Response rate, speed, and completeness:
A comparison of Internet-based and mail surveys

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Because of their speed and accessibility, the use of on-line research tools has grown considerably in recent years. The present study compared two ways of delivering surveys: Internet-based and mail delivery methods. Although Internet-based and mail surveys achieved a similar response rate, Internet-based surveys may be more effective than mail surveys in a setting such as when the target population has both e-mail and Internet access.

Of the three forms of on-line survey delivery methods—e-mail, Internet-based, and downloadable interactive applications (Bowers, 1998)—the e-mail survey distribution method appears to be the most often used and examined for its effectiveness (e.g., Bachmann, Elfrink, & Vazzana, 1996; Kawasaki & Raven, 1995; Kittleson, 1995; Mavis & Brocato, 1998; Parker, 1992; Schuldt & Totten, 1994; Tse, 1998; Weible & Wallace, 1998). Researchers have investigated several attributes of e-mail distributed surveys, such as response rate, speed, and completeness. These investigations consistently revealed that surveys delivered in the mail achieve higher response rates then do those distributed by e-mail (e.g., Bachmann et al., 1996; Kittleson, 1995; Mavis & Brocato, 1998; Schuldt & Totten, 1994; Weible & Wallace, 1998).

Kawasaki and Raven (1995) noted different response rates for e-mail and mail surveys depending on the personnel involved—agents or specialists among Montana Extension Service employees. Agent response rates for e-mail distributed and mail distributed surveys were 60.6% and 39.4%, respectively; by contrast, specialist response rates for e-mail and mail distributed surveys were 43.3% and 56.6%, respectively. A study involving AT&T employees resulted in response rates of 68% and 38% for e-mail and mail distributed surveys, respectively (Parker, 1992). Response speed of e-mail distributed surveys averaged about 6 days faster then did mail distributed surveys in being returned (Tse, 1998). Response quality of e-mail and mail distributed surveys do not appear to differ (Mavis & Brocato, 1998; Mehta & Sivadas, 1995; Tse, 1998).

Technological advancements have begun to shift researcher interest from e-mail to the Internet as a data collection method. Many researchers who have used the Internet for data collection have been encouraged by the results (e.g., Coomber, 1997a, 1997b; Fawcett & Buhle, 1995; Houston & Fiore, 1998; Krantz, Ballard, & Scher, 1997; Pettit, 1999; Piper, 1998; Smith & Leigh, 1997; Subramanian, McAfee, & Getzinger, 1997; Welch & Krantz, 1996). It has been suggested the Internet has been used less frequently for research than have e-mail, mailing lists, or newsgroups (Zhang, 2000), and no studies comparing Internet-based and mail distribution methods appear in the literature.

This literature gap comparing Internet-based surveys with an established method such as the mail survey method may be due to the newness of the method itself. "The use of the Internet as a researcher medium . . . is in its infancy. Much basic information concerning the applicability, effectiveness, and overall credibility of survey procedures using the Internet still remains to be established" (Schonland & Williams, 1996, p. 81). In addition, Zhang (2000) noted that "more research is needed to expand our understanding of this new approach and to explore the full potential the Internet can offer to survey researchers" (p. 67). To realize its full potential, a methodology must achieve acceptable response quality and completeness levels (Schaefer & Dillman, 1998). "Researchers must now determine whether questionnaire data collected in this fashion [Internet-based] is comparable to paper and pencil data" (Pettit, 1999, p. 71). The present study compared Internet-based surveys with mail-distributed surveys, with respect to response rate, response speed, and response completeness.

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The threefold purpose of the present study was to compare the response rate, response speed, and completeness of Internet-based and mail surveys. Specifically, answers to the following questions were sought: (1) Is there a difference in the response rate proportion of Internet-based and mail surveys? (2) Is there a difference in the response speed of Internet-based and mail surveys? (3) Is there a difference in the response completeness of Internet-based and mail surveys?

METHOD

Participants

Individuals appearing in the *Business Education Professional Leadership Roster* in the December 1999 issue of the *Business Education Forum* listing both e-mail and mail addresses were selected as potential participants. A total of 336 potential participants were identified. A pool of 30 potential participants was held back as replacements in case some e-mail addresses were returned as undeliverable. The remaining 306 individuals were randomly assigned to receive either an Internet-based survey or a mail survey. Of the 306 surveys distributed, 159 (52%) were returned to the researchers as usable: 78 (49%) were Internet distributed and 81 (51%) were mail distributed.

Instrumentation

To explore the response rate, speed, and completeness of Internet-based and mail survey delivery methods, a dummy instrument was used. The instrument consisted of 10 questions: 5 questions were closed-ended, and 5 questions were open-ended. Closed-ended questions offered all participants an appropriate response option. The open-ended questions solicited a specific number of responses from the participants. The instrument was reviewed for clarity by individuals similar to those in the target population with suggestions integrated into the final version of the "Educator's Survey." The Internet-based version of the survey was posted on a server and piloted in-house to detect any technical problems. For follow-up purposes, Internet-based surveys were coded with unique hyperlink addresses, whereas mail surveys were coded with a numbering system.

Data Collection

The participants were randomly assigned to either an Internet-based survey recipient group or a mail survey recipient group. The group receiving the Internet-based survey was e-mailed a personalized cover letter explaining the purpose of the study with a hyperlink to the Web page hosting the Educator's Survey embedded in the message. Since each hyperlink was unique, the tracking of participant responses was possible. Information was tracked for participants who did and did not respond; for those who did respond, the date and time of their responses were recorded. The participants with undeliverable e-mail addresses were replaced until 153 Internet-based surveys were delivered. None of the mail surveys were returned as undeliv-

erable. Both Internet-based and mail surveys were sent the same day. A follow-up request was sent to each nonrespondent 3 weeks after the initial survey distribution. Responses to the second round of survey distribution were collected through the end of Day 42.

Data Analysis

A *z* score was used to determine whether a difference existed in the response proportions of Internet-based and mail distributed surveys. To determine whether there were differences in the response speed and completeness of Internet-based and mail delivered surveys, *t* tests were used. Response speed was determined by the number of days between initial mailing to reception of a usable survey. Response completeness for each survey was determined by totaling the number of responses by participants on each survey. Alpha for all tests of significance was set at .05.

RESULTS

Response Rate

To determine whether the proportion of the respondents were equivalent for the two survey delivery methods, a *z* score ($z = -.485, p = .313$) was calculated, with the proportions not being found to be significantly different. Overall, 159 (52%) of the 306 surveys were returned to the researchers. More specifically, 78 (51%) of the 153 Internet-based surveys and 81 (53%) of the 153 mail surveys were returned in usable form. In addition, 2 (1%) of the mail surveys were returned unusable. Internet-based and mail survey response rates are displayed in Table 1.

Response Speed

On average, it took 9.22 days for the Internet-based surveys and 16.43 days for the mail surveys to be returned over the two rounds of distribution. A *t* test analysis [$t(157) = 4.21, p < .001$] indicated a statistically significant difference between the response speed of Internet-based and mail surveys. Power was calculated to be .998 with an η^2 of .101. The speed of Internet-based surveys was significantly faster than that of mail surveys in being returned to the researchers. Figure 1 presents a breakdown of usable surveys returned by day and method.

Response Completeness

Respondents to the Internet version of the survey completed 22.51 of the 35 possible items, whereas respondents to the mail version of the survey completed 16.88. A *t* test analysis [$t(157) = -5.14, p < .001$] indicated a statistically significant difference between the response completeness

Table 1
Response Rate for Internet-Based and Mail Surveys

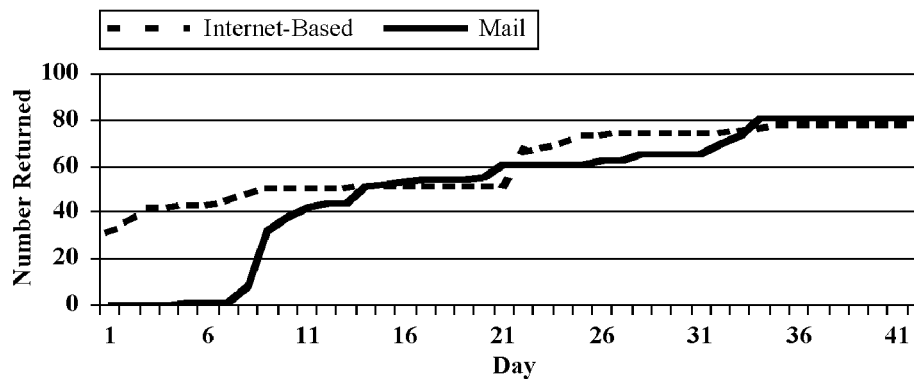| Survey Response	Internet-based (N = 153)		Mail (N = 153)	
	No.	%	No.	%
Surveys returned completed	78	51	81	53
Surveys returned unusable	0	0	2	1
No reply	75	49	70	46

Figure 1. Cumulative response distribution by survey method.

of Internet-based and mail surveys. Power was calculated to be .999, with an η^2 of .144. The response completeness for Internet-based surveys was significantly higher than the response completeness of mail surveys.

CONCLUSIONS AND DISCUSSION

Generalizing beyond the actual participants is not possible given the nonprobability method of their selection. In addition, it was assumed that the participants receiving the e-mail message directing them to the Educators' Survey Web site had access to the Internet. Although there is no evidence to the contrary, this assumed Internet access might not necessarily have been the case. Despite the limitations, this study is significant in that it has added to the body of knowledge comparing the results of a new method of survey distribution (Internet-based) with an established method of survey distribution (mail). Thus, the results of this study lend support to several conclusions.

First, both Internet-based and mail survey distribution methods achieved similar return rates. The usable return rates in the present study examining the return rates for Internet-based and mail distributed surveys were 51% and 53%, respectively. The finding that, for all practical purposes, there was no difference in the return rates of Internet-based and mail distributed surveys is a considerable improvement over the result of other on-line survey delivery methods relative to mail delivered surveys (i.e., e-mail). In nearly all cases, e-mail distributed surveys have produced considerably lower rates of return than have mail distributed surveys (e.g., Bachmann et al., 1996; Kittleson, 1995; Mavis & Brocato, 1998; Schuldt & Totten, 1994; Tse, 1998). Second, the response speed of Internet-based surveys was significantly faster than the response speed of mail surveys. This finding is consistent with findings about other forms of on-line distributed surveys (e.g., e-mail) when compared with mail distributed surveys (e.g., Bachmann et al., 1996; Mavis & Brocato, 1998; Oppermann, 1995). Third, the response completeness of Internet-based

distributed surveys was significantly higher than the response completeness of mail distributed surveys. Results of this study are inconsistent with results of studies in which the completeness of e-mail and mail surveys was compared (Mavis & Brocato, 1998; Mehta & Sivadas, 1995; Tse, 1998). Specifically, Internet-based surveys produced significantly higher levels of completeness in this study, whereas e-mail and mail surveys produced similar response completeness results in earlier studies.

IMPLICATIONS FOR PRACTICE

This study has provided insight for the use the Internet-based survey delivery method when compared with the established mail survey delivery method. The most significant limitation of the Internet-based survey delivery method is the nonprobability sampling of participants. If researchers want to generalize to an entire population, the Internet-based survey delivery method may not be a viable option for several reasons. First, all individuals in the population would need to have an e-mail address and access to the Internet or be excluded from the study by default. Second, members of the population whose e-mail addresses were inaccurate or inoperable would also be excluded from the study. Third, in most cases, it would be assumed that participants listing e-mail addresses would also have access to the Internet, and this may not necessarily be the case. Thus, the major limitation of Internet-based surveys may indeed be the inability to generalize beyond the participants. Generalization may become less of a concern as more individuals secure e-mail and Internet access. In fact, "e-mail access has reached nearly 100 percent for some groups of survey interest, such as company employees and association members" (Schaefer & Dillman, 1998, p. 378).

Like other steps in the research process, investigators must carefully evaluate the choice of a survey delivery method. Given the relatively new and limited use of the Internet as a survey delivery tool, it may be necessary to limit the use of Internet-based distributed surveys to popula-

tions in which all participants are known to have e-mail and Internet access and to situations in which the sensitivity of questions require anonymity.

RECOMMENDATIONS FOR FURTHER RESEARCH

On the basis of the review of related literature and the analysis of data, the following recommendation for further research are offered:

1. This study should be replicated and include a follow-up component. The follow-up component should be directed toward Internet-based respondents and nonrespondents to determine why they did or did not respond to the survey. Studies of this nature could offer insight into why participants elect to respond or not respond to Internet-based surveys. The result could be the establishment of a protocol when using the Internet-based survey delivery method.

2. An Internet-based survey study should be conducted with a shorter time frame between follow-up activities. Most (85%, $n = 66$) of the 78 usable responses to the Internet-based survey in this study were received within 1 week of the initial or follow-up contacts, suggesting that a quicker follow up turnaround time may be appropriate with Internet-based surveys.

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