

WEB SURVEY DESIGN PAGING VERSUS SCROLLING

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Abstract A key choice in the design of Web surveys is whether to place the survey questions in a multitude of short pages or in long scrollable pages. There are advantages and disadvantages of each approach, but little empirical evidence to guide the choice. In 2003 we conducted a survey of over 21,000 undergraduate students. Ten percent of the 10,000 respondents were directed to the scrollable version of the survey, containing a single form for each of the major sections. The balance was assigned to the paging version, in which questions were presented to be visible without scrolling. The instrument contained a maximum of 268 possible questions, including topics that varied in sensitivity and desirability. The survey also permitted comparison of the effect of skip patterns by implementing skip instructions and hyperlinks in the scrollable design, and also recorded time at the end of each of the five topical sections. Differences between designs are evaluated in terms of various forms of non-response, univariate and bivariate measurement properties, and proxies for respondent burden.

Background

Differences in questionnaire layout have long been acknowledged to affect responses (e.g., Jenkins and Dillman 1997; Sanchez 1992; Smith 1995) and response rates (Dillman, Sinclair, and Clark 1993; Jansen 1985) in mail

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surveys. Research on computer-assisted interviewing has shown that features such as real-time validation and automatic skips also affect responses (e.g., Baker, Bradburn, and Johnson 1995; Couper, Hansen, and Sadosky 1997; Ramos, Sedivi, and Sweet 1998). In Web surveys the designer has control over how questions are presented, potentially affecting both nonresponse and measurement error through both layout and functionality of the survey instrument.

There is a continuum of design choices for Web surveys. At one extreme, a scrolling design has all the survey questions displayed in a single Web page that is periodically scrolled by the respondent in order to read, select, and finally submit the responses. A submit button transmits the responses to the Web survey, much like the act of mailing a paper questionnaire. At the other extreme, the paging design involves a separate page with a submit button for each survey question, where each response is submitted prior to receiving the following question, much like a survey interview. Between these two ends, hybrid surveys may provide a mixture of paging and scrolling.

Proponents of each approach offer a variety of reasons for choosing one design over the other, affecting nonresponse, measurement error, and even cost. Although software choice may mandate either design, major surveys such as the National Survey of Student Engagement (<http://nsse.iub.edu/index.cfm>) have been designed as scrolling and paging in different years. It is not the intention of this article to reject the use of either design but to provide empirical evidence for their differences to inform future design decisions.

The implementation of automated skip logic is an important distinction between the designs, as it removes unintentional item nonresponse (errors of omission)¹ and unnecessary burden (errors of commission).² Typically, skips in a scrolling survey behave much like in a paper survey, with the respondent following instructions. However, they can induce measurement error as they can prompt respondents to endorse false responses to avoid answering more questions. Some have argued, but without any empirical evidence, that the use of hyperlinks could facilitate the respondent's task of following the skip instruction (e.g., Dillman 2000). If so, it may reduce respondent burden and unintentional item nonresponse.

Another potential difference in nonresponse between the designs is treatment of missing data through validations. In paging designs, validation can occur immediately after the responses to that item are submitted. Due to the number of questions per page in scrolling surveys, item-missing data are accepted as they would be in mail surveys.

1. Not answering an applicable question.

2. Responding to an inapplicable question.

In the scrolling design, the length of the survey is revealed at the outset, possibly leading to higher unit nonresponse. However, more respondents in the paging survey may start but break off.

Time is often used as proxy for respondent burden and cost to the survey organization. Scrolling designs could take longer because the interface may affect the time spent by respondents in providing answers and moving from one question to the next. However, most paging surveys use server-side programming that is activated between pages. There is some evidence from simple surveys that the scrolling design takes less time (Vehovar, Manfreda, and Batagelj 2000). Hence, it is important to find whether the gains from the automatic navigation in a paging design can counter the additional time for Internet communication between client and server machines.

Consistent with prior literature, Web experiments manipulating the number of questions per page find higher inter-item correlations when the items are placed together (Couper, Traugott, and Lamias 2001; Tourangeau, Couper, and Conrad 2004), the result of higher correlated measurement error (Peytchev 2003). Based on work using the same questions (McCabe 2000), we will examine the relationship between variables for differences in designs.

Methodology

The experiment was embedded in the University of Michigan Student Life Survey, conducted in 2003 as a census of the undergraduate population over the age of 18. This biennial survey is conducted to evaluate tobacco, alcohol, drug use, and related risk behaviors.

The study used student e-mail addresses to contact respondents. Non-respondents were recontacted with a series of up to four reminder e-mails. Students were randomly assigned to a condition, with 10 percent (2,130) assigned to the scrolling design and the balance (19,164) to the paging design. The e-mail invitations for the two versions were identical, as were the survey introductory screens. Once respondents consented to participate in the survey, they were directed to the assigned version of the survey. The paging version is shown in appendix A. In some cases, several related questions were displayed on the same page, but few respondents ever had to scroll to view all questions. This version also contained server-driven skip logic and missing data checks.

The scrolling version of the survey, shown in appendix B, included no automated skip logic or missing data checks. It was designed to utilize only static HTML functionality and included no server- or client-side logic. Following the consent page, the survey consisted of a series of five scrolling pages that were delivered sequentially as respondents progressed through the instrument. Both versions had a section indicator above the questions.

Results

The response rates were not significantly different by version, with 43.6 percent completing the scrolling version and 43.4 percent the paging version (appendix C). We also found no significant differences in the break-off rates by version. Among all who logged in to the survey, 7.3 percent did not complete the scrolling version, compared with 8.4 percent for the paging version. Population files were obtained from the university registrar including student ethnicity, gender, year in school, and total cumulative credit hours completed. Those who responded to the scrolling version did not differ significantly from the paging version in terms of these characteristics, nor did either group of respondents differ from the population on these variables.

The cumulative proportion of break-offs was similar in the two versions over the entire questionnaire (see figure 1). That is, aside from the stepwise break-off by section in the scrolling version, respondents in one version did not abandon earlier than in the other version.

We also examined differences in survey completion time, both for the overall survey and by each individual section.³ Contrary to the findings of Vehovar, Manfreda, and Batagelj (2000), on average the scrolling version took slightly but significantly longer, as shown in table 1. However, the current survey contained

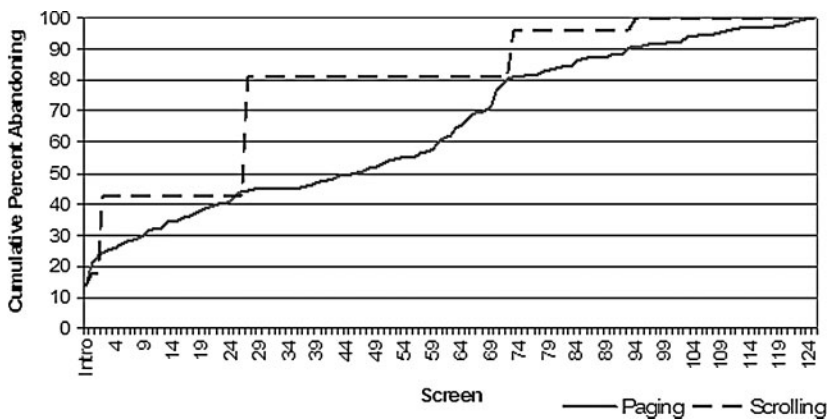


Figure 1. Cumulative percentage of break-offs by point in the survey and survey design.

3. Cases were excluded based on (1) large variation in time across the five sections (using the standard deviation for each respondent instead of a constant cutoff for each section protects “slower” respondents from exclusion); (2) Section D, which had only five simple questions, should have been completed in less than five minutes (more than 99 percent of the sample did so); and (3) cases subjected to additional experiments in the paging version were removed.

Table 1. Time per Section by Design, Use of Hyperlinks, and Time per Section by Use or Nonuse of Hyperlinks among Those Eligible to Skip Questions

Section	Maximum Number of Questions	Scrolling Time in Minutes (SE) <i>n</i> = 760	Paging Time in Minutes (SE) <i>n</i> = 4,327	Number of Possible Links	Number of Questions That Could Be Skipped	Percent of Eligible Who Used Links	Ratio of Links Clicked to Eligible Links	Used Links Time in Minutes (Sample Size)	Did Not Use Links Time in Minutes (Sample Size)
A	32	4.39 (0.07)	4.95*** (0.03)	1	1	7.9	0.08	4.64 (47)	4.25 (535)
B	73	7.59 (0.11)	7.88* (0.05)	7	53	20.4	0.17	6.74 (148)	7.70** (593)
C	103	4.71 (0.07)	3.00*** (0.03)	3	3	22.1	0.20	4.50 (162)	4.79 (594)
D	5	0.98 (0.02)	0.91*** (0.01)	0	0	—	—	—	—
E	55	5.86 (0.07)	6.19*** (0.03)	7	10	25.3	0.22	6.06 (182)	5.81 (577)
All	268	23.53 (0.25)	22.93* (0.10)	18	67	26.3	0.20	22.36 (195)	22.62 (565)

*Significant difference at .05 level.

**Significant difference at .01 level.

***Significant difference at .001 level.

questions that were to be skipped by some respondents, and this was done automatically in the paging version. Advances in bandwidth, browser speed, and Web-related technologies may also account for the direction of the effect. Although differences in all sections were statistically significant,⁴ there was a particularly large time difference for Section C, with the scrolling version taking 57 percent longer than the paging version. Only in this section skip instructions were not possible in the scrolling version, and questions provided a “not applicable” option.

In the paging version skips were handled automatically, displaying only the relevant questions to respondents. In contrast, in the scrolling version skips were facilitated by offering hyperlinks to the appropriate subsequent question. This raises three questions: (1) do respondents use the hyperlinks to help them navigate through the survey’s skip logic; (2) do hyperlinks help respondents complete the survey faster; and (3) does the use of hyperlinks have adverse effects due to respondents’ ability to anticipate the consequences of their selections?

We recorded each use of a hyperlink to skip in the scrolling version. Overall, about one-quarter of those eligible to use hyperlinks (those who chose a response that required a skip) did so (see table 1). There appears to be a learning effect—among those eligible in each section, the proportion using hyperlinks increased over the four sections with links.

The last two columns in table 1 present the average time per section by hyperlink use, among those eligible. The hyperlinks in Section B of the survey involved skips of the largest number of questions, and it was the only section for which the difference in time between those using and not using the hyperlinks was significant (almost a minute difference).

In Section C, where hyperlinks were implemented only for a minority of the conditional questions, hyperlink use reduced time very slightly (from 4.8 to 4.5 minutes), compared with the paging design (3.0 minutes). However, in Section B, where there were more hyperlinks for all conditional questions, use of the hyperlinks led to significantly less time (from 7.7 to 6.7 minutes), and the section was completed even faster than the paging version (7.9 minutes).

There were only two questions in the survey that permitted skipping a large number of questions (four or more), and this allowed us to test whether the presence of skips in a scrolling survey encouraged respondents to select responses that let them skip. The first was a question on lifetime tobacco use, where the hyperlink from “No” instructed the respondents to skip nine questions (see appendix B). The difference in responses to lifetime tobacco use between the two versions was not significant. A second question asking about lifetime alcohol use could skip 31 questions. The difference in the percentage reporting having used alcohol was significant (87.3 percent for the scrolling version and 89.4 percent for the paging version, $\chi^2(1) = 3.938$, $p < .05$). We

4. The median times were very similar to the means, and Wilcoxon-Mann-Whitney-U tests were significant for all five sections and overall time.

thus have limited evidence that the presence of skips in the scrolling version tempts a respondent to choose a response that would avoid subsequent questions.

Related issues for the scrolling version are errors of omission and commission. If those respondents who reported consuming alcohol in the past did not answer subsequent questions on alcohol, errors of omission occurred. However, if they selected "Never had alcohol" and answered the alcohol questions, errors of commission occurred. The overall errors of omission rate in the scrolling survey was 2.3 percent, while the errors of commission rate was 6.9 percent. These rates are in line with those reported by Redline and colleagues (2003) for a paper-based survey.

Aside from intentional misreporting and errors of omission/commission, we also compared data quality between the paging and scrolling designs by looking at the proportions of nonsubstantive answers ("Refused" and "Don't know") in each design, and item-missing data. In the paging version responses were mandatory (i.e., respondents could not proceed without providing an answer), but a "Refused" option was provided for all questions. In the scrolling version respondents could skip questions without providing a response. The rates of nonsubstantive responses and missing data are presented in table 2.

The scrolling version has a significantly higher rate of nonsubstantive responses than the paging version (Wilcoxon test, $p < .001$). When the missing data are included, the scrolling version has an overall rate of item non-response of 2.3 percent compared with 1 percent for the paging version. Mandating responses in the paging version did not increase the refusal rate to items, and it generally resulted in more complete data.

We also explored possible differences in the substantive distributions of the data from the two versions. Significant differences were found for only one potentially sensitive question, an item on U.S. citizenship. However, no other differences were found in the univariate distributions of questions, such as family income, body weight, substance use, and lifetime sexual behavior. We thus believe the single difference to have occurred by chance.

Based on previous research (McCabe 2000), two traditionally associated variables were examined to see whether either survey design affected this association. Heavy episodic drinking and precollege drinking had a Pearson correlation of 0.440 in the paging version and 0.449 in the scrolling version (Fisher's $Z = 0.298$, $p > .05$). The Pearson correlation between the same two variables in the 1999 Student Life Survey (a paging design) was 0.444, providing evidence that the results obtained in the current study were comparable.

Finally, we explored the respondents' indirect evaluation of the two designs. Results from a question asking, "If there were another survey like this one about one year from now, how likely are you to complete it?" are presented in appendix D. Although the overall test for significance failed to reject the hypothesis that the scrolling and paging versions were rated the same, the difference in the proportion endorsing "very likely" to complete it again was

Table 2. “Refuse,” “Don’t Know” Responses, and Item-Missing Data per Section by Survey Design

	Maximum Number of Questions	Scrolling			Paging		
		Refused, Don't Know	Item-Missing	Refused, Don't Know, and Item-Missing	Sample Size	Refused, Don't Know	Sample Size
Section A	32	1.15%	0.91%	2.07%	970	1.07%	8747
Section B	73	0.77%	4.10%	4.88%	942	0.93%	8474
Section C	103	1.29%	1.37%	2.65%	932	0.17%	7559
Section D	5	4.16%	4.16%	8.33%	932	0.87%	8379
Section E	55	2.74%	2.38%	5.12%	928	2.14%	8308
All Sections	268	1.47%	2.34%	3.82%	970	0.96%	8747

Note.—Rates are based on the total number of questions that each respondent was eligible to answer.

significant: 42.4 percent in the paging versus 46.2 percent in the scrolling version, $F(1,8386) = 4.794$, $p < .05$.

Those who responded that they were unlikely to complete the survey next year were asked why, in an open-ended question. Neither the use of this question nor the length of the answers differed by survey design. Among those who responded, significantly more respondents in the paging version used the words “long” or “time” in their answers—55 percent (of 297) in the paging versus 35 percent (of 34) in the scrolling version.

Discussion

Overall, few differences were found between the paging and scrolling designs. The nonresponse and break-off rates and measurement in terms of univariate distributions and associations did not differ. Item nonresponse in terms of nonsubstantive responses was slightly higher in the scrolling version. In addition, item-missing data were possible only in the scrolling version but were not substantial in this study—a fraction of a percent to most of the questions. An argument against scrolling Web surveys is their inability to retain information from partial interviews, yet that effect was minimized by using multiple scrolling sections.

Contrary to several earlier studies and prevailing belief, the paging design did not take longer to complete—in fact, it took slightly less time. Paging surveys no longer require lengthy Internet communication and can also omit inapplicable questions based on previous responses, thus facilitating the respondent and eliminating errors of commission. Although incorporating hyperlinks in the scrolling design facilitated navigation by decreasing survey-taking time, the time difference was small, and only a minority of the respondents took advantage of the hyperlinks.

While the skip instructions in the paging version are hidden, respondents in the scrolling version are able to see them and choose responses to minimize subsequent effort, inducing measurement error. We find some limited support for this in the present study, but the effect is small; about 2 percent fewer respondents in the scrolling version reported having used alcohol in their lifetime.

There may be other differences between the paging and scrolling designs that could not be detected in this study. For example, the sample was composed of university students, who are typically very experienced in using the Internet, and the survey was sponsored by a department of the university, likely affecting the level of motivation and effort. This may have diminished differences between designs.

We continue to hold the view that there is no one best design choice for all survey applications, but we have provided empirical evidence to aid the design decision based on the survey’s goals and characteristics.

Appendix A

SCREENSHOT OF THE PAGING DESIGN

msinteractive

Questions about this survey?
Email us at umsi@msiresearch.com
or call toll free 1.866.674.3375

Consent About You **Tobacco & Alcohol** Other Drugs Perceptions Sex & Driving

How many cigarettes have you smoked in the PAST 30 DAYS?

☐ None

☐ Less than one cigarette per day

☐ 1-5 cigarettes per day

☐ About 1/2 pack per day

☐ About 1 pack per day

☐ About 1 1/2 packs per day

☐ 2 or more packs per day

☐ Refused

Next Screen Previous Screen

Appendix B

SCREENSHOT OF THE SCROLLING DESIGN

msinteractive

Questions about this survey?
Email us at umsi@msiresearch.com
or call toll free 1.866.674.3375

Consent About You **Tobacco & Alcohol** Other Drugs Perceptions Sex & Driving

These next questions have to do with TOBACCO USE

B1 IN YOUR LIFETIME, have you ever smoked a cigarette (even a puff)?

☐ Yes

☐ No ([Skip to B11](#))

☐ Refused ([Skip to B11](#))

B2 How old were you when you smoked your first cigarette?

☐ Refused

B3 How many cigarettes have you smoked in the PAST 30 DAYS?

☐ None ([Skip to B11](#))

☐ Less than one cigarette per day

☐ 1-5 cigarettes per day

☐ About 1/2 pack per day

☐ About 1 pack per day

☐ About 1 1/2 packs per day

☐ 2 or more packs per day

☐ Refused ([Skip to B11](#))

B4 Please indicate which of the following is true for you: (Check all that apply)

☐ I smoke mostly on weekends

☐ I smoke mostly at parties where alcohol is served

☐ I smoke mostly when I'm with friends

☐ I smoke mostly when I'm studying hard

☐ None of the above

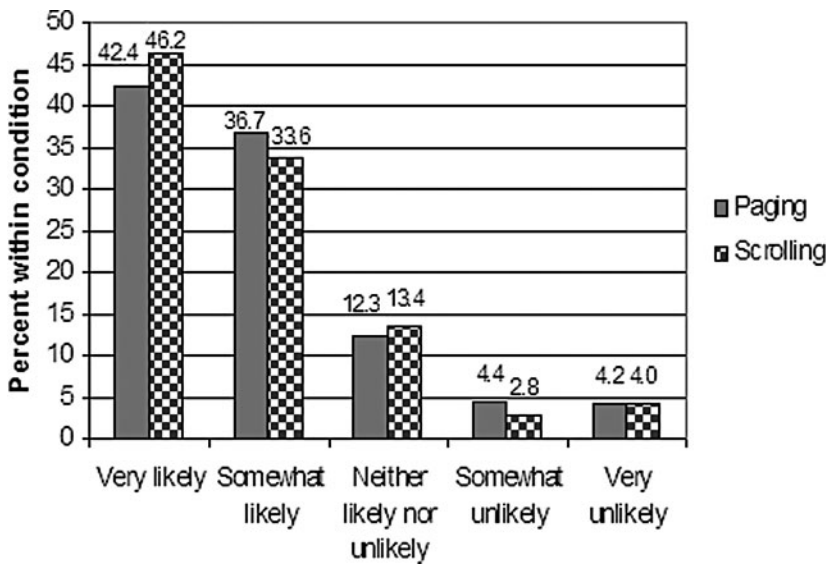
Appendix C

RESPONSE DISPOSITIONS BY SURVEY DESIGN

	Scrolling	Paging	Total
Completed	928 (43.6%)	8308 (43.4%)	9236 (43.4%)
Abandoned during the survey	60 (2.8%)	609 (3.2%)	669 (3.1%)
Consent (same layout in both versions)	3 (0.1%)	49 (0.3%)	52 (0.2%)
Introduction screen (same layout in both versions)	10 (0.5%)	108 (0.6%)	118 (0.6%)
Did not respond (same invitation used in both versions)	1129 (53.0%)	10090 (52.7%)	11219 (52.7%)
Total invited	2130 (100%)	19164 (100%)	21294 (100%)

Appendix D

SELF-REPORTS TO LIKELIHOOD OF COMPLETING THE SURVEY THE NEXT YEAR



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