondents used plain text editors a little more often than HTML authoring programs—51% and 47%, respectively, indicating that they used these programs at least occasionally. Help-authoring software was the least frequently used document production tool among editing respondents, with only about a third reporting at least occasional use, and 43% answering "never."

Editing associated with use of larger monitors. The survey asked about only one hardware tool for editing: the size of monitor most often used. Four out of five of all respondents used a monitor that was 17 inches or larger. The proportion of editing respondents reporting use of a larger monitor was about 6% greater than the proportion of

TABLE 7: RESPONDENTS' REASONS FOR USING HARD COPY WITH E-EDITING PROCESS

	Percent (N = 310)
Hard copy used along with electronic editing to . . .	
Check elements that I find difficult to edit efficiently on-screen, such as complex graphics, tables of numbers, etc.	84
Give long and/or complex documents an initial reading.	81
Perform the final pre-publication edit.	75
Check formatting details.	68
Catch errors I know I will miss when editing or proofing on-screen text.	67
Mark up hard copy to initiate and guide electronic editing.	53
Mark up hard copy to show changes in e-copy.	29

nonediting respondents (about 79% to 73%), a statistically significant difference.

Blending hard-copy with electronic editing

Technical communicators who edit electronically usually blend the use of hard copy into their e-editing procedures (see Table 7). Four out of five respondents who reported editing electronically at least occasionally indicated that they used hard copy when editing elements difficult to read on screen. Nearly as many said they used hard copy to give lengthy or complex documents an initial reading before editing them on screen. A supermajority ranging from two-thirds to three-fourths also reported using hard copy to check formatting details, perform final prepublication edits, and catch errors missed by on-screen proofing.

Respondents mentioned a wide variety of advantages of hard copy for editing specific types of material or for assisting in the e-editing process in specific ways. They also mentioned ergonomic advantages, usually the ease of reading printed documents compared with reading online; quite a few said they used hard copy when they wanted a break from on-screen work. Some comments asserted that hard copy gives easier global access to documents; others maintained that it was always necessary to give electronically edited documents a final hard-copy check. Finally, a few respondents noted that they needed to use hard copy as part of their e-editing process for accountability and policy reasons or to ensure top quality.

Attitudes toward electronic and hard-copy editing

The survey's respondents regarded hard-copy editing somewhat more favorably than they did electronic editing (see Table 8).

- ◆ Almost three out of four editing respondents agreed that they preferred to interact with hard copy when editing the work of others.
- ◆ Almost half agreed that hard-copy markup was superior to electronic methods for showing or suggesting changes to authors.
- ◆ A little more than half agreed that e-editing brings with it more physically stressful work routines and health problems related to computer use.
- ◆ The percentages of respondents disagreeing with the three positions listed above were much smaller.

For all five items in Table 8, the results of Pearson's chi-square test were very highly significant ($p \leq 0.001$), and the results of Cramer's V test indicated a weak to moderate association between the attitude variables and edit-mode group. The pattern that clearly emerges from the data in Table 8 is that the electronic-editing group was not nearly as supportive of their primary edit mode as the hard-copy group.

The electronic-editing group's lukewarm support for their primary edit mode also manifested itself when respondents indicated the edit mode they deemed to be inherently better suited for particular types of editing (see Table 9). The edit-mode groups generally agreed on which mode was better for four types of editing: hard-copy markup for substantive, equa-

TABLE 8: EDIT-MODE GROUPS' ATTITUDES TOWARD HARD-COPY AND E-EDITING*

Gist of Statement	Hard-Copy Editing Group			Electronic-Editing Group		
	Agree	Disagree	Neutral	Agree	Disagree	Neutral
I prefer to interact with hard copy.	87	6	7	55	26	19
E-edited docs are as good as hard copy.	13	52	35	44	29	27
E-edit has stress/health downside.	63	13	24	45	29	26
Hard-copy editing is behind the times.	9	64	26	32	39	29
Hard-copy markup is superior to e-markup.	53	16	31	37	40	23

* The five-point Likert scale response used in the survey has been reduced to three points; "strongly agree" and "agree" responses are grouped, as are "strongly disagree" and "disagree." Percentages do not sum to 100% across some rows because of rounding.

tions, and final editing; and electronic for mechanical editing. On the other four types of editing, the responses of the two groups were roughly inverse.

Work-situation and personal factors associated with e-editing

The survey gathered data about work-situation and personal factors that might influence a technical communicator's use of electronic editing. Here I provide a summary of my conclusions regarding these factors.

I expected that the physical distance between editing respondents and those they most often edited would be strongly associated with use of electronic editing as a primary edit mode and with e-editing frequency. The association of these variables proved to be very highly significant, but the measures of association were only moderately strong. Three-fourths of the hard-copy group but only a little over half of the electronic editing group worked in the same general area as those they edited. Although about one-third of the electronic editing group worked at a distance from those they usually edited, in the hard-copy group only about one in ten reported that situation.

The survey also confirmed the obviously predictable association between edit mode and method of receiving documents. Almost two-thirds (64%) of the hard-copy editing respondents said they usually received documents to edit both as hard copy and as electronic files, less than half as many (29%) received only hard copy, and about 7%

received only electronic files. For electronic editing respondents, the proportions were almost exactly inverse to the results for the hard-copy group.

Attitudes about electronic editing versus hard-copy markup were also among the few variables significantly associated with edit mode and frequency of electronic editing. When cross-tabulated with primary edit mode, 10 of 13 survey items designed to measure attitudes toward hard-copy versus e-diting produced significant *p* values, though the measures of association were only weak to moderate.

Respondents' job-role category produced a significant association with usual edit mode. Hard-copy markup was the usual edit mode for a majority of all the groups except the writer-editors, a solid majority of whom (57%) reported that they most often used electronic methods to edit others. A little over half the editors were in the hard-copy edit mode, compared with two-thirds of the peer-editing writers. In general, the job-role groups presumed to do the most editing were more likely than the others to use electronic editing.

The connection between electronic editing and editing online documents was not as clear cut and strong as I had expected. The proportions in the electronic and hard-copy groups indicating that they edited online documents were nearly equal, 75% and 73%, respectively. On the other hand, those who edited online documents most frequently were most likely to belong to the electronic-editing group.

TABLE 9: EDIT-MODE GROUPS' OPINIONS ABOUT EDIT-MODE SUPERIORITY FOR EIGHT TYPES OF EDITING

Type of Editing	Hard-copy Editing Group			Electronic Editing Group		
	% hc	% ee	% neutral	% hc	% ee	% neutral
Substantive [◆]	80	10	10	58	26	16
Mechanical [◆]	37	43	20	19	64	16
Language [◆]	61	16	23	25	42	33
Format ^{◆◆}	45	40	15	32	54	14
Graphics ^{◆◆◆}	50	28	22	37	42	21
Tabular numerical data	40	33	27	33	43	24
Equations	36	27	37	37	25	37
Final pre-publication	73	11	16	64	22	14

◆ Percentages do not sum to 100% across some rows because of rounding.

◆ Pearson's chi-square statistic was very highly significant ($P \leq .001$) and Cramer's V indicated a moderate association.

◆◆ Pearson's chi-square statistic was highly significant ($P \leq .01$) and Cramer's V indicated a weak association.

◆◆◆ Pearson's chi-square statistic was significant ($P \leq .05$) and Cramer's V indicated a weak association.

Of those editing online documents less than 25% of the time, 61% were in the hard-copy group; of those editing online documents 75% or more of the time, 62% were in the electronic-editing group.

Although statistically significant, the association between edit-mode group and frequency of editing online documents was only weakly positive. Statistical tests showed a slightly stronger association between electronic editing frequency and the frequency of editing online documents, at a higher level of significance.

I found a statistically significant though weak association between years of experience and frequency of e-editing. A little over half the respondents with 20-plus years of experience (53%) edited electronically often or very frequently, whereas only about a third in the other years-of-experience groups put themselves into that category (35%). Based on these figures, we might expect that the most senior respondents in terms of age would have a higher than average proportion in the e-editing group and in the highest e-editing frequency groups. That proved to be true, but the differences did not reach statistical significance.

I also found a statistically significant but weak association between increasing frequency of e-editing and rising level of educational attainment, especially for respondents

with a master's or PhD.

In face-to-face conversations or electronic correspondence, a number of technical communicators had told me that they felt more secure or comfortable editing certain types of documents on paper: documents that were quite long or that had a lot of tabular numerical data, many technical graphics, and equations. My survey tested the hypothesis that editing these types of documents was associated with hard-copy editing. A slightly higher proportion of the hard-copy group indicated that they edited the first three types of documents frequently, whereas a slightly higher proportion of the e-editing group indicated that they edited the fourth type (many equations) frequently. The differences between the edit-mode groups were not significant, however, for any of the document-type variables.

The type of organization for which respondents were working at the time of the survey was not associated with edit-mode group or e-editing frequency. I was particularly interested to know whether respondents working in the computer industry were significantly more likely to use electronic editing; this was not the case.

Sex was the demographic variable producing the least difference in proportions of respondents in the edit-mode groups: 47% of the women and 46% of the men were in the

TABLE 10: RESPONDENTS REPORTING COMPUTER-RELATED HEALTH PROBLEMS

Health Problem	Percent Yes (N = 580)
Repetitive stress injury diagnosis	17
Persistent fatigue	18
Headaches	22
Eye strain	26
Arm, elbow, wrist, and/or hand pain	36
Neck and/or back pain	40

e-editing group. Similarly, 38% of the women and 37% of the men were in the two highest e-editing frequency groups.

Health problems related to heavy computer use

The survey solicited information about health problems often associated with heavy computer use in the workplace. The data reveals that many respondents experienced these health problems and associated them with heavy computer use (see Table 10). Statistical analyses showed that female respondents suffered these problems in significantly greater proportions than men—or were more willing to report that they had experienced them.

Age and years of experience were also factors affecting the likelihood that respondents would suffer some of these health problems. Of the six health problems, only eye strain and headaches were *not* significantly associated with age.

I found no significant statistical relationship between job role and the health problems, except for eye strain. The percentage of editors reporting serious eye strain was more than double the percentage for all respondents (57% versus 26%). Two other editing groups had the next highest percentages of eye-strain sufferers: the “other” category for which editing was important (42%) and writer-editors (30%). Only about one in five of the peer-editing writers, nonediting writers, and the “other” category for which editing was not important reported serious eye strain. Manager-editors had the lowest percentage reporting eye strain, 18%. The Pearson chi-square statistic for this data indicated the differences to be very highly significant. The strength of the association was weak, however.

Although we would probably expect that respondents with larger monitors would report less eye strain, the sur-

vey showed just the opposite trend. The larger the monitor most often used, the more likely it was that a respondent reported having experienced serious eye strain. One obvious explanation is that monitor size and amount of editing might be correlated; thus, monitor size might be an intervening variable in the relationship between editing and eye strain. Results of statistical testing suggested that this might be the case for the small group of editors.

Another possible explanation is that, for a large number of those reporting eye strain, the problem may have been one they had resolved by obtaining a larger monitor. The survey did not ask respondents whether eye strain was a problem in their current work situation, only whether they had ever experienced it to such a degree that they had missed work or consulted a health professional.

E-editing and the role of the technical editor

The survey asked respondents to categorize the job they held by picking one of seven fixed-choice answers: editor, writer-editor, manager/editor, peer-editing writer, nonediting writer, and two “other” categories—one designated as doing little or no editing, and the other defined to include editing as an important though not primary job function. Each job category was precisely defined. I also asked respondents to supply their job titles.

About one in four of the 353 STC members who completed Rude and Smith’s self-administered questionnaire in 1990 (Rude and Smith 1992, p. 335) identified themselves as editors (94 or 26.6%). In my survey, only about 6% (33) listed job titles in which the word *editor* appeared as the sole noun (technical editor, senior production editor, etc.). Only 4%, or 23 of the 580 respondents, classified themselves as editors (see Table 3). Although it seems surprising, that low proportion of editors is consistent with a 1995 trends survey by the STC that found that only 6% of members identified themselves as editors (cited by Rew 1999, p. xxi).

Differences between my survey and Rude and Smith’s warrant caution in comparing results, even on variables that appear to be equivalent. Still, I am confident that the trend indicated by the difference in these proportions—27% editors in 1990 versus 4% in 1999—accurately reflects something that has happened in technical communication during the 1990s. During that decade, STC’s membership in the writer-editor category more than tripled, growing from “approximately 6,000” (Rude and Smith 1992, p. 335) to a little over 18,000. Much—if not most—of that phenomenal growth came from computer-related businesses.

Let us suppose that factors associated with the typical priorities of struggling high-tech companies have made dedicated technical editors a smaller proportion of STC members than they were 10 years ago. These same priorities would likely encourage more use of peer-editing by

writers and the creation of more jobs in which technical communicators find that both writing and editing others are functions of nearly equal importance. Results from my survey are consistent with this line of conjecture.

Only 8% of Rude and Smith's respondents in 1990 indicated that they did both writing and editing. In my survey, a third of the respondents put themselves into the writer-editor category, more than into any other, and fully one-fourth classified themselves as writers who regularly participated in peer editing.

In sum, the data from my survey suggests that the technical editor became a much rarer specialist function during the 1990s. My speculation that the cause is likely found in the priorities of entrepreneurial high-tech companies and not in the use of the computer to edit merits further study. I think it is also possible that network computing and not the computer itself may have contributed to the decline in the number of jobs in technical communication for those who "just edit." Network-centric work processes may have done so indirectly by encouraging nonhierarchical collaboration and, with it, collective ownership of information products under development.

Recall that about one in six of my editing respondents reported that they provided authors with only a summary of changes or did not track changes at all.

CONCLUSION

The survey results summarized in this article provide a vivid snapshot of electronic editing practices and attitudes in technical communication. The picture, obviously, is time-stamped. The practices and attitudes revealed by the survey have undergone some change since 1999—but not, I would argue, as much as many might suppose.

Undoubtedly, the diffusion of electronic editing in technical communication is continuing, driven by the increasing use of telecommuting, dispersed work teams, single-sourcing, Web-based documentation, and ever-compressed product development cycles. Nevertheless, I believe that the widely perceived advantages of interacting with printed, material texts have kept most technical communicators dependent on hard copy when they edit others. The survey results clearly demonstrate that technical communicators have this in common with knowledge workers from many occupations and professions: pragmatism in balancing computer use with the use of printed documents (see Sellen and Harper 2002).

The reports I found in the technical communication literature depicting editors as resistant to using the computer are passé. The very small group of editors in my survey, who were probably doing more editing in terms of their total time at work than any other group of respondents, was about evenly split between hard-copy and e-editing users. However, they had the highest proportions of all the job-role groups in the two highest e-editing

frequency categories.

The writer-editors, who probably did the most editing after the editors, were the only job-role group with a solid majority (57%) indicating that their usual editing method was electronic. They also had a slim majority in the two highest e-editing frequency categories.

Among the peer-editing writers, on the other hand, the hard-copy group outnumbered the e-editing group by two to one. And on the questions measuring attitudes toward hard-copy and e-editing, the peer-editing writers and non-editing writers by far expressed the strongest loyalty to hard copy.

Because editing is more central to what they do, I think that editors and writer-editors are more likely than peer-editing writers to perceive significant advantages to on-screen editing: increased productivity, decreased drudgery, and increased status and job satisfaction.

Most writers who edit their peers likely regard editing as a decidedly secondary function. This attitude would make them more likely to treat editing chores as a chance to take a break from their main work routine at the computer. Editors and writer-editors, on the other hand, would be more likely to conclude that the potential advantages of on-screen editing more than compensate for the drawbacks often associated with it: the loss of work-whenever convenience, eye strain, uncertainty about error detection, and sometimes markup methods that may be less effective and more error prone than hard-copy markup.

The pros and cons of electronic editing compose a complex dialectic, which I investigated through open-ended survey questions and interviews conducted electronically and face to face. In the next article in this series, I will describe and analyze how that dialectic played out in five different technical communication workplaces. That localized, qualitative description of electronic editing practices and attitudes will complement the quantitative, field-level view presented here. To understand technical communicators' diverse opinions about and implementations of electronic editing requires an examination of attitudes and practices in situ, observing the interplay of the personal, the social, and the technological within specific organizational contexts. **TC**

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