

Development of a Standard E-Mail Methodology:
Results of an Experiment*

by

David R. Schaefer
Washington State University

Don A. Dillman
Washington State University

Forthcoming in Public Opinion Quarterly

* Revision of a paper presented at the 53rd Annual Conference of the American Association for Public Opinion Research, St. Louis, MO, 1998. This research was supported by the College of Liberal Arts, the Social and Economic Sciences Research Center, and the Agricultural Research Center (USDA-CSREES regional research project W-183), at Washington State University. David R. Schaefer is a Teaching Assistant in the Department of Sociology. Don A. Dillman is Professor of Sociology and Rural Sociology and Deputy Director of the SESRC. The authors wish to thank John Pierce, who was Dean of the College of Liberal Arts at the time this research was conducted, for his financial support of this experiment. Renee Shatos Petrie and other staff at the SESRC also contributed significantly to the conduct of this study.

Development of a Standard E-Mail Methodology:
Results of an Experiment

ABSTRACT

Review of past e-mail surveys indicates that a methodology to achieve consistently high response rates similar to those that can be obtained by traditional mail has not been developed. Additionally, researchers have tended to use e-mail surveys only for populations with universal e-mail access. This study utilizes knowledge from past mail survey research to develop an e-mail procedure. Further, an experiment is conducted to assess the potential for using a multi-mode strategy to obtain responses from individuals unreachable through e-mail. The multi-mode approach proved to be successful and techniques shown to be effective in standard mail surveys were also found to be appropriate for an e-mail survey.

Development of a Standard E-Mail Methodology:

Results of an Experiment

Introduction

Electronic mail and the Internet provide a promising means for conducting future surveys as the proportion of people accessible through e-mail or the Internet continues to rise. It is estimated that 45% of households now have computers, and the proportion on the Internet is 22% (Witt, 1997). Although these percentages are much too small for conducting general population surveys by e-mail, access has reached nearly 100% for some groups of survey interest, such as company employees and association members. Thus far, the use of e-mail surveys has been restricted by the tendency of researchers to apply it only to such populations with nearly universal e-mail access. The risk of non-coverage error has prevented researchers from applying an e-mail methodology to other groups. However, an e-mail strategy might be utilized with much more diverse populations if it is incorporated into a mixed mode design. E-mail can be used to survey individuals with e-mail access, while more expensive methods can be used to survey those without access.

The advantages of e-mail for surveying are enticing. It offers the possibility of very rapid surveying, an attribute well documented by past research (Bachmann, Elfrink & Vazzana, 1996; Kittleson, 1995; Mehta & Sivadas, 1995; Sproull, 1986). E-mail surveys can be done faster than telephone surveys, especially for large samples, where the number of telephones and trained interviewers limit the number of completions per day. The method is also inexpensive, since it eliminates postage, printing and/or interviewer costs.

To realize such benefits, it is important that a methodology be developed which can ensure acceptable levels of response quantity and quality. It is evident that such a general protocol for achieving high response rates and data quality to e-mail surveys has not yet been developed and tested as has been done for mail surveys (e.g. Dillman, 1978).

Our purpose in this paper is to report on the development and testing of alternative sets of procedures for conducting e-mail surveys which build on knowledge of how to improve response to mail surveys. While the technology for e-mail is vastly different from established mail surveying methods, the communication itself is similar to self-administered questionnaires (SAQS) delivered by postal mail. Thus, applying knowledge from previous research on mail SAQS to e-mail is a logical place to begin developing an e-mail methodology.

Results from an experimental test of three mixed mode, multiple contact e-mail procedures are compared to one another and to a similar mail survey control group within the same population. The elements of these e-mail procedures were formulated on the basis of proven methods for designing and implementing self-administered or mail surveys. Further, in an attempt to eliminate coverage error, the e-mail procedure is augmented by a mail version for individuals who are unreachable by e-mail. Limited information on data quality are also reported.

Past Research

A review of the literature reveals that, to date, a method to consistently achieve response rates as high as those obtained with mail surveys has not been developed. As presented in Appendix 1, electronic mail has generally failed to meet the standard set by comparable mail techniques. For instance, in a study of federal agency employees Couper et al (1997) found an e-mail survey obtained an average response rate of 42.6% compared to 70.7% for mail, a difference ranging from 13.5% to 28.1% lower for each sub-sample. The only published study to report an acceptably higher response by e-mail, as compared to regular mail, is Parker's (1992) study of AT&T employees. She reports a 63% response rate for e-mail versus a 38% response rate for traditional mail. The higher e-mail response rate is attributed to the fact that 1) e-mail was (at the time) more carefully examined when it arrived, as opposed to company "junk" mail, which was typically thrown out "without a single qualm or backward glance" (54); and 2) the high-tech "allure" and "novelty" of e-mail. While these perceptions may have been responsible for the difference, they seem inadequate for development of a standard e-mail methodology.

MULTIPLE CONTACTS

Research in mail, telephone, and face-to-face interviewing has universally found that the most powerful determinant of response rates is the number of times a respondent is contacted (Dillman *et al*, 1974; Goyder, 1985, 1987; Heberlein & Baumgartner, 1978; Scott, 1961). The more attempts made to reach people, the greater the chances of them responding. Thus, for an e-mail survey to be successful, it seems important that multiple contacts be made.

Indeed, evidence exists that multiple contacts increase response rates in e-mail surveys as well. Studies by Mehta and Sivadas (1995) and Smith (1997) compared a single contact e-mail survey with multiple contacts. Smith achieved a 5.3% higher response rate with e-mail using multiple contacts and Mehta and Sivadas gained 20% with multiple contacts combined with personalization, the exact nature of which was not reported. Of surveys reported in the literature, the average response rate for e-mail surveys with a single contact is 28.5%, compared with 41% for two contacts and 57% for three or more contacts (see Appendix 1 for studies). While this is a crude comparison, it does not contradict the assertion that multiple contacts are effective in increasing response rates to e-mail surveys.

PERSONALIZATION

Personalization has also been reported to be an important element in increasing the response rate in mail surveys (Dillman, 1978, 1991). A personalized letter addressed to a specific individual shows the respondent that he or she is important. This technique can also be applied to e-mail. E-mail has evolved, so that some e-mail is personal and other e-mail is not (e.g. listservs and mailings to multiple addresses). This information is immediately visible when one opens an e-mail message, much in the way that recipients of a mail survey can immediately discern a "Dear Citizen" salutation versus their name as a salutation on a personal letter. In order to let

individuals know that they are individually important, and not just an item on a list, it seems important that e-mail messages be sent directly to individual respondents, not part of a mailing list. An added benefit to personalized e-mail messages is that individuals are prevented from responding to the other recipients of the survey, thus helping to ensure confidentiality.

MIXED MODE

It seems likely that some populations will be completely accessible by e-mail in the near future. For other groups, a large proportion of members will have e-mail access, yet some will not. For these populations, a mixed mode survey strategy needs to be considered - using e-mail when possible and other methods when not possible. Thus, a proposed method for e-mail surveys, to be generally useful, must take into account a way of reaching people whose e-mail addresses aren't available and those who simply don't have or use them.

In addition to decreasing costs and providing more timely data, a mixed mode survey strategy can reduce non-coverage error (Dillman & Tarnai, 1988). This is critical with an emerging form, such as e-mail, which has yet to be adopted by the majority of the population. The cost and speed advantages of e-mail make it ideal for a first mode of contact in surveys. Researchers can begin with an e-mail approach and use progressively more expensive methods for nonrespondents until an acceptable response level is reached. Additionally, with e-mail researchers know immediately whether members of the sample have valid addresses. Thus, alternative methods can be implemented much sooner than with traditional mail. Finally, it's been argued that individuals may have a mode preference and that offering an alternative response format may improve response rates (Goyder, 1987; Groves & Kahn, 1979).

DATA QUALITY

For an e-mail methodology to become feasible, it is necessary to demonstrate that the quality of data is equivalent to that of currently used methods. It is not yet known whether people tend to comprehend and respond to questions differently by e-mail compared to other survey methods. Mail and e-mail surveys are both SAQS and, as such, rely on an individual's comprehension of written text. Hence, response order effects, such as primacy and recency, should not be noteworthy between modes. It also seems feasible that item nonresponse to e-mail surveys could be lower if the answer format is convenient. Finally, because entering answers on a keyboard may be easier for some people than writing by hand, it seems plausible that response to open-ended questions may be more complete.

Previous studies report varied results when comparing the data quality of e-mail to mail surveys. In experimental studies comparing e-mail and mail surveys, Sproull (1986) and Bachmann, Elfrink, and Vazzana (1996) report a higher nonresponse for e-mail items. However, Mehta and Sivadas (1995) and Tse et al (1995) report no difference in data quality between the two modes. Finally, Bachmann, Elfrink and Vazzana (1996) also found that length of answers to open-ended questions was higher with the e-mail version. These mixed reports demonstrate the need to develop a method which can be relied upon to provide consistent results.

A second concern, especially when sensitive issues are involved, is the virtual lack of anonymity which characterizes e-mail. It is difficult for e-mail respondents to remove all identifying information from their returned surveys. Thus, e-mail surveys must rely on researchers' assurances of confidentiality. Further, organizations that provide e-mail have the potential to monitor their employees messages, which limits confidentiality guarantees. Nevertheless, research by Couper et al (1997) indicates that this may not be as much of a problem as it seems. The present study does not deal with a particularly sensitive issue; thus, assurances of confidentiality should be more than adequate.

Experimental Design

POPULATION

The permanent faculty of Washington State University was the population for this experiment. A previous 1996 survey of WSU faculty had found that nearly 89% of the faculty had electronic mail access (Carley, 1996), thus suggesting that coverage error from an electronic mail survey while higher than desirable might in some instances be acceptable. The 904 faculty members in the survey population were randomly divided into four groups. Each group received four contacts (pre-notice, questionnaire, thank-you/reminder, and replacement questionnaire), the only differences being the mode of contacts (see Table 1).

TREATMENTS

Group one (1) was designated to receive "all paper" contacts. No attempt was made to locate e-mail addresses for these individuals. This group served two purposes, as a comparison group for the e-mail groups and as a hypothetical portion of the population assumed not to have e-mail addresses. This allows us to examine how well a multi mode strategy will work for those populations without universal e-mail access. Individuals in this group received paper versions of the pre-letter, questionnaire, thank-you/reminder postcard¹, and replacement questionnaire, each by campus mail. This is a procedure that is regularly used by the Social and Economic Sciences Research Center (SESRC) for faculty surveys, of which several are conducted each year. This method has demonstrated the potential to achieve response rates of 60-75% for most surveys².

Group two (2) was designated as the "all e-mail" group. These individuals received four contacts by e-mail, modeled after those sent by paper in Group 1 (i.e. a pre-letter, questionnaire, reminder, and replacement questionnaire).³ One difference between the four contacts in Group 1 and Group 2 was that a replacement questionnaire was included with the Group 2 thank-you/reminder whereas the traditional paper method used a postcard reminder (Dillman, 1978). It was reasoned that there was no additional cost for including a replacement questionnaire by e-mail and it would be more convenient for respondents. In effect, there was no downside to adding the questionnaire to the e-mail reminder. Group 2 served as a comparison group to the next two mixed-mode groups.

Group three (3) was labeled the "paper pre-notice" group. Members of this group received essentially the same treatment as Group 2, except they were sent a paper pre-notice via campus mail. The pre-letter notified them of the upcoming questionnaire on e-mail and offered them the chance to complete a paper version of the questionnaire by returning a postcard. Those who returned the postcard were given the same treatment as Group 1 (all paper contacts) for the remainder of the study. Those who did not return the postcard were sent three e-mail contacts; the questionnaire, reminder with questionnaire, and replacement. This treatment was designed with the goal of reaching those respondents who had working e-mail accounts but did not use them at all or did not check them regularly. It was reasoned that the letter would give individuals incentive to check their e-mail, as well as provide a means for those not using e-mail to obtain a questionnaire. The mixed mode contacts and choice of response format was reasoned to lead to a higher response rate for this group than the "all e-mail" group.

Group four (4) was designated the "paper reminder" group. Individuals in this group were given virtually the same treatment as Group 2, the exception being that a paper reminder was sent via campus mail. The basis for this approach was that as many responses as possible would be obtained with the simpler, cheaper e-mail before using campus mail to reach those who don't use their e-mail accounts. However, we would preserve a regular mail contact to encourage people to check their e-mail for the questionnaire. This group received an e-mail pre-notice, e-mail questionnaire, paper reminder, and e-mail replacement questionnaire.

As with virtually any population of interest, we expected that some individuals in the sample destined to receive e-mail contacts would not have valid e-mail addresses or we would not be able to obtain them. Thus, each group would have members we could not contact by e-mail. The desire to obtain a representative sample requires that those people still be given the chance to respond. In order to include them, a second mode of the survey was used. Those individuals for whom e-mail addresses could not be found, or whose e-mail addresses were invalid (realized during the first e-mail contact), were sent paper versions of each contact. For all practical purposes, they were given the same treatment as Group 1.

IMPLEMENTATION STRATEGY

We decided not to utilize any of the commercially available software designed specifically for e-mail surveys. Rather, the form was developed and sent out using the program Eudora. Returned e-mail surveys were printed out on paper and later entered into the SESRC's CATI system.

For experimental purposes, two versions of the survey were developed. The paper form was created first. It contained 46 questions and was printed on both sides of a folded 8.5" by 11" sheet of paper. The e-mail version was as similar as possible to the paper version with these exceptions. A 5-point Likert on the mail version was reduced to 3-points for the e-mail version to allow question stems and response boxes to fit on the same line. Additionally, to help ensure that the text of the message would appear the same to all recipients (i.e. the lines would not "wrap-around") and in a legible format, a maximum line length of 70 characters was chosen.

Great care was taken in deciding exactly how respondents would be asked to indicate their

answers on the e-mail version. The concern at this point was that they must type something, somewhere and it had to be easy to do. The traditional SAQ procedures of circling an answer or checking a box are impossible with e-mail, yet we wanted the e-mail survey to resemble a paper version as closely as possible. By using a familiar format, the cognitive burden placed on the respondent is reduced. Respondents must only comprehend a new method of entering their answers, not a new method of determining where to place them. Thus, a box was placed in front of each answer choice on closed-ended questions. Respondents were asked to place an anywhere in the box. Boxes were also used for open-ended questions. They were placed on the line following the question and, once again, respondents were asked to type their answers in the box. While boxes were not necessary here (respondents could have just typed in the blank lines) using them provided respondents with a consistent answer format, further reducing their cognitive burden. Finally, skips were handled by placing statements at the beginning of the question asking those respondents who fit the relevant criteria to skip the next set of questions and scroll down to the appropriate question.

The directions for responding to the e-mail version were as straightforward as possible. Respondents were asked to create a reply message that contained the message we sent. Then, all they needed to do was type in their responses in that version and send it to us. They were also told that they could print the e-mail and return it via campus mail or contact SESRC and request a paper version be sent to them. They were given an e-mail address and telephone number to call if they had any questions.

All e-mail contacts were personalized to the extent possible. Since we did not want the names of multiple recipients to appear at the top of the screen, we decided against using the carbon copy function or sending a group message. The blind carbon copy feature, which conceals the names of the other recipients, was also inappropriate in that the To: line reads To: Undisclosed Recipients when received. Rather, each individual in the sample was sent a separate e-mail message addressed only to him or her. This process took only slightly more time than using a list or the blind carbon copy feature, thanks mainly to the cut-and-paste features of modern computer applications. Additionally, using individual e-mail messages had the benefit of preventing respondents from accidentally sending their reply message to each of the other recipients.

The process of obtaining e-mail addresses for the three e-mail panels was a multi-stage endeavor since the university does not maintain a list of faculty e-mail addresses. The first step was to look up professor's names in the university's electronic phonebook. To help remove the possibility for error, e-mail addresses were cut and pasted from the phonebook to the sample list. A total of 414 (61%) of addresses were found here. The second step was to contact individual departments asking secretaries for the addresses and to search department and individual web-sites. This proved to be successful; an additional 222 e-mail addresses were obtained (33%). The second step was repeated for those e-mail addresses which were found to be incorrect after the initial e-mailing. In the end, all but 42 addresses were found. It was later discovered that 17 e-mail addresses were incorrect, with messages being returned as undeliverable . The inability to locate correct addresses for these 17 faculty members left 619 (of a possible 678) useable e-mail addresses for the e-mail treatment groups. It is important to

note that we avoided contacting the individual professors to ask for their addresses since it was reasoned that we would have to explain our purpose, and so doing would disrupt the experimental procedure.

Results

Three criteria are used to judge the success of each of the e-mail survey treatments. First, the response rates from the e-mail groups are compared with the response rate from the standard mail group. Second, the quality of data obtained is compared (operationalized as item nonresponse and length of response to an open-ended question). Finally, speed of response is compared across modes.

RESPONSE RATES

The overall response rate for the study was 55.1% (see Table 2). The response rate for the control group (Group 1) which received a standard mail approach was 57.5%.⁴ Group 2, who received all e-mail contacts when possible or paper contacts when e-mail was not appropriate, had a response rate of 58%. A chi-square test revealed no significant difference between these two response rates, ($p=.924$). The response rate for Group 3, which received the paper pre-notice, was 48.2%. This was significantly lower than both Groups 1 and 2, ($p=.048/.038$). Group 4, which received a paper reminder, had a response rate of 54.4%, which, although lower, was not significantly different than Groups 1 and 2, ($p=.507/.448$). Finally, a response rate of 58.6% was achieved for the set of individuals who received a paper survey upon their request or because they were unreachable by e-mail. This was not significantly different from the response rate for the ?all paper? Group 1 ($p=.877$), indicating that the availability of such individuals did not differ from the rest of the population as represented by Group 1.

It is also important to note the response rates that would have been achieved had we not sent a paper version to those unreachable by e-mail. The simplest way to do this would be to remove those individuals from the each e-mail group who completed a paper version and then compare response rates. However, groups 3 and 4 were given the opportunity to return a postcard requesting a paper version of the survey. There is no way of knowing how many of them would have returned the e-mail version of the survey. However, with an estimate based on the actual e-mail response rates of Groups 3 and 4, an electronic response rate of 48.23% is obtained, which is significantly less than the 53.54% achieved with the multi-mode strategy ($p=.05$). Thus, the multi-mode strategy led to a 5.3% higher response rate.⁵ The difference would have been greater under the assumption that those requesting a paper version would not have completed an e-mail version.

In order to test the effectiveness of using a paper pre-notice versus using an e-mail pre-notice with an e-mail questionnaire, a chi-square test was conducted comparing the number of responses to the first mailing of the questionnaire. Groups 2 and 4 (which utilized an e-mail pre-notice) included a total of 184 out of 409 completed responses to the first questionnaire mailing (45%). Group 3, using a paper pre-notice, achieved 61 completes out of 202 (30%). The two rates were significantly different ($p=.001$). Thus, the e-mail pre-notice was much more effective

in increasing response rate to an upcoming e-mail questionnaire than the regular mail pre-notice.

RESPONSE QUALITY

Overall, the e-mail version obtained more complete returned questionnaires. An examination of the total number of questions left unanswered reveals that 69.4% of those responding to the e-mail version completed at least 95% of the survey, while only 56.6% of those responding to the paper version completed 95%. In addition, the e-mail version had a lower item nonresponse than the paper version. Of 44 questions asked, 30 had higher completion rates on the e-mail version than on the paper version. A series of chi-square tests revealed that 6 of the questions had a significantly higher completion rate on the e-mail version, while only one question was significantly more complete on the paper version ($\alpha=.05$).

A closer examination of responses to open ended questions reveals more important differences between e-mail and mail. Four of the questions obtaining significantly higher completion rates by e-mail were open-ended. The last question on the survey, which asked for additional comments achieved a 12% higher completion rate on the e-mail version ($p=.004$). Further, the e-mail version achieved much longer responses to open-ended questions than the paper version. On average, open-ended responses on the e-mail version contained 40 words, while open-ended responses on the paper version contained 10 words.

RESPONSE TIME

The average time required to receive a completed questionnaire, from the day they were sent out, was 9.16 days for e-mail and 14.39 days for paper (See Figure 1 for a plot of returns over time). A two-tailed t-test revealed a significant difference between the response times ($t = -5.718, p < .0001$). Fifty-seven e-mail questionnaires were returned the same day they were sent out (17.6% of all received). Over 50% of all completed e-mail questionnaires were received before the first completed paper questionnaire was returned.

Discussion and Conclusions

Results of this experiment showed that for this population comparable response rates can be obtained for regular mail surveys and electronic mail surveys (57.5% and 58% respectively) when a mixed mode strategy is used to obtain responses by mail for sampled individuals who do not have e-mail addresses. Certain potential advantages of e-mail surveys were also evident from these results. Returns came in more quickly by e-mail than from the paper survey, a slightly lower item nonresponse was achieved, and more complete answers were given to an open-ended question. Additionally, through the inclusion of a paper element in a mixed mode design, the problem of coverage error was eliminated. The equal success of modes demonstrates that researchers can take advantage of the capabilities and benefits of an e-mail methodology for populations without universal e-mail access.

Coverage error will continue to be a problem for e-mail surveys, at least into the

foreseeable future. Thus, its inclusion into a mixed mode design is probably essential. Additionally, just as adoption of telephone survey methodology encouraged changes in protocol (e.g. shorter questions), it seems useful to make certain adjustments in procedures based on the peculiar characteristics of e-mail. One such change is sending replacement questionnaires with each subsequent contact, rather than the traditional postcard thank-you/reminder. It is also apparent that one needs to take into account the way people handle e-mail. Some potential respondents may want to print their questionnaire so a return mailing address should be included in the e-mail version of the questionnaire.

Other results were more unexpected and confounding. While the response rates for the ?all paper? and ?all e-mail? groups were nearly identical, contrary to expectations the response rate for the ?paper pre-notice? Group 3 was significantly lower. For some reason the paper pre-notice was not as effective as the e-mail pre-notice in encouraging responses to the e-mail survey. It could be that the pre-notice was thrown away or otherwise disregarded. Perhaps respondents did not cognitively connect the paper pre-notice with the electronic questionnaire, thus the paper pre-notice failed to serve its purpose of familiarization. In such cases, when the questionnaire was received, it was easier to ignore. This coincides with the findings of Mehta and Sivadas (1995) who concluded that unsolicited e-mail surveys are unacceptable. They found that people who received an e-mail questionnaire without a prior e-mail notification or request for participation were less likely to respond. If some respondents did not connect the paper pre-notice with the following e-mail questionnaire then, in effect, the e-mail survey was unsolicited.

The ?paper reminder? Group 4 had a response rate similar to the ?all e-mail? group. Thus, it appears that a paper reminder did not achieve its purpose of increasing response rate above that of the ?all e-mail? group by encouraging non e-mail users to check their e-mail. Part of this lack of effect could be due to the already high use of e-mail within the population. A 1997 survey of the same faculty later revealed that 95% used e-mail and that 93% of e-mail users checked their e-mail at least five times a week (Carley-Baxter, 1997). Thus, the use of the paper reminder to increase response rate would only be appropriate for the 5% of faculty who do not use e-mail and the 7% of e-mail users who do not check it at least five times per week. Differences in such a small sub-population would not be noticeable in the response rate of group four.

A second reason for the lack of effect could be due to the number of questionnaires sent to each group. The ?all e-mail? group received a questionnaire with the reminder e-mail. In addition to the initial and replacement questionnaires, a total of three questionnaires were sent to the ?all e-mail? group. In contrast, the ?paper reminder? group received only two copies of the questionnaire - the initial questionnaire and the replacement. While the reminder may have been effective in motivating people to check their e-mail and respond, had such individuals already deleted the questionnaire they did not have anything to respond to. It may have been helpful to send another e-mail questionnaire to them at the same time the paper reminder was sent (four people in that group actually sent e-mails requesting another copy). Such an effort would require more time and money, but it may be appropriate considering the relative ease of sending an e-mail questionnaire. Future research is needed to determine the optimum allocation of mailings, both paper and e-mail.

The lengthier responses to open ended questions on the e-mail version was not surprising. It was reasoned that a convenient format in the e-mail version and the relative ease of typing a longer response (compared with writing by hand) would elicit more detailed responses. The lower item nonresponse to e-mail might be explained by the proposition that moving visually moving through an e-mail message requires more effort than filling out a paper questionnaire. Since individuals can only view a few questions at a time (fewer than in the paper version) each question may be less likely to be overlooked.

The identification of different rates of item nonresponse between the two modes suggests that discrepancies in item quality may also exist. However, since both modes are self-administered, the mode effects that are evident between mail and telephone surveys (see Dillman et al, 1996) should not be present. Nevertheless, if a mixed-mode design is to be effective then the equivalency of the two modes must be demonstrated through further empirical research.

The speed of responses in favor of e-mail realized in this study may indicate the opportunity for a change in protocol for e-mail surveys. Because over 76% of all completed e-mail questionnaires were returned within 4 days of their mailing, it may be helpful to compress the time frame of the survey. For example, the questionnaire could follow the pre-notice by 2-3 days; reminders could be sent a couple days later; and replacements could be sent a week after the reminder. This is possible because the time delay in the transmission of e-mail messages is virtually non-existent and researchers know immediately when someone has responded. However, there are potential drawbacks to compressing the time frame. People who are away from their e-mail for a couple of weeks would not be contacted within the shorter time span of the survey, whereas with a 7 week survey they would be reached. Additional research should explore the optimal amount of time between the contacts.

This study suggests the viability of a standard e-mail method based on techniques found successful in mail survey research, that is multiple, carefully-timed and personalized contacts (Dillman, 1991). However, the questionnaire we used was relatively short, not exceedingly complex, and contained few skip patterns. Research by Couper et al (1997) indicates that the technological factors involved in a longer questionnaire could make them more problematic. Additionally, unlike many populations, the population utilized in this study had very high coverage. Thus, it is important to test these procedures with more heterogeneous populations and those with lower rates of e-mail access. It is also important to test them with larger, more elaborate questionnaires containing more complex skip patterns.

Development of this experiment revealed to us the possibility that e-mail surveys represent only an interim surveying technology. The difficulties of setting up a format which will appear the same on all users' screens are substantial. Additionally, the format of e-mail surveys can be cumbersome to navigate, leading some individuals not to reply. Internet based surveys, on the other hand, can be designed to appear nearly the same on all screens and, due to their interactive nature, may be easier for people to navigate (Dillman and Tortora, 1998). Further, the web enables researchers to utilize complex question formats and skip patterns while making the survey appear simple to the respondent. Some e-mail users now have software which enables them to use a ?double-click? to shift from e-mail to an Internet address in order to respond to a survey. However, others must leave e-mail, open a web-browser, and type or ?paste? a complete address

in order to access a web survey. The complexity of this requirement seems likely to decrease web survey response rates significantly. Additionally, usage of the Internet might not be as prevalent as e-mail usage. For instance, it was apparent from the 1997 survey of WSU faculty that they were not only more likely to use e-mail than the Internet (95% versus 88%), but spent more time on e-mail than on the Internet (51 minutes per day versus 29) (Carley-Baxter, 1997; Carley-Baxter & Dillman, 1997). Nevertheless, as Internet access and use become more prevalent, it seems likely that the ease and speed of Internet based surveys will lead to more widespread utilization. Meantime, e-mail surveys with a mixed mode component to reduce coverage error represent an important addition to the arsenal of survey techniques. Data can be collected from important survey populations at lower costs with no reductions in response rates and improved data quality, compared to traditional mail surveys.

References

- Bachmann, Duane, John Elfrink, and Gary Vazzana. 1996. ?Tracking the Progress of E-Mail Versus Snail-Mail.? Marketing Research. 8:31-35.
- Besser, Terry L. 1997. ?Non-Renewing Member Survey.? Unpublished Report to the Rural Sociological Society.
- Carley, Lisa R. 1996. ?Faculty Use of Computer-Related Technologies: A Baseline Study of All WSU Instructional Faculty.? Social and Economic Sciences Research Center: Data Report #96-51.
- Carley-Baxter, Lisa R. 1997. ?How Are Computer Related Technologies Changing Faculty Work at WSU?: A 1997 Survey of All WSU Instructional Faculty.? Social and Economic Sciences Research Center: Data Report #97-39.
- Carley-Baxter, Lisa R. and Don A. Dillman. 1997. ?1997 Faculty Use of Computer Technology with 1996 Comparisons.? Social and Economic Sciences Research Center: Summary Report #97-40.
- Couper, Mick P., Johnny Blair, and Timothy Triplett. 1997. ?A Comparison of Mail and E-mail for a Survey of Employees in Federal Statistical Agencies.? Paper presented at the Annual Conference of the American Association for Public Opinion Research. Norfolk, VA.
- Dillman, Don A. 1978. Mail and Telephone Surveys: The Total Design Method. New York: Wiley-Interscience.
- Dillman, Don A. 1991. ?The Design and Administration of Mail Surveys.? Annual Review of Sociology 17:225-49.
- Dillman, Don A., J.A. Christenson, E.H. Carpenter, and R. Brooks. 1974. ?Increasing Mail Questionnaire Response: A Four-State Comparison.? American Sociological Review 39:744-56.
- Dillman, Don A., Roberta L. Sangster, John Tarnai, and Todd H. Rockwood. 1996. ?Understanding Differences in People?s Answers to Telephone and Mail Surveys.? New Directions for Evaluation 70:45-61.
- Dillman, Don A. and John Tarnai. 1988. ?Administrative Issues in Mixed Mode Surveys.? pp. 509-528 in Telephone Survey Methodology. Ed. Groves, Robert M. New York: John Wiley Company.
- Dillman, Don A. and Robert Tortora. 1998. ?Principles for Constructing Respondent-Friendly WEB Surveys and Their Influence on Response.? Paper for Presentation at the 1998 American Statistical Association Meeting. Dallas, TX
- Groves, Robert M. and Robert Kahn. 1979. Survey Research by Telephone. New York: Academic Press.
- Goyder, J.C. 1985. ?Face-to-Face Interviews and Mail Questionnaires: The Net Difference in Response Rate.? Public Opinion Quarterly 49:234-52.
- Goyder, J.C. 1987. The Silent Majority: Nonrespondents on Sample Surveys. Boulder, CO: Westview Press.
- Heberlein, Thomas, A. and Robert Baumgartner. 1978. ?Factors Affecting Response Rates to

- Mailed Questionnaires: A Quantitative Analysis of the Published Literature. American Sociological Review. 43:447-62.
- Kittleston, Mark J. 1995. ?An assessment of the Response Rate Via the Postal Service and E-Mail.? Health Values. 18:27-29.
- Mehta, Raj and Eugene Sivadas. 1995. ?Comparing Response Rates and Response Content in Mail Versus Electronic Mail Surveys.? Journal of the Market Research Society. 37:429-439.
- Opperman, Martin. 1995. ?E-Mail Surveys: Potentials and Pitfalls.? Marketing Research. 7:29-33.
- Parker, Lorraine. 1992. ?Collecting Data the E-Mail Way?. Training and Development. July:52-54.
- Schuldt, Barbara A. and Jeff W. Totten. 1994. ?Electronic Mail Versus Mail Survey Response Rates.? Marketing Research. 6:36-39.
- Scott, Christopher. 1961. ?Research on Mail Surveys.? Journal of the Royal Statistical Society. 124:143-205.
- Smith, Christine B. 1997. ?Casting the Net: Surveying an Internet Population?. Journal of Communication Mediated by Computers. <http://www.usc.edu/dept/annenberg/vol3/issue1/>.
- Sproull, Lee S. 1986. ?Using Electronic Mail for Data Collection in Organizational Research.? Academy of Management Journal. 29:159-69.
- Tse, Alan C.B., Ka Chun Tse, Chow Hoi Yin, Choy Boon Ting, Ko Wai Yi, Kwan Pui Yee, and Wing Chi Hong. 1995. ?Comparing Two Methods of Sending Out Questionnaires: E-Mail Versus Mail.? Journal of the Market Research Society. 37:441-446.
- Walsh, John P., Sara Kiesler, Lee S. Sproull, and Bradford W. Hesse. 1992. ?Self-selected and Randomly Selected Respondents in a Computer Network Survey.? Public Opinion Quarterly. 56:241-44.
- Williams, Andrew N., Christopher C. Morphew, and Sarah M. Nusser. 1997. "Some Considerations for Conducting an Electronic Mail Study with University Students." Paper Presented at the Annual Conference of the American Association for Public Opinion Research. Norfolk, VA.
- Witt, Karlan J. 1997. ?Best Practices in Interviewing Via the Internet.? Paper Presented at the Sawtooth Software Conference. Seattle, WA.

Endnotes

1. To encourage faculty to respond, the pre-notice letter/e-mail was sent by the Dean of Liberal Arts whose office was sponsoring the study.
2. Based on 6 surveys of Washington State University faculty conducted by the SESRC over the past two years.
3. With e-mail, we know immediately whether an individual has replied. Thus, it would not be appropriate to send the traditional thank-you/reminder postcard, which states, "if you have already replied, thank you; if not, please do?". Instead a message repeating the importance of the study and requesting participation was sent.
4. A separate mail survey of the same population at the same time achieved the similar response rate of 60.5%.
5. The response rate for group 3 after removing those requesting a paper survey (n=6) was 43.18%; group 4 (n=5) was 47.51%. These percentages were multiplied by the number requesting the survey in each group to estimate how many of them would have returned the electronic version

Table 1. Treatment Groups

Group	1 ? all paper?	2 ? all e-mail?	3 ? paper pre-notice?	4 ? paper reminder?
Pre-notice	paper	e-mail	paper	e-mail
Letter and Survey	paper	e-mail	e-mail	e-mail
Thank-you/reminder	paper	e-mail*	e-mail*	paper
Replacement Survey	paper	e-mail	e-mail	e-mail

* the e-mail reminders included another questionnaire

Table 2. Response Rates utilizing the multi-mode strategy

Group	1 ? all paper?	2 ? all e-mail?	3 ? paper pre-notice?	4 ? paper reminder?	Total*
N	226	226	226	226	904
Invalid e-mail addresses	---	18	20	21	59
Requested paper version	---	---	6	5	11
Completes	130	131	109	123	498
returned by paper	130	9	14	18	176
returned by e-mail	0	114	84	98	296
returned by printed e-mail	0	8	11	7	26
Overall Response Rate	57.5%	58%	48.2%	54.4%	55.1%
Portion Paper	57.5%	4.0%	6.2%	8.0%	19.5%
Portion E-mail (includes printed e-mail)	---	54.0%	42.0%	46.5%	35.6%

* Five surveys were returned anonymously (ID labels were removed). Thus, treatment group was impossible to determine.

Appendix 1. Summary of Previous Studies Using E-mail

Author	Year	Number of Contacts (e-mail/mail)	N (e-mail/mail)	Response Rate (%) (e-mail/mail)	Item NR (e-mail/mail)	Speed (in days) (e-mail/mail)	Population
Sproull*	1986	2	30/30	73/87	1.4%/.2%	5.6/12	Department
Parker	1992	2	100/40	63/38	not given	not given	AT&T emp
Walsh, Kiesler, Sproull & Hesse**	1992	3	300	76	not given	not given	subscribers
Schuldt & Totten	1994	1	343/200	19.3/56.5	not given	#	Marketing : universities
Kittleson	1995	1	153/153	28.1/76.5	not given	2.88/12.6	Internation: Educators
Mehta & Sivadas	1995	1,3,3/ 1,3	60,122,172/ 202,107	43,63,64/ 45,83	no difference	2/21	users of ele
Opperman**	1995	2	665	48.8	not given	#	American /
Tse et al	1995	2	200/200	6/27	no difference	8.09/9.79	staff at Chi
Bachmann, Elfrink & Vazzana	1996	1	224/224	52.5/65.6	3.1%/0.7%	4.68/11.18	business sci
Besser	1997	1	86/109	19.8/15.6	not given	not given	former mer Society
Couper, Blair & Triplett ^{##}	1997	4/5	4,066/4,187	42.6/70.7	not given	not given	employees agencies
Smith**	1997	1, 2	150, 150	8, 13.3	not given	not given	members o
Williams, Morphew & Nusser*	1997	4	200/226	26.5/74.6	not given	not given	Iowa State

- * The e-mail method was compared with a phone method
- ** Only an e-mail method was used
- # The response time was given, but in an incomparable format
- ## The final contact for each mode was by telephone