Response Effects in the Electronic Survey

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IN ALL SCIENTIFIC ENDEAVOR the available tools affect the questions one can ask and the data one can collect. In this report, we examine a new tool in survey research, the electronic or computer-mediated survey. In the last two decades, electronic computers have come to figure in many phases of survey research—instrument design, sampling, monitoring of work in the field, coding and editing, data entry, data cleaning, scale and index construction, data base organization, data base retrieval, statistical analysis, documentation, and report writing (Kar-

Abstract This report examines the electronic survey as a research tool. In an electronic survey, respondents use a text processing program to self-administer a computer-based questionnaire. As more people have access to computers, electronic surveys may become widespread. The electronic survey can reduce processing costs because it automates the transformation of raw data into computer-readable form. It can combine advantages of interviews (e.g., prompts, complex branching) with those of paper mail surveys (e.g., standardization, anonymity). An important issue is how the electronic survey affects the responses of people who use it. We conducted an experimental sample survey on health attitudes, behaviors, and personal traits using two forms of administration: electronic and paper mail. Closed-end responses in the electronic survey were less socially desirable and tended to be more extreme than were responses in the paper survey. Open-ended responses that could be edited by respondents were relatively long and disclosing. These findings are consistent with other research on computer-mediated communication, raising general issues about using computers to collect self-report data.

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weit and Meyers, 1983:379–414). Still, the full application of computers to survey research is limited by the fact that raw survey data are collected off-line. The technology in common use that most closely approximates the electronic survey is computer-assisted telephone interviewing (CATI). In CATI, the interviewer types oral responses directly into the computer, which improves the efficiency of data collection over oral-response-to-paper-to-computer methods. However, in CATI, a person (the interviewer-recorder) stands between the respondent's behavior and the data that are analyzed. By contrast, in an electronic survey respondents at computer terminals or microcomputers enter their own data directly into the computer.

The sampling frame of the electronic survey is restricted to members of organizations and populations who have access to computers and to people who feel comfortable using them. Until such time as computers and networks spread throughout society, the electronic survey will probably be infeasible for general surveys. More limited applications, however, are increasingly appropriate. Greist and Klein and their colleagues have used free-standing microcomputers to collect diagnostic information directly from psychiatric patients (e.g., Greist et al., 1973). Researchers could use free-standing or portable computers in shopping centers and convention centers to carry out market studies, in military bases and firms to carry out personnel research, and in schools and government agencies to carry out program evaluations. The data collected on small computers can be transferred by telephone to any central data processing source.

When people are linked by a computer network, the electronic survey can be administered to any person having access to the network or to a connected network. Kraut (1984) used a computer network in an international corporation to conduct research on work behaviors and attitudes. Sproull (1985) used computer mail in a Fortune 500 firm to study organizational communication. Computer networks add value to the electronic survey because these systems locate respondents automatically, deliver survey instruments to remote locations (wherever respondents have access to the network), and permit respondents to answer questions at their own convenience. Computer networks also make feasible automatic event-driven surveys, for example, a consumer survey keyed automatically to particular purchases by shoppers who are using electronic catalogs.

If only because it seems to reduce research costs, the electronic survey may become widespread. Once respondents have access to a computer or to a network, relatively lower marginal costs of collecting and communicating data electronically can be substituted for the substantial costs of interviewing, telephoning, and sending questionnaires

through the mail. In addition, 20–40 percent of the total computing costs of conducting a survey may derive from transforming data collected off-line into a form which can be processed by the computer (Ferrara and Nolan, 1974:27). The electronic survey eliminates the need for a person (such as a transcriber) or a technology (such as an optical character reader) to stand between respondents and the computer that stores and analyzes their data. Some open-ended material would still have to be hand-coded, but even this task could be aided by computerized text search and text categorizing programs. Another potential advantage of the electronic survey is that the instrument can be standardized easily, as is true of a paper questionnaire. But as with the telephone or face-to-face interview, the instrument is highly flexible. It may have any style, formal or informal. It can include explanatory material, prompts, error corrections, menus, branches, and skips. Because of this flexibility, the electronic survey is potentially adaptable to many kinds of research including organizational case studies, political polls, attitude surveys, experiments, and evaluations.

Assessing Survey Utility

Apart from any economic advantages, the utility of the electronic survey will depend on its comparability to other methods of survey administration. This comparability is not obvious because the electronic survey both shares characteristics of various other methods and has some unique features of its own. One way to approach this issue is through a comparison of nonsampling errors, that is, of variations from theoretically true survey responses. After Bradburn (1983:289) and others, we will refer to these errors as "response effects."[1]

Every survey administration introduces or exacerbates response effects (DeLamater, 1982:37). These include respondents' systematically refusing to answer certain questions, or giving incomplete answers or not following instructions, underreporting socially undesirable or threatening information, overreporting socially desirable information, choosing conventional or "moderate" response categories, and "yea-saying"—agreeing with whatever the researcher asserts. Face-to-face and telephone interviews increase respondents' desire to please over self-administered paper questionnaires. Hence interviews increase the quantity of responses and detail in reports of behavior; they also increase overreporting of socially desirable attributes or attitudes (for a

[1] We use the term *response effects* because we did not compare subjective responses with objective data and therefore cannot establish the degree of nonsampling error in the strict sense of that term. We recognize that this expediency avoids deeper measurement issues surrounding the nature of true subjective information.

secondary analysis and review, see Sudman and Bradburn, 1974). Self-administered questionnaires are relatively anonymous and tend to reduce respondents' concern over presenting themselves in a good light. Hence self-administered questionnaires reduce total reporting and accuracy but increase reporting of negative information and attitudes (e.g., Kahn, 1952; Hochstim, 1967).

Because the essence of both an electronic survey and the self-administered paper questionnaire is answering questions presented via printed text, we expect responses to an electronic survey to be much like responses to a paper survey. However, like the telephone and face-to-face interview, the electronic survey is interactive. Interactive features such as prompts might increase respondents' perceived control and attention, with the result of increasing their involvement beyond that evoked by a paper questionnaire.

The electronic survey is also unique because of the degree to which it lacks social context information. All survey administration methods, because they standardize interaction, reduce social context information beyond that which we gather in most interactions in everyday life. Mail surveys reduce social context information more than telephone surveys do, telephone surveys more than face-to-face interviews. However, electronic surveys, because they lack even the social artifacts embodied in letterheads, postal rate markings, and print formats reduce social context information most of all.[2] Research suggests that reduced social context information in the electronic survey will make the research setting impersonal and anonymous, and that respondents will become self-centered, and relatively unconcerned with social norms and with the impression they give others (e.g., Short et al., 1976; Kiesler et al., 1984).

Economic considerations will probably make electronic surveys popular for some kinds of survey research. On the basis of our ideas about technologically induced shifts of attention and reduced social context information, we predict specific differences in response effects for the electronic survey in comparison with the paper mail survey. The remainder of this report presents the results of our first experiment.

Method

During the fall of 1983, we conducted an experiment to compare responses in the electronic survey with those in an equivalent paper

[2] The social quality of electronic communication is not simply a matter of narrow bandwidth. Developers of computer communication programs and text editors deliberately design these programs to maximize flexibility and freedom from the social constraints embodied in other methods of communication.

survey. On the basis of the reasoning described above, we formulated two sets of working hypotheses about relative response rates and response effects.

Absorption/attention effects:

Respondents in an electronic survey will complete more items and will complete them with fewer mistakes than will respondents in a paper survey.
Respondents in an electronic survey will give longer answers to open-ended questions than will respondents in a paper survey.
Respondents in an electronic survey will talk more about themselves than will respondents in a paper survey.

Lack of social context information effects:

Respondents in an electronic survey will less frequently choose "agree" responses and middle responses in Likert scales than will respondents in a paper survey.
Respondents in an electronic survey will admit to more socially undesirable behavior, and they will report more personal traits and feelings, than will respondents in a paper survey.

SETTING

This research was conducted at Carnegie-Mellon University, a private university enrolling 6100 students. Students and employees have wide access to computers; more than 85 percent of the students have a computing account. Every liberal arts student is required to take an introductory programming course (usually PASCAL) and many other courses make use of the computer. The most frequently used computer programs, in and out of classes, are the communication and text-editing programs run on a network of time-sharing computers (Blackwell, 1984). Hence, the experiment was conducted in a relatively computer-intensive environment, where many people use computers to communicate text.

SAMPLE SELECTION AND STUDY PROCEDURES

On the basis of a pilot study we conducted in spring 1983, we decided to sample from the population of recently active computer mail users. On each of three days and on each of eight computers, we ran a system program that lists all currently logged-in users and the name of the program they are running. (At any given time, about one in six users are running a mail program.) We also invoked a system command to

list every person who has a visible mail file, along with the date and time it was last used. From the first 300 computer mail users identified by these methods, we randomly selected 76 students and 75 faculty/staff employees. This resulted in a sample roughly proportionate to the distribution of employees and students across colleges and administrative units, with a small oversampling of employees in Computer Science, Robotics, and the Computation Center (18.7 percent versus 14.8 percent in the university as a whole).

We sent each person in the sample a letter inviting him or her to participate in a research project on electronic surveys. The invitation explained that the respondent would receive either a hard-copy or an on-line version of a questionnaire drawn from current social science projects. It also promised that respondents' data would be anonymous and would be used for statistical purposes only. Follow-up telephone calls were made to the group to ask verbal permission to proceed with the survey. Overall, 93 percent received the invitation (141/151) and 71 percent of the group that received the invitation (100/141) agreed to participate and actually returned the questionnaire.

SURVEY INSTRUMENT

The survey instrument we used was a simple 18-item self-administered questionnaire on health and personal characteristics. Fifteen of the items were closed-ended: five questions were used to group respondents by gender, organizational position, and computer use; five 7-point Likert scales on attitudes about health (e.g., "There is nothing more important than good health") were used to measure yea-saying and extreme responses; five true-false questions from the Marlowe-Crowne (1964) Need for Approval Scale were used to measure social desirability responses. Three of the items were open-ended: One asked the respondent to describe his or her most recent illness; one asked, "What are the habits and reactions of yours which bother you at present?" One asked, "What characteristics of yourself give you cause for pride and satisfaction?"

The paper survey was prepared with a high-quality laser printer. The electronic survey was a computer program which the respondent invoked at his or her terminal to display each question and prompt for answers. The program allowed respondents to retype any answer after they had finished the questionnaire, but it did not permit respondents to edit their answers as they completed the questionnaire.

When the respondent had completed the electronic questionnaire he or she returned it to a master storage directory on one computer. There, numerical identification codes were added automatically. Then the coded data (without names) were forwarded to a different computer

directory where data analyses were performed. This procedure protected the anonymity of respondents' data while also permitting us to contact respondents in the future by matching codes to mailing label information in the storage directory.

PRELIMINARY ANALYSES

Correlations among the dependent variables indicate that our primary measures were independent (r's = .01–.03). There were some group effects—females wrote longer open-ended responses, and heavier computer users gave less socially desirable answers—but group variables did not interact with survey method effects.

Results

PARTICIPATION IN THE SURVEY

More respondents returned the paper survey than returned the electronic survey (75 percent vs. 67 percent). Still, the electronic response rates compare favorably with rates of 48–61 percent in conventional mail surveys (Heberlein and Baumgartner, 1978). Furthermore, the electronic survey was returned more quickly than was the paper survey (9.6 days vs. 10.8 days).

Overall, the survey respondents consisted of 84 percent male students and 54 percent male employees, which corresponds to 70 percent male students in the university as a whole and 57 percent male (noncustodial) employees in the university as a whole. Respondents reported spending 3.7 hours computing on a "typical" weekday (which is not very different from what was reported by the pilot study sample). Male and female respondents reported an equal number of hours for computer use. Gender and time spent using the computer did not affect response rates or response times.

ITEM COMPLETION

Respondents who answered the electronic survey made fewer item completion mistakes (e.g., writing an integer in response to a true-false question) on the closed-ended items than did respondents who answered the paper survey. Of the total of 53 items where a mistake had been made in answering a question (5.3 percent of the total possible correct), none was made by elecronic survey respondents. Electronic survey respondents also left fewer items blank and refused to answer fewer questions than did paper survey respondents. Of the total of 20 missing or refused items, 8 came from electronic survey respondents. Overall, 22 percent of the paper survey respondents failed to complete

or spoiled one or more items, whereas only 10 percent failed to complete or spoiled one or more items in the electronic survey.

OPEN-ENDED ANSWERS

Total number of words, of personal pronouns, and of trait descriptions did not differ significantly between the electronic survey and the paper survey. Several respondents in the electronic survey condition sent us computer mail complaining about the absence of text editing capabilities in the electronic survey. Later in this report we describe some data relevant to editing of open-ended items.

RESPONSE SETS

We used the health attitude Likert scales to check two kinds of response set: the tendency to agree (yea-saying), and the tendency to avoid extreme answers, that is, to prefer the midpoints of scales. Since the format for each item was a 7-point scale where 1 = "agree" and 7 = "disagree," smaller mean scores indicate more yea-saying. To estimate moderation in responding, we subtracted 4 (the midpoint of the scale) from the respondent's answer; a smaller absolute difference indicates a less extreme answer. On the basis of an analysis of variance to measure the effects of survey method, position (staff or student), and item, we found no significant differences in yea-saying or extremity of response attributable to survey method.

SOCIAL DESIRABILITY EFFECTS

To measure the social desirability of responses we used items from the Need for Approval Scale (Marlowe and Crowne, 1964). Published norms suggest that most people answer in a socially desirable direction; in all cases this is a "true" response. Our data indicate that respondents who answered electronically gave less socially desirable responses than did respondents who answered on paper. Analysis of variance on the factors in Table 1 (survey method, position, and items) showed a significant main effect for survey method, $F(1,87) = 3.8$, $p < .05$, and no interactions.

EXTENSION

Four months after we completed the experimental survey, we mailed letters to the 100 respondents (using a mailing list generated from the storage directory) asking them to participate in an extension to the electronic survey study. Sixty-three people volunteered. One purpose of our follow-up was to explore the reliability of our findings by giving respondents the instrument they had not received previously. We did so with 33 of the volunteers; 20 of the (previous) electronic survey

Table 1. Percentage of Socially Desirable Responses

	Method of Administration			
	Students		*Employees*	
Item	*Paper* (n = *26*)	*Electronic* (n = *25*)	*Paper* (n = *25*)	*Electronic* (n = *24*)
I am always careful about my manner of dress.	50%	50%	52%	20%
I always try to practice what I preach.	75	67	79	72
When I don't know something I don't at all mind admitting it.	80	75	61	60
I would never think of letting someone else be punished for my wrongdoings.	90	92	87	57
I never resent being asked to return a favor.	74	63	74	59
Mean %	74%	69%	71%	54%

respondents completed the paper version, and 13 of the (previous) paper survey respondents completed the electronic version.

Although the number of respondents is small, we found differences similar to those we had observed earlier or even stronger in the predicted direction: (1) New electronic survey respondents were more cooperative than were new paper survey respondents (faster response time, more items completed, fewer mistakes in responding). (2) New electronic survey respondents were less likely to be "yea-sayers" ($F[1,24] = 4.1$, $p < .05$) and more likely to use extreme scale points than were paper survey respondents ($F[4,120] = 2.64$, $p < .05$). (3) New electronic survey respondents gave less socially desirable answers than did new paper survey respondents ($F[1,21] = 3.41$, $p < .08$).

Another purpose of our follow-up was to collect data on response effects in an open-ended instrument that could be edited freely by respondents. We sent 30 of the study extension volunteers the three open-ended items that had appeared in our experimental survey as electronic questions that could be freely edited. An example of one edited response follows:

I get excited too easily and sometimes get impatient with people and react too spontaneously when it would sometimes be better to "go with the flow." I also feel that I ought to give up alcohol, caffeine and smoking my pipe, he said as he took a puff.
There are also days when I feel that I push too hard, both myself and the people

who work for me. And I sometimes worry that I demand too much and don't encourage people enough.

Respondent-edited answers in the brief questionnaire were twice as long as were responses to the same items in the paper survey and more than three times as long as were responses in the standard electronic survey, $F(2,49) = 7.55$, $p < .01$. (The statistics reflect comparisons among all study extension volunteers.) Respondent-edited responses also were more self-centered, as measured by the number of first-person personal pronouns in relation to third-person personal pronouns, $F(2,49) = 3.52$, $p < .05$ (e.g., Davis and Brock, 1975). Finally, respondent-edited responses included more self-description, as measured by counting personal attributes and traits in the answers ($F[2,49] = 5.0$, $p < .01$). The standard electronic survey, however, elicited the most trait descriptions per words written.

Discussion

The population of interest for an electronic survey will be a community or organization with access to and familiarity with computers or computer networks. These groups will tend to be relatively well-educated, urban, white collar, and technologically sophisticated. Assuming the electronic survey is feasible with respect to this population, it seems to offer some advantages over a paper survey. The results of our experiment suggest that the electronic survey, at least one administered within an organized setting, can elicit good response rates with faster turnaround time and fewer item incompletions than a regular mail survey. Our survey was simple, but it need not have been. The electronic survey can be designed to handle any of many formats prohibited in self-administered paper surveys: open-ended questions requiring long answers, corrections, questions which screen and then branch to other questions, and questions which must be answered in certain sequences (Dillman, 1983:359, 369–370).

Our results show considerable similarity of response between the paper and electronic survey but not so much that the two may be considered interchangeable without further research. Even in our small sample we found more socially undesirable responses in the electronic survey than in the paper survey. In other research we have found that people tend to be both self-absorbed and uninhibited when they communicate using a computer (Kiesler et al., 1984). Sproull (1985) found that employees answering a questionnaire using electronic mail gave more extreme answers than employees who answered on a paper questionnaire. Within the context of response effects this work suggests a

caution and counterweight to economic factors that encourage the use of electronic surveys. (See, for example, Green, 1983, on personality testing via computer, Slack, 1971, on medical history-taking via computer, and Knight et al., 1980, on performance appraisal via computer.) At a minimum, electronic survey results should be calibrated against those obtained through more conventional means. Beyond that, electronic survey results may give us a glimpse into how people behave in a new communication environment.

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