How You Ask Counts:

A Test of Internet-Related Components of Response Rates to a Web-Based Survey

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Previous research on web-based surveys lacks systematic tests of Internet-related factors of unit response rates. Strategies that do not rely on more expensive and time-consuming methods to improve response rates are important for maximizing the utility of this survey mode in social science research. This article presents detailed analyses of response rate data from a two-stage experiment embedded in a web-based survey. These data show that contrary to some previous assertions, theoretically consistent Internet-related strategies for meaningfully improving response rates to web-based surveys exist and that further attempts to identify these mechanisms should focus on invitation and reminder e-mails. This idea is a departure from previous analyses that examine survey content and presentation for sources of variability around web-based survey response rates.

Keywords: *Web-based survey; response rate*

Convincing research has shown that a web-based survey is not yet an appropriate mode in and of itself for surveying representative samples of the general population (Kaye & Johnson, 1999; Miller, Miller Kobayashi, Caldwell, Thurston, & Collett, 2002; Schaefer & Dillman, 1998). However, the potential for web-based surveys is not restricted to studies of the general population. Large amounts of social science research entail survey data collection from samples with active Internet user data, such as with lists produced by some sampling firms and populations in applied work with service providers' clients. Using the Internet to inexpensively collect data from these populations—groups about which basic parameters such as population size and member location are well documented—is likely the most promising employment of this burgeoning survey mode.

Few options for increasing response rates to web-based surveys outside of incentives and follow-up paper or telephone surveys have been offered in the literature (Couper, 2000; Schaefer & Dillman, 1998; Sills & Song, 2002). A multimode approach is probably necessary in most populations to achieve exceptionally high response rates, however, the Internet is playing an increasingly prominent role in collecting the first round of data in many studies. Little evidence can be found to suggest factors related to web-page content bear strongly on unit response rates, and many conclusions of how to increase web-based response rates are derived post hoc (Kaye & Johnson, 1999; Saxon, Garratt, Gilroy, & Cairns, 2003). Previous research is clearly limited in the way of Internet-related strategies to reduce noncoverage error through higher unit response rates. Yet for mail and telephone-based surveys, strategies abound for increasing response rates that use the same medium of the survey itself (e.g., a

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prenotification mailing for a mail-out survey or a specific script to be read at the beginning of a telephone survey) (Dillman, 1978, 2000; Yammarino, Skinner, & Childers, 1991).

Preceding attempts to identify sources of web-based survey response-rate variance have dealt with presentation of survey content (Couper, Traugott, & Lamias, 2001; Dillman, Tortora, Crandt, & Bowker 1998; Kaye & Johnson 1999). Instead, I investigated the e-mail invitation used to entice respondents to determine if it is a source of Internet-related mechanisms of response rates to web-based surveys.

Through imbedded experiments in a large company's services evaluation survey, I examined unit and item response rate data that show the intersections of time, number of requests, and request type as varied in the invitation e-mail significantly affect the rates at which respondents initiate and complete web-based surveys. Among other services, the company provides a free daily e-mail newsletter to clients who subscribe to the service. A simple random sample of 7,600 subscribed U.S. clients was drawn to participate in the web-based survey. The company only records e-mail addresses of individual users for a subscription, a feature that recipients of this service indicate helps comfort their concerns of personal information privacy. Addresses where initial contact e-mails were returned as invalid were removed from the study, resulting in a total of 7,496 members of the sample.

We sent members of the sample a total of three e-mail invitations/reminders to participate in the anonymous 20-item survey using no explicit incentive. We sent the initial invitation e-mail on a Monday morning. Because of technical problems, we sent only one half the initial invitations before work hours EST; the remainders were sent during lunchtime. This caveat is important, as it caused a substantial effect detailed in the Results section. We sent the next e-mail before work hours 2 days later. The third and final e-mail was sent before work hours the following Monday, 7 days later. We deemed data collection complete 1 week thereafter.

Because the sample contains addresses from a variety of host servers, it is extremely difficult—if not unethical—to obtain information about Internet activity of individual users unless it comes from the user. Therefore, we did not determine whether individuals who had valid e-mail addresses checked their e-mail during the period when the study was conducted. However, Couper et al. (2001) noted that in their sample of university students, these individuals were too few to warrant concern.

IMBEDDED EXPERIMENTAL DESIGN

Three experimental conditions were imbedded in invitation/reminder e-mails for the web-based survey of customer opinion. All conditions pertain to content in the invitation/reminder e-mails sent to participants throughout the experiment. The content of the survey remained the same for all conditions during the course of the current study. Exchange theory, which views behaviors such as completing a survey as fundamentally a negotiation of costs and benefits, was used to formulate meaningful experimental manipulations (Dillman, 2000; Homans, 1958). This internal process of negotiation is varied systematically through time estimates, request types, and last-chance survey lengths.

Experimental Conditions

The experiment was a two-stage design, where the third manipulation was not carried out until the final e-mail invitation. Because the participants in the current study were not aware their data were being collected for experimental reasons, survey results as well as an announcement of the imbedded response rate experiment were posted to all newsletter readers on the subscriber web site. The exact wording of these manipulations across the three invitation/reminder e-mails is found in the appendix.

Time estimate. The short condition informed respondents the survey should take 3 to 5 minutes to complete. The long condition reported 10 to 15-minute expected completion time. Both time estimates are tenable—one liberal and the other somewhat conservative. Again, the survey itself was identical for participants in both manipulations. Only the estimate reported on the e-mails differed. If the invitation/reminder e-mails operate consistent with the basic premise of exchange theory, respondents will be more likely to complete a survey they suspect is short because it requires less effort than a survey they expect to be long.

Request type. Respondents in the plea condition received e-mails where the subject line pleaded for the opinions of the respondent to improve the company's services. In terms of exchange, the plea-request type was expected to increase the intrinsic reward of participating in the study by issuing requests for help. To avoid any confounding of results in the request-type condition because of the amount of subject line characters allowed by users' e-mail software, the subject lines of the plea and offer conditions were nearly identical by total number of characters.

Last-chance survey length. Respondents in the shortened condition were sent an e-mail that said the survey had been shortened from the original survey length. However, the survey was identical to the original version. Although this manipulation admittedly deceives respondents in this condition, its effect is relatively harmless. For respondents who are originally quoted a 10 to 15-minute response time, it is likely when they actually take the survey to spend less than that estimate. For respondents quoted 3 to 5 minutes, the survey can realistically only be shortened by 2 minutes, otherwise it would truly take "no time at all." To be certain respondents were aware of the original time estimate quoted to them, it was repeated according to the respondent's time estimate condition. The potential harm to respondents who are not expecting 2 extra minutes of survey is offset by the ease with which a person can simply exit his or her Internet browser to quit the survey.

This step was necessary to test the possible interaction between the time estimate and last-chance survey length variables. In particular, I predicted the exchange-based reward of the shortened last-chance survey would be predicated on the initial reported length of the survey. Although a shortened survey should create a more favorable exchange equation for all respondents, I expected this effect would be amplified for respondents who were initially quoted a longer survey.

Ensuring Data Accuracy

As noted in most previous research, web-based surveys pose new problems for data accuracy that are not encountered by other survey modes (Heerwegh & Loosveldt, 2002). All e-mail messages were sent in plain text format; words requiring special emphasis were printed in all caps. Last, to prevent users from accidentally taking the survey multiple times, a program was included in the survey web site that stored in users' computers (through cookies) information that the user had already completed the survey.[1] If the user had cookies enabled—as most casual users do—a screen would appear that informed the respondent he or she had already taken the survey.

STAGE 1 FINDINGS: TO PLEAD OR BE BRIEF?

The first stage of the experiment involves the first and second e-mail requests for participation. With no incentive and only two e-mail invitations, the total response rate in Stage 1 reached 24%. During this first stage, time estimate and request-type manipulations are carried out. Collectively, the short time estimate manipulation in Stage 1 accounts for an increase of 75 responses, or 4% of total responses. The plea condition elicits an increase of 95 responses, otherwise represented as 5% of total responses. The collective impact of the two manipulations results in statistically significant increases in response rates, χ^2 (3) = 8.6, $p <$ .05. Further examination of the 2×2 table indicates are higher than expected response rates are found in the short-time estimate/plea condition and lower in the long-time estimate/offer condition. Together, differences in observed and expected frequencies in these two cells accounts for 99% of the variance in the chi-square value. As such, time estimate and request-type effects are expectedly additive (Dillman, 2000). Both variables perform as suspected under the guise of exchange theory, suggesting web-based survey response rates operate very similar to other survey modes (Schaefer & Dillman, 1998).

As mentioned briefly earlier, a technical problem in the first-round mailing caused one half the invitation e-mails to be sent during lunch hours rather than during the early morning. Fortunately, the halves were split along the final experimental manipulation not yet carried out, last-chance request length. Therefore, one half the respondents in each cell of the Stage 1 2×2 design received the initial invitation e-mail during midday. More interesting, those who receive the e-mail during this time period are substantially less likely to respond than those who receive the e-mail before standard work hours EST, χ^2 (7) = 51.8, $p < .001$. This serendipitous finding suggests future research is needed to examine the role of time of day for mailing on response rates to web-based surveys.

The data also allowed me to test whether responses to the first two e-mail invitations are immediate or delayed. I examined observed frequencies of "following day" responses—responses submitted a day or later than the invitation was sent out—against expected frequencies distributed according to the number of responses submitted the day of the invitation. If a chi-square test proves significant, it means the number of responses from "following days" is affected differentially by experimental conditions instead of following the distributions expected from response rates of the initial day. These tests for the first and second e-mails show a significant effect for the first invitation e-mail, χ^2 (3) = 32.7, $p < .001$, however, no such effect for the second invitation/reminder e-mail, $p > .05$. Respondents in the long-time estimate condition are much more likely to wait a day to complete the survey than respondents who are invited to take a short survey.

Despite the significant effects of the two variables manipulated in Stage 1, the question remains whether the invitation itself is a detractor for those in the offer and long conditions, or whether nonrespondents actually visited the web site only to quit before submitting the survey. Although we did not track individual users for technical and privacy reasons, we did maintain record of the number of times all users viewed the first page of the survey. The number of page views represents the maximum number of potential respondents; this value minus the number of completes represents the most liberal estimate of respondents who view the survey and decide against completing it. For example, if potential respondents in the long-time estimate condition are more likely to visit the site and decide against completing the survey, differences in observed number of page views and expected number of page views according to complete rates will emerge.

Tests for these effects are conducted separately for the first and second invitation e-mails. The data show, however, that no more page views than expected are found by condition following the first invitation e-mail, $p > .05$, or the second e-mail, $p > .05$. The influence of the invitation/reminder content appears thus far to extend only to "transporting" the respondent to the survey, with no identifiable independent influence on completion rates. Overall, the rate of completed surveys to page views is high in Stage 1, with an average of 82% across the 4 conditions.

STAGE 2 FINDINGS: REDUCING RESPONDENT WORKLOAD

The second stage of the experiment involves only the third (final) invitation/reminder e-mail. This stage continues manipulations from Stage 1 while adding a third manipulation, last-chance survey length. Quite simply, inviting yet-to-participate members of the sample to take a shortened survey does not increase response rates over those who are invited to take the unchanged survey. This finding is particularly surprising because shortening the survey is critical to favorably altering the balance of rewards and cost of exchange theory.

Higher than expected third e-mail response rates (8%) are found among respondents who believe the survey will take a long time to complete (long-time estimate) but who also were recruited through a plea for their help (plea-request type). The other one half of respondents who believe the survey will take a long time to complete did not receive a plea for help and thus responded to the final e-mail request at one half the rate (4%) of their long-time estimate counterparts. If a plea is not submitted, the final request will be less efficacious for long surveys than short surveys. Although it is possible that the shortened last-chance survey effect is suppressed because the differing delivery times of the first invitation is confounding, it is doubtful given the 1-week lag between the first and third e-mail delivery times.

Just as was possible with Stage 1 results, so, too, are Stage 2 findings potentially attributable to differences in completion rates among respondents who view the survey web site. Just as it was tested in e-mails from Stage 1, the page view to complete survey rates following the third e-mail are statistically similar across condition, $p > .05$.

Although I established that differences in page view to complete rates are not attributable to experimental conditions, a noticeable drop in complete survey to page view rates is found between the two stages of the experiment. The overall increase in page views that do not result in completed surveys is statistically significant over the three invitation/reminder e-mails, $\chi^2 (2) = 11.0$, $p < .005$. The effect appears to be linear, where more potential respondents exit the survey before completing it as time progresses. Figure 1 plots the total number of completed surveys next to the total number of page views over time. Note the gap between the two lines increases after successive invitation/reminder e-mails.

DISCUSSION AND CONCLUSION

Of the three basic strategies tested to improve web-based response rates through e-mail invitation/reminder content, two expected effects are supported by the data. First, the data show that a short expected completion time results in higher response rates to a web-based survey. The data also show that respondents who do choose to take a long survey from the first request are more likely to wait before completing the survey. I proposed this lag occurs because respondents who expect to take a longer survey find it necessary to better plan when they are able to devote their time. If so, this finding has two implications. First, it would mean

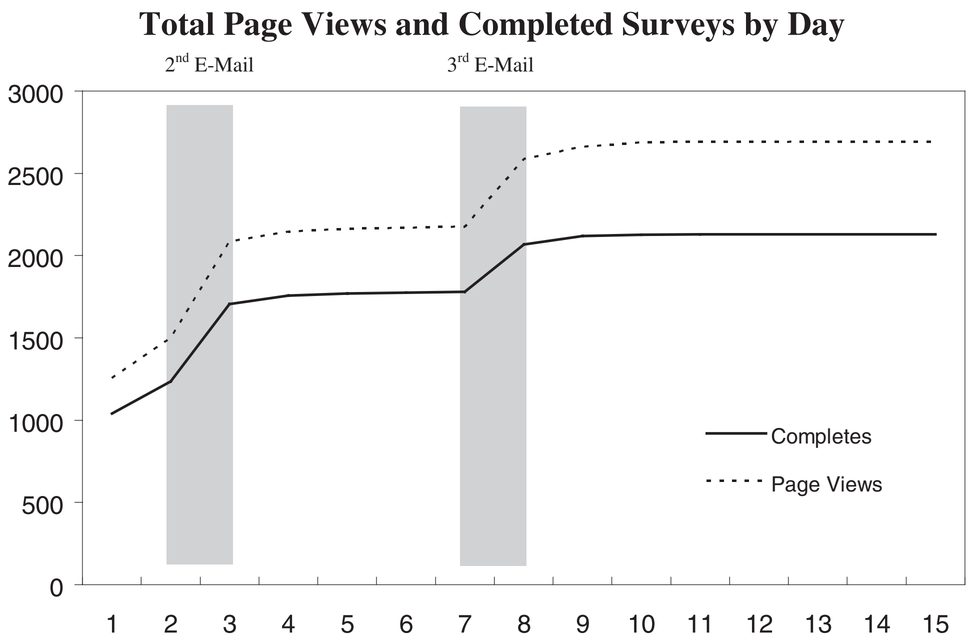

Figure 1: Total Page Views and Completed Surveys by Day

that many respondents to web-based surveys choose to participate at the first invitation, whether they take the survey immediately or wait. Second, it would probably mean that a number of well-intentioned respondents fail to complete a long survey because they either cannot find the time or simply put the task "on the back burner," only to later forget.

The second basic strategy shown to improve web-based response rates through invitation/reminder e-mail content is pleading for the help of the respondent in the subject line of the e-mail. The experiment shows a consistent positive effect of the subject-line plea throughout the two stages of the experiment. A fine line exists between asking for help and sounding desperate, but if navigated appropriately this strategy can have a constructive effect. This interpretation is qualified, however. Because the service evaluated in this study is free to subscribers, pleading for help might be more effective than it would for surveys of customers who pay for a service.

Offering a shortened survey in the final request e-mail has no impact on response rates, regardless of whether the initial survey is short or long. The absence of this effect is particularly surprising, as exchange theory forecasts potential respondents who are initially turned off to the survey because of length should find the prospect of a shortened survey more appealing. Again, further testing to decompose this finding is required.

These findings are important for two key reasons. First, they show that Internet-related factors of web-based surveys response rates do exist and operate in manners generally consistent with extant theory. Second, they indicate with little question that the e-mail invitation to participate in a web-based survey is a prime source of variability within unit response rates.

APPENDIX
Invitation E-mail Conditions (experimental conditions in italics)

Subject Line

Mailing 1 & 2	*Plea*	Please help [Name of Company] with your advice and opinions
	Offer	Share your advice and opinions now with [Name of Company]
3	*Plea*	Please take some of your time to help [Name of Company]
	Offer	Take some of your time to share with [Name of Company]

Body

Mailings 1 & 2

We are conducting a survey of subscribers to our free daily e-mail newsletter. We would greatly appreciate you taking time to tell us what you think about our services.

Short	The survey should take 3 to 5 minutes to complete.
Long	The survey should take 10 to 15 minutes to complete.

Mailing 3

If you have already completed the [Name of Company] survey, thank you!

For those of you who have not had a moment to take the survey, we are looking for your thoughts as a subscriber to our free daily e-mail newsletter. We would greatly appreciate you taking time to tell us what you think about our services.

Short	The survey should take 3 to 5 minutes to complete.
Long	The survey should take 10 to 15 minutes to complete.

NOTE

1. Using cookies to store user information is an effective way to prevent most casual Internet users from taking a web-based survey multiple times, however, this tool can also be misused to invade user privacy (Cho & LaRose, 1999).

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