Appendix A

LITERATURE REVIEW OF RESPONSE RATES

In this appendix, we give a detailed account of the Internet survey literature with respect to response rates in particular. The following sections are structured around the number of response modes that were used in each study (single response mode versus dual-response mode) and by Web versus e-mail response modes.

Single Mode: Web

Studies on the use of the Web as a response mode vary widely in terms of the nature of their target populations, how respondents are recruited, and whether any attempts at statistical adjustment are made in the studies' analyses. In this section, we discuss surveys that primarily or exclusively used the Web as the response mode. We broadly classify these surveys by their method of recruiting respondents: through preselected samples, censuses and probability samples, convenience samples, or hybrid samples. By "preselected," we mean that the respondents were selected and screened to meet specific criteria for responding to a Web survey. By "hybrid," we refer to various or multiple combinations of probability-based and convenience-based methods used to recruit potential respondents.

For Web surveys that used either preselected or probability samples, we compared outcomes in terms of the response rates that were achieved. However, response rates cannot be computed when respondents are recruited through convenience sampling, such as through various forms of advertising, or if the survey is simply posted on the Web for anyone to complete. There are situations in which convenience sampling does allow for the computation of completion

rates, which is defined as the ratio of the number of surveys returned to the number of requested surveys. However, in these cases, it is not clear that a high completion rate conveys anything that is particularly meaningful or relevant about the respondents.

We begin by discussing one organization's extensive efforts at evaluating the Web as a survey medium: the United States Census Bureau's Computer Assisted Survey Research Office (CASRO). The U.S. Census Bureau has been actively engaged in research related to electronic surveys (such as CSAQs) for the past decade. The Census Bureau started using CSAQs in 1993 and 1994 by mailing DOS-based diskettes to respondents. From 1996 to the present, CASRO has fielded CSAQs by mailing Windows-based diskettes to respondents and by sending CSAQs via the Web. The first Web CSAQ was conducted in 1997 and, as of this writing, nine more have been fielded, four more are in production, and four are under development. Much of CASRO's completed work, which we concentrate on here, was directed toward business surveys, such as the Industrial Research and Development survey.

Table A.1 lists Web surveys of preselected potential respondents, which are from Sedivi Gaul (2001) and Nichols and Sedivi (1998). With the exception of the Manufacturers' Shipments, Inventories, and Orders Survey, for which the survey team also sent a paper survey in the initial mailing, these surveys were conducted solely via the Web. The table shows that careful preselection can result in high response rates. The exception is the 1998 Company Organization Survey, for which the low response rate was attributed to the use of an encryption level that resulted in many potential respondents not being able to access the survey (168-bit encryption was used versus the more common 128 bit). Lowering the encryption requirement to 128 bit in 1999 resulted in a significantly better response rate.

It is worth noting here that the U.S. Census Bureau put considerable effort into carefully designing and extensively testing these instruments to make them as user friendly as possible. For example, the Industrial Research and Development Survey instrument for the Web was written completely in house in HTML and JavaScript. The program was designed perform real-time branching and editing, opening in its own browser window with "help" information and edit

Table A.1

Response Rates for U.S. Census Bureau Web-Based Surveys (Sent to Preselected Organizations)

Survey	Sample Size	Response Rate
Manufacturers' Shipments, Inventories, and Orders Survey, 2000	73	89%
Company Organization Survey, 1999	194	75%
Company Organization Survey, 1998	48	27%
Industrial Research and Development Survey, 1997	50	68%[a]

[a]After the Web survey phase was completed, paper surveys were mailed to the nonrespondents. Thirteen respondents subsequently returned the paper version, for a total response rate of 96 percent.

capabilities built in. Respondents could partially complete the survey, close the application, and then return later to continue the survey. The instrument had a menu bar on the right side of the screen that permitted immediate branching to any section in the survey, so respondents could choose to work through the instrument sequentially or jump around in any order they preferred. In addition to automatically writing the data to a database, the software also recorded how respondents moved through the instrument—information that could be used to improve future survey instruments. Nichols and Sedivi (1998) provide a detailed description of the design and evaluation process.

Table A.2 presents results for other studies that used the Web as the primary or only response mode and used censuses or probability samples. This table shows more-modest response rates than those in Table A.1.

Couper (2001) conducted an experiment in which 7,000 University of Michigan students were randomized to receive a survey about drug and alcohol use; 3,500 potential respondents received a mail survey and 3,500 were notified of an equivalent Web-based survey. Respondents in both groups received an incentive consisting of a $10 gift certificate. The Web-based survey achieved an almost 62-percent response rate compared with a response rate of slightly less than 41 percent for the mail survey.

Table A.2

Response Rates for Web-Based Surveys Using Censuses or Probability Samples

Survey	Sample Size	Response Rate	Population
Couper (2001)	7,000	62%	University of Michigan students
Asch (2001)[a]	14,150	8%	College-bound high school students and college students
Everingham (2001)	1,298	44%	RAND employees
Jones and Pitt (1999)	200	19%	University staff
Dillman et al. (1998)[b]	9,522	41%	Purchasers of computer products
Dillman et al. (1998)[c]	2,466	38%	Purchasers of computer products

[a] Most respondents were contacted via their parents, which reduced the response rate.
[b] A relatively plain Web survey design was used in this experimental arm.
[c] A relatively elaborate Web survey design was used in this experimental arm.

Asch (2001) contacted a random sample of college-bound high school youths and college students by mail (via their parents) and asked them to participate in a Web survey.[1] Nonrespondents were subsequently contacted in a follow-up mailing, which included a mail survey. The study used incentives and several follow-ups, including phone follow-ups to a subset of the sample. The overall response rate was almost 21 percent, of which almost 8 percent answered via the Web. This study is described in more detail in Chapter Six.

Everingham (2001) conducted a "Work/Life Balance Survey" via the Web in early 2000 at RAND. The survey consisted of slightly more than 80 questions about quality-of-life programs. Respondents in two geographically separate offices were initially contacted through an e-mail that contained a link to the survey Web site. Ultimately, 44 percent of the eligible office staff members responded to the survey. Because the target population was employees, Everingham was able

[1] Contacting the sample was complicated and that complication impacted the overall response rate for the survey. In general, the young adults were first contacted through a letter sent to their parents at the parents' last known home address. Parents were then asked to forward the survey material to their sons and daughters.

to compare the demographics of respondents and nonrespondents and the two groups were found to differ only in one dimension: gender. A larger fraction of the respondents was female (59 percent) compared with a fraction of the total population that was female (50 percent) and this difference is reasonably attributable to the survey subject matter. While no equivalent paper-based survey was distributed to allow for direct response-rate comparisons, RAND had previously fielded a paper-based survey on dependent care in 1990 that achieved a significantly higher response rate (more than 90 percent). Whether some or all of the differences in response rates between the two surveys can be attributed to differences in the survey delivery mode cannot be determined.

Jones and Pitt (1999) sampled staff at ten universities whose staff directories were available on the Web. They compared three study arms: contact and response by e-mail; contact by e-mail and response via the Web; and contact and response by mail. The response rates for the three study arms were 34, 19, and 72 percent, respectively.

Dillman et al. (1998) conducted a survey of purchasers of computer products who were at least 18 years of age and had used the Internet from home, school, or work for at least one application other than e-mail in the past month. Dillman et al. obtained a sample of purchasers of computer products and attempted to contact each potential respondent by phone up to five times. Those who agreed to participate were then asked to respond on the Web and were sent an incentive of two dollars. Respondents who initially agreed to participate but then did not were sent follow-up reminders by e-mail (their e-mail addresses were obtained during the initial phone contact). The study had two arms: one using a relatively plain Web survey design and one using a relatively fancy design. (The more-elaborate surveys take longer to load on the computer.) The overall response rates were 41 percent for the plain survey and 36 percent for the fancy one. Dillman concluded that the plain design worked better but also speculated that as Internet access speed increases, this difference may decrease significantly.

There are a number of studies that use convenience samples; often respondents are recruited through advertisements of some form. As we have noted in this report, for studies using convenience samples,

response rates cannot be computed or are meaningless. Flemming and Sonner (1999) reported on two Web surveys involving convenience samples. In one, individuals who visited the Pew Research Center Web site were given an opportunity to fill out a Web survey. In the other, respondents to an RDD phone survey were asked if they were interested in participating in an unrelated Web survey. Because both sets of respondents form convenience samples, response rates are not given.

Kaye and Johnson (1999) conducted a Web survey about uses of the Web for obtaining political information. Participants were recruited through newsgroup postings and Web site links. In a social science study of geographic mobility and other related topics, Witte et al. (2000) recruited a large number of respondents: 32,688. The survey design was unusual; it used a base module and four optional extension modules and respondents could elect to answer all of the extension modules.

Vehovar et al. (1999) conducted a large-scale survey targeted at the Internet population of Slovenia, which corresponds to about 13 percent of the country's total population. They sent out 19,000 e-mails and advertised widely in traditional media. Coomber (1997) conducted a survey on the practices of illegal drug dealers. His target population was dealers worldwide. Coomber solicited responses by e-mail and through advertising, and collected responses on the Web (with a very small number of respondents responding by mail) in the hope that the participants would be encouraged to respond honestly because of the perceived anonymity.

Dual Modes: Web and Mail

The number of studies that allow respondents to choose either a Web or postal mail response mode is small. Nevertheless, these studies are important because, for many populations, the fraction of respondents who can answer via the Web may not be sufficiently large to make a Web response option economical, in which case mail is the most-appropriate alternative mode. Table A.3 summarizes these dual-mode studies, reporting the percentage of individuals who responded via the Web compared with the percentage that responded by mail.

Table A.3

Studies Allowing Respondents to Choose a Web or Mail Response Mode

Study	Total Sample Size	Percentage Who Chose to Respond by … Mail	Web	Overall Response Rate	Population
Sedivi Gaul (2001) and Griffin et al. (2001) (American Community Survey, 2000)	9,596	95%	5%	38%	U.S. households
Sedivi Gaul (2001) and Griffin et al. (2001) (Library Media Center Survey, 1998)	924	95%	5%	38%	Librarians
Sedivi Gaul (2001) and Griffin et al. (2001) (Library Media Center Survey, 1999)	13,440	81%	19%	63%	Librarians
Quigley et al. (2000) (DoD study)	36,293	77%	23%	42%	U.S. military and spouses
Quigley et al. (2000) (DoD study)	36,293	83%	27%	37%	Civilians
Zhang (2000)	201	20%	80%	78%	Researchers
Schleyer and Forrest (2000)	405	16%[a]	84%	74%	Dentists

[a]The response mode in this case was either e-mail or fax.

NOTE: The Quigley et al. entries represent two arms of the same study.

Table A.3 lists the results of two U.S. Census Bureau surveys from Sedivi Gaul (2001) and Griffin et al. (2001)—the American Community Survey and the Library Media Center Survey. In contrast to the respondents to the surveys listed in Table A.1, the respondents to these surveys were not preselected and were also provided with a paper survey. With these surveys, there is a definite negative effect on Web response rates when respondents are not prescreened and

when respondents are given another response mode as an alternative to the Web.

The results are mixed for the remaining studies listed in Table A.3. In Zhang (2000) and Schleyer and Forrest (2000), respondents were initially contacted by e-mail; 80 percent of the respondents in the Zhang study and 84 percent of the respondents in the Schleyer and Forrest study responded via the Web. In contrast, the respondents in the two arms of the Quigley et al. (2000) study were contacted via mail; only 23 percent of the respondents in one arm of the study and 28 percent in the other responded via the Web. The studies of Zhang and Schleyer and Forrest typically involve groups of respondents who are largely or entirely computer literate and comfortable with electronic communication. By comparison, the respondents in the Quigley et al. study and American Community Survey study by Sedivi Gaul and Griffin et al. tend to more closely approximate a general cross-section of the U.S. public in terms of computer usage and familiarity.

Quigley et al. (2000) reported on a study by the U.S. Department of Defense (DoD) involving a random sample of 36,293 participants, 52 percent of whom were active-duty personnel, 33 percent were military spouses, 9 percent were civilians working in military settings, and 5 percent were reserve members. The study consisted of three arms, two of which allowed respondents to reply by either mail or the Web. In all cases, the respondents were initially contacted via postal mail. The study design included a prenotification mailing and three follow-up mailings.

In the Quigley et al. mail-with-Web-option study arm, paper surveys were sent out (except with the prenotification) and each contact with respondents (including the prenotification) provided the address for responding via the Web if desired. The final response rate was 42 percent. Of those who responded, 23 percent chose to respond via the Web and 77 percent by mail. In the Web-with-mail-option study arm, respondents were expected to reply via the Web. They were also given the option to request a paper survey, but very few people took advantage of that option. Because of the poor response rate, a mail survey was included with the third follow-up, which significantly boosted the final response rate to 37 percent. Of those respondents, 27 percent chose to respond via the Web and 73 percent chose to

respond by mail, and most of that 73 percent responded only to the third follow-up that included the paper survey. In contrast, the mail-only study arm had an overall response rate of 40 percent.

Zhang (2000) conducted a survey of researchers who were scheduled to have their papers published in library science journals. The respondents, who were initially contacted via e-mail, could respond via the Web or could request a mail survey. In the third of three follow-ups, a paper survey was also sent by postal mail. The total sample size was 201 and ultimately a 78 percent response rate was achieved. Of that 78 percent, 80 percent chose to respond via the Web and 20 percent by mail.

The third follow-up generated more mail than e-mail responses, indicating that there is a slice in the target population who will not or cannot fill out a Web survey and will not request a mail survey, but will participate in a mail survey if the questionnaire is sent to them directly. The total number of respondents to the third follow-up was very small (roughly a dozen surveys were obtained by mail and a half-dozen via the Web).

Not surprisingly, a comparison of respondents by response mode showed that those who responded via the Web had a higher self-perceived overall ability to use the Internet, were using the Internet more frequently, and were younger that those who responded by mail. Nevertheless, some of the mail respondents were also highly experienced Internet users.

Schleyer and Forrest (2000) assembled a convenience sample of 450 e-mail addresses in order to conduct a survey about clinical practices among dentists. Schleyer and Forrest obtained the e-mail addresses from large Internet discussion groups for dentists. Their survey consisted of 22 questions that were initially pilot tested. Nonrespondents received three follow-up e-mail contacts. Schleyer and Forrest allowed respondents to return their surveys by the Web, e-mail, or fax; they achieved an overall response rate of 74 percent.

Single Mode: E-mail

In general, the research comparing e-mail with other response modes is limited, most likely because that mode was quickly eclipsed

by the Web-based surveys. Most of the e-mail survey studies in the literature are fairly limited in scope and weak in methodology and can be characterized as simple pretests of a new medium rather than careful experimental comparisons of a new survey mode versus existing modes.

However, the literature does contain some fairly rigorous attempts to compare the response rates of surveys delivered via e-mail compared with those delivered via traditional mail. As shown in Table A.4, surveys using e-mail as the sole response mode generally do not achieve response rates equal to those of postal mail surveys.

Note that many of the studies listed in Table A.4 have relatively small sample sizes and that as the e-mail response rate increases so does the mail response rate. This suggests that the improved response rates are likely attributable to an increased overall propensity of the sample to respond because of differences in either the survey methodology or the population. Only two of the studies (Couper et al., 1999; Schaefer and Dillman, 1998) have relatively large sample

Table A.4

Studies Comparing Response Rates for E-Mail and Mail Response Modes

		Response Rate		
Study	Total Sample Size	E-Mail Study Arm	Mail Study Arm	Population
Tse et al. (1995)	400	6%	27%	University staff
Tse (1998)	500	7%	52%	University staff
Schuldt and Totten (1994)	418	19%	57%	MIS and marketing faculty
Kittleson (1995)	153	28%	78%	Health educators
Jones and Pitt (1999)	200	34%	72%	University staff
Mehta and Sivadas (1995)	262	40%	45%	BBS newsgroup users
Couper et al. (1999)	8,000	43%	71%	Federal employees
Schaefer and Dillman (1998)	904	53%[a]	58%	Washington State University faculty
Parker (1992)	140	68%	38%	AT&T employees

[a]Another 5 percent that were returned by mail are not included in this percentage.

sizes, and only one study (Parker, 1992) showed e-mail surveys resulting in a higher response rate than mail surveys. However, the Parker study was conducted very early in the course of Internet surveying and its results are anomalous.

In a survey of administrative and teaching staff at the Chinese University of Hong Kong, Tse et al. (1995) achieved only a 6-percent response rate with an e-mail survey (with a sample size of 200) but a 27-percent response rate with a survey using university campus mail (with a different sample of 200). In a follow-up experiment, Tse (1998) randomly assigned 500 potential respondents selected from the Chinese University telephone directory to receive either an e-mail survey or an equivalent paper survey sent through the campus mail. The result was a 7-percent response rate for the e-mail survey and a 52-percent response rate for the mail survey. Tse et al. did find an average *initial* response time of about one day for those who received an e-mail survey compared with an average response time of 2.5 days for those who received a paper survey through the campus mail. The differences in the response times applied only to those who responded to the first survey mailing and not the subsequent follow-up mailing.

The first Tse et al. mailing was followed by a second mailing to all 500 potential respondents, whether or not they had responded to the first mailing. For the mail survey, 64 percent of those who responded via campus mail did so after the first mailing, and the remaining 36 percent did so after the second mailing. In contrast, 86 percent of those who responded via e-mail did so after the first mailing and only 14 percent responded after the second mailing. Thus, in this experiment, most e-mail survey recipients either responded almost immediately (within one day) or they did not respond at all.

Schuldt and Totten (1994), in surveying management information system (MIS) and marketing faculty, achieved only a 19-percent response rate[2] with e-mail (with a sample size of 218), as compared with a 57-percent mail response rate (with a sample size of 200). Similarly, in a comparison of e-mail versus postal mail surveys,

[2]A total of 343 faculty members were in the initial e-mail sample. Of those, 125 were undeliverable. If those 125 undeliverable e-mails are counted as nonrespondents, the actual response rate is only 12 percent.

Kittleson (1995) found that 153 health education professionals, each receiving both a paper survey in the mail and a similar survey via e-mail, were almost three times more likely to respond to the paper survey as they were the e-mail survey (78 percent versus 28 percent).

Mehta and Sivadas (1995) also conducted an experiment involving e-mail and postal mail surveys in which respondents were randomly assigned to one of five groups: (1) those who were sent surveys via regular mail with no prenotification and no reminders; (2) those who were sent surveys via regular mail with prenotification and reminders; (3) those who were sent surveys via e-mail with no prenotification and no reminders; (4) those who were sent surveys via e-mail with prenotification and reminders; and (5) an international group of respondents who were sent surveys via e-mail with prenotification and reminders. Group 2 also received a one-dollar incentive in the survey package.

The most-direct comparison that can be made in the Mehta and Sivadas experiment is between Group 1 (with a sample size of 202) and Group 3 (with a sample size of 60), neither of which received prenotifications or reminders. In those groups, mail surveys achieved a 45-percent response rate and e-mail surveys achieved a 40-percent response rate. A slightly less-direct comparison is between Group 2 and Groups 4 and 5; Group 2 achieved an 83-percent response rate while Groups 4 and 5 achieved 63- and 64-percent response rates, respectively. However, this comparison may not be a fair one because Group 2 also received a one-dollar incentive whereas the e-mail recipients did not.

A number of conclusions can be drawn from the Mehta and Sivadas study. First, e-mail surveys do seem to benefit from advance notification and follow-up in the same way that mail surveys do; in this case, these additional components increased the response rate almost 25 percentage points. Second, because researchers at this point do not know how to most effectively employ incentives for surveys that are conducted exclusively via the Internet, response rates for Internet surveys may continue to lag until the effect of Internet survey incentives is better understood. In any case, employing incentives can prove to be very successful. In this experiment, the inclusion of just a one-dollar bill in the mail surveys increased response rates by 20 percentage points.

In one of the few studies to randomize respondents to response mode, Couper et al. (1999), in a survey of employees in federal statistical agencies, obtained an average response rate of about 43 percent with e-mail compared with almost 71 percent with mail. The experiment conducted by Couper et al. randomized more than 8,000 employees of five different agencies. Couper et al. chose e-mail over the Web as the survey mode because e-mail was almost universally available in the five agencies whereas Web access was often not available. The entire survey effort was carefully administered following TSD principles. In particular, advance notification was provided for all surveys via agencywide e-mail broadcasts and bulletin board notices, mail surveys were followed a week later by a postcard reminder, and e-mail surveys were followed a week later by an e-mail reminder.

Schaefer and Dillman (1998), as reported in Dillman (2000), conducted an experiment involving e-mail versus postal mail surveys of Washington State University faulty (with a survey sample numbering 904). Using a TDM approach, Schaefer and Dillman divided the potential respondents into four groups. The first group was contacted by postal mail only (prenotification, survey, thank-you/reminder, and replacement survey); the second group was contacted by e-mail only; the third and fourth groups were contacted by a combination of postal mail and e-mail. Schaefer and Dillman achieved a 58-percent response rate with the all-postal-mail group. In comparison, they achieved a 53-percent response rate with the all-e-mail group.

Most of the studies we examined conclude that mail achieves a higher response rate than e-mail; Schaefer and Dillman (1998) and Parker (1992) are the only studies we know of in which e-mail achieved equal or higher response rates when compared with postal mail. Parker conducted a survey of 140 former AT&T employees on matters related to corporate policies for expatriation and repatriation. Parker reported a 63-percent response rate with e-mail (63 returned out of 100 sent by e-mail) compared with a 38-percent response rate for postal mail (14 returned out of 40 sent by mail). Interestingly, Parker attributed the difference in response rates to the fact that, at the time, AT&T employees received a lot of corporate paper junk mail but little or no internal junk e-mail. Therefore, recipients of the paper survey were more likely to ignore the survey than

were recipients of the e-mail version. With the spread of e-mail spam, the situation is likely to be just the reverse today.

The only other published study that noted exceptional response rates with e-mail is Walsh et al. (1992) in which potential respondents were solicited by e-mail and were offered the option to respond by e-mail or request a paper survey by postal mail. Although Walsh et al. did not conduct an equivalent postal-mail-only survey for comparison, for an e-mail survey of a random sample of scientific computer network subscribers (300 from a total population of 1,100), they achieved a 76-percent overall response rate. Walsh et al. also sent nonrespondents two follow-up reminders and employed a lottery prize of $250 as an incentive.

Walsh et al. found that 58 percent of the random sample replied by e-mail and 18 percent responded by postal mail. They also received requests from an additional 104 subscribers (who were not chosen in the sample of 300) to participate in the survey. Of the self-selected 104 subscribers, 96 percent responded by e-mail. Not surprisingly, Walsh et al. also found a positive correlation between a respondent's propensity to respond electronically and the amount of the respondent's network usage.

Multiple Modes: Web or E-Mail and Telephone

We found no studies that evaluate mixed modes using either the Web and the telephone or e-mail and the telephone. This is not particularly surprising given that Web surveys are often used to reduce survey costs and interviewing by telephone is very expensive. However, telephone contact or response may have other benefits, such as improving response rates, and deserves study in this regard.