

AN EXPERIMENTAL EVALUATION OF LEFT AND RIGHT ORIENTED SCREENS FOR WEB QUESTIONNAIRES¹

Dennis Bowker, Don A. Dillman, Washington State University²

Dennis Bowker, Washington State University, PO Box 641150, Pullman, WA 99164-1150

Key Words: Web survey, Internet, Questionnaire format

utilizes similar principles as well as the user-interface principles developed by Schneiderman (1997).

INTRODUCTION

Many different types of screen formats have been used to display web surveys. In addition to the obvious substantive differences, web surveys vary primarily in their patterns of navigation and in their physical layout of questions and answers. With respect to the various navigational systems used in web surveys we have witnessed dynamic screen-by-screen and static horizontal/vertical-scrolling techniques, and physical layouts that involve right, left, and center alignment of answer categories. While the web offers tremendous potential in varying the navigation and layout of a questionnaire, there is currently no experimental research that provides any theoretical justification for using one approach over another, or, that suggests why one might be more efficient than the other.

However, the literature on human computer interaction (e.g., Schneiderman, 1997) and emerging studies in survey methodology (e.g., Jenkins and Dillman, 1997; Dillman, 2000), suggest that alternative methods of information display are worth investigating. A common conclusion in this research is that the development of any devices designed to decrease human effort in the person-computer interaction, and hence increase the rewards for participation, will result in higher levels of comprehension and may subsequently improve the quality of responses.

In this paper, we report on an experiment that compares two types of web questionnaire screen layouts. One of these designs uses a traditional method of questionnaire construction that draws heavily from previous research on comprehension and navigation of paper questionnaires (see Jenkins and Dillman, 1997), while an alternative format has also been developed that

BACKGROUND

In practice, traditional paper questionnaires favor the use of numbers and answer boxes placed on the left and have been applied to the vast majority of web surveys we have reviewed. These surveys implicitly assume a cultural model of cognition in that they rely heavily on the expectation that readers will employ a conventional "paper logic" while filling out the web survey—a logic that dictates a top-bottom, left-right information processing based on cultural socialization. Numerous examples exist of such an approach, and any casual browsing of current or past paper questionnaires will verify this point.

With the advent of web surveys and their inherent flexibility, there is reason for re-examining traditionally accepted methods of placing text. First, there are several differences in the way one interacts with paper and web questionnaires that may suggest alternative formats would improve navigation and comprehension. Two of the more obvious differences for our discussion here are in the rules of navigation and the capacity of displaying information. For example, unlike a paper questionnaire where the respondent can "navigate" her way through the document with little effort by turning the pages back and forth, a web questionnaire requires its respondent to use either her keyboard and/or mouse to advance to the next question, and therefore assumes a certain level of proficiency beyond the use of a pencil, a skill usually mastered in grade school. Moreover, whereas the centralization of eye, hand, and paper assist in the coordination and comprehension of the survey experience in paper questionnaires, in computer-assisted surveys, the eye-hand centralization is lost; we now have a separation of the two due to the addition of a keyboard and mouse. It seems logical then, to anticipate that in addition to the

¹Presentation to Annual Meeting of the American Association for Public Opinion Research, Portland, Oregon, May, 2000.

²Dennis Bowker is Graduate Research Assistant and Don A. Dillman is the Thomas S. Foley Distinguished Professor of Government and Public Policy, and Deputy Director in the Social and Economic Sciences Research Center at Washington State University, Pullman, Washington. Support from the Gallup Organization, The Social and Economic Sciences Research Center, and the Sociology and Rural Sociology Departments (including Western Region Project W-183 of the Agricultural Research Center) is greatly appreciated. The contributions to this research of Spring Semester 2000 participants in Sociology 525: A Survey Practicum, are also gratefully acknowledged. Comments and suggestions on this paper are requested and may be sent to: bowker@wsu.edu and/or dillman@wsu.edu.

consequences as a result of the interruption in the navigational flow, the complexity of computer use in general will contribute negatively to the cognitive processes that afford effective participation—particularly for those who may have little or no experience with computers.

Paper and web questionnaires also differ in their capacity to display information. Computer displays have greater width than height to their general display, and vary according to the screen resolution in use by the respondent. Using a standard sheet of 8"x10" paper, one can fit approximately 64 characters (assuming 1 inch margins using a proportional font) per line of text. That same line of text in a web browser however, will only cover 75% of a computer screen if displayed in 800x600 pixels, the current industry standard. In other words, you gain approximately 25% more horizontal space in displaying information with web surveys—which can be further augmented if one is using a higher screen configuration such as 1024x760 pixels. Consequently, alignment of text is almost always somewhat variable across respondents browsers; text “wraps” and may cause additional unwanted space between answer categories unless specifically controlled in the HTML programming. Any alternative format that reduces the amount of variation across browsers should be considered an effective strategy.

In accordance with emerging perspectives in human and computer interaction, we might conclude that a more efficient and therefore perhaps more appropriate format for static scrolling web surveys, would involve the general alignment of the questionnaire—and specifically the categories—to the right of the screen in order to reduce the effort required for efficient navigation and completion of the survey. In left aligned web surveys, respondents are forced into an answer routine of reading and answering questions on the far left of the screen, moving the mouse to the far right to advance to the next visible question using the scroll bar, and then having to repeat the process over and over to complete the questionnaire. In addition, respondents may have to constantly move their visual focus from the far left of the screen, over to the right and occasionally beyond to check on the location of the mouse. For these reasons alone, it would seem more efficient if a right oriented format were used to reduce the amount of hand-eye-keyboard-mouse coordination required in responding to the survey. This way, even though the respondent would begin reading questions starting towards the left of the screen, the cursor movement would be limited to a short distance between the right positioned scroll bar and the nearby answer categories.

In contrast, traditional usage that places questionnaire items and answer categories to the left suggests that the left aligned format would be the preferred choice of respondents because of its familiarity, and therefore may be more likely to improve comprehension and navigation.

METHODS

Instrumentation

Two versions of the questionnaires were constructed and placed on an access-controlled server. The questionnaires contained substantive measures about the environment and included all of the response options available in web surveys such as radio buttons, drop-down menus, check boxes, and open-ended text boxes. The principle difference in the two forms involved the general layout of text (left vs. right) and the location of answer categories (left vs. right). (See Figure 1.)

Following the 17 questions related to environmental issues, we included measures of how easy or difficult it was to complete the survey, whether or not there were areas in the survey that caused confusion, and perceived satisfaction with the visual design. Personal characteristics such as age, sex, and computer experience were asked.

The forms were programmed in HTML using the principle of the Least Compliant Browser (LCB) outlined by Bowker (2000). In short, the LCB approach seeks to reduce survey measurement and nonresponse error by designing the web questionnaire for the lowest anticipated browser level such that the likelihood of distributing an equal visual stimulus to all participants is maximized (measurement) and that access is not impeded by incompatible programming (nonresponse).

Design and Procedures

The experimental design of this study is based on a simple random assignment to one of two treatments: Treatment 1, is the traditional left-aligned questionnaire, while Treatment 2 is the alternative right-aligned survey. Each form was placed on the web with entry restricted to those who had been assigned an access code and invited to take the survey. Upon entry of the code, respondents were randomly assigned to one of the two questionnaire formats and then asked about environmental issues. Multiple participation entries were not permitted—once a respondent successfully logged in with their access code, they could no longer return to the survey to fill it out again, or pass their number on to someone else.

Sample Characteristics

The total number of cases used in this study is 684, with 51% (n=350) completing the right-aligned survey,

and 49% (n=334) completing the left one. It is important to note that due to the nonrandom solicitation procedures, these data are not a representative sample from the population of potential web survey participants. Therefore we can only focus on issues of internal rather than external validity.

Nearly 55% of the sample members were female, while the average age for all respondents was 28 years old--the youngest respondent being 12 and the oldest 76. To address potential cultural effects due to language use, we asked respondents to report the language they first learned to speak. Fifteen percent of the sample reported a first language other than English.

RESULTS

Ease of Use

The first indicator of a format's effectiveness is the respondent's perception of how easy or difficult the questionnaire was to complete. When asked, "How easy was it for you to complete the survey?", similar patterns emerged. Ninety-one percent of the respondents to each form stated they found the survey "very easy" or "somewhat easy" to complete (see Table 1).

Table 1. Ease of Use by Format

| | | Survey Treatment | | Total |
|--------------------|-------|------------------|---------------|-------|
| | | Left Aligned | Right Aligned | |
| Very Easy | Count | 207 | 203 | 410 |
| | % | 63.5% | 58.7% | 61.0% |
| Somewhat Easy | Count | 91 | 112 | 203 |
| | % | 27.9% | 32.4% | 30.2% |
| Somewhat Difficult | Count | 22 | 30 | 52 |
| | % | 6.7% | 8.7% | 7.7% |
| Very Difficult | Count | 6 | 1 | 7 |
| | % | 1.8% | 0.3% | 1.0% |
| Total | Count | 326 | 346 | 672 |
| | % | 100% | 100% | 100% |

Confusion About What to Do

Next, respondents were asked, "Were there any places in the questionnaire that you were confused about what to do." Nearly 17% stated there was confusion while filling out the questionnaire. For the left format, only 15% indicated they were confused, while 18% stated they were confused while completing the right format, a difference that was not statistically significant.

Perception of Design and Layout

We also asked respondents for their general opinion regarding the visual layout and design of the questionnaire. Respondents were reminded that we were not concerned with the survey content, but rather how they felt the survey "looked." Ninety-seven percent stated the questionnaire design and layout was "very good" or "somewhat good." Again, an almost identical pattern occurs when comparing the two forms. In both cases

97% felt the design and layout was very or somewhat good (see Table 2).

Table 2. Ease of Use by Format

| | | Survey Treatment | | Total |
|---------------|-------|------------------|---------------|-------|
| | | Left Aligned | Right Aligned | |
| Very Good | Count | 220 | 213 | 433 |
| | % | 67.7% | 61.4% | 64.4% |
| Somewhat Good | Count | 98 | 123 | 221 |
| | % | 30.2% | 35.4% | 32.9% |
| Somewhat Bad | Count | 7 | 9 | 16 |
| | % | 6.7% | 8.7% | 7.7% |
| Very Bad | Count | | 2 | 2 |
| | % | | 0.6% | 0.3% |
| Total | Count | 325 | 347 | 672 |
| | % | 100% | 100% | 100% |

Immediately following the question about the visual design and layout, we asked respondents to tell us specifically what it was they liked or disliked about the questionnaire's design. Overwhelmingly, respondents remarked positively about the form's layout and design for both the right and left versions. The total number of open-ended responses for each form varied slightly. For the left format, there were 218 responses provided, while the right format recorded 240 responses. In addition, the left format elicited fewer "negative" comments than the right format, 52 versus 89 respectively. Table 3 shows the results after coding both the positive and negative responses for each of the survey formats across five substantive dimensions: colors and/or graphics, font size and/or spacing text alignment, questionnaire navigation, and general content.

In addition to the observation that the right format has more negative responses than the left, the left format has more comments regarding the navigation of the survey. In particular, negative comments regarding the use of the scroll bar on the left-justified format was the most common response. Overall, it is clear respondents remarked positively in their open-ended response, corroborating their initial position of the design and layout.

Table 3: Open-ended Responses on Visual Design and Layout*

| Comment Type | Questionnaire Format | | | |
|-------------------|----------------------|------------|---------------|------------|
| | Left-Aligned | | Right-Aligned | |
| | - | + | - | + |
| Colors/Graphics | 16 | 31 | 31 | 31 |
| Font Size/Spacing | 10 | 8 | 9 | 34 |
| Text Alignment | 8 | 1 | 17 | 1 |
| Navigation | 7 | 30 | 3 | 73 |
| General Content | 11 | 159 | 29 | 164 |
| Totals: | 52 | 229 | 89 | 303 |

*Responses can be coded multiple times. For example, if a respondent stated the colors were bothersome and that they did not like the scrolling, their negative responses are reflected in both the navigation and the colors/graphics cell.

Other interesting comments included the preference and appreciation for a simple and plain design. Also, despite the fact that both forms looked the same, and used the same colors and graphics, the right format was perceived more negatively than the left.

Respondent's Comfort Level and Experience with Computers

One might ask, does a respondent's level of comfort and/or experience with computers affect the way he or she experiences the survey? We expect that those who are least comfortable with computers would find the "unfamiliar" right aligned format more difficult to complete, which might arguably confound the initial relationships outlined above. However, there were no significant differences between formats.

Do respondents who use the web more frequently and/or who have had experience with websurveys in the past more or less likely to favor one format over the other? Human computer interface research would suggest that more experienced users would find the right format easier to use, and likely even more appealing. In contrast, traditional methods would predict that the unfamiliarity of the right aligned format would be bothersome for experienced users, especially since their expectations (i.e., for a left aligned format) of web use are more prevalent. However, no significant differences were found for ease of use perceptions and hours/day of computer use. Across all levels of use, there are no significant differences between the two forms.

Finally, we examine how weekly web use is related to perceptions of visual design and layout. Again, there is little variation across all levels of weekly web use and the two formats.

Measurement Differences

One of the questions this study attempts to answer involves the differences in item distributions between the two formats. Does one format result in different distributions for the survey items? And, if so, are these due to the substantive content of the survey items or the variation in alignment of the questionnaires? A simple comparison of the survey items by each form shows no differences in any of the questions. We conducted extended analyses controlling for variables such as computer use and previous experience with completing web surveys, and none showed any statistical or even substantive differences for any of the items in either form.

Item Nonresponse

Item nonresponse is affected by such factors as inadequate information organization, poor navigational flow, and improperly worded questions. It is possible that

the questionnaire's alignment could lead to increases in nonresponse error if some people are so uncomfortable with the survey's layout and design that they stop and fail to complete the web survey. Moreover, right or left justification could increase the number of hand movements associated with completing the questionnaire, as well as add to the survey's complexity. This might result in respondents inadvertently clicking on the wrong responses—thus leading to measurement error.

We examined rates of item nonresponse for both forms and found that overall, 84% of the respondents did not skip any questionnaire items. Of those that did however, the average number of skipped items was 1.12. When compared across both forms, we find that the left format was more likely to contain a higher rate of item-nonresponse than the right format. A Chi-square test indicates these differences are significant ($X^2=6.64$, $p=.016$). A possible reason for these differences is that the greater "back and forth" eye movement required for answering the left aligned questionnaire may have contributed to a greater number of items being missed by some respondents.

Furthermore, recall that our sample initially included 717, but 33 were dropped because they only answered the first few questions before terminating. Of these 33 respondents, 16 had been assigned to the left aligned format, while 17 were assigned to the right aligned treatment. Thus, it appears there is no difference in the early terminations that is contributable to the format itself.

Finally, while there were only 15 people in the sample who had four or more missing items, we wondered if perhaps there was a pattern of termination that would suggest a particular questionnaire item(s) that confused respondents. An examination of these cases however shows no identifiable pattern that would suggest a decision to terminate was based on a specific questionnaire item.

Time to Complete the Survey

Though the right-aligned format took slightly longer to complete, there was not a single comment that suggested a respondent was dissatisfied with the length of the survey or the amount of time it took to load. Several respondents completing the left format however stated the survey was too long and that too much scrolling was involved. The average amount of time taken to complete the left aligned survey was six minutes and seven seconds, while the right aligned format took six minutes and thirty-three seconds. Although the right format took slightly longer to load (due to additional HTML code required for right alignment), nearly two-thirds of all respondents completed the survey using a high-speed

connection from on-campus computer labs. Therefore, there is no reason why the left format would take longer, except that it takes longer to respond to questions due to the disjuncture of the answer categories and the scroll bar—the mechanism used to advance to the next question.

DISCUSSION AND CONCLUSIONS

It is important to note some of the limitations of this study. First, it should be reiterated that the respondents were not selected at random and do not represent any given population of interest other than the population of users solicited to take the survey and thus these results cannot be generalized beyond our sample.

Moreover, the sample members studied here were above average with respect to education and experience with computers. It is possible that these results may not be the same in a less educated sample, or one with one that has less computer experience. Any future studies in this area should definitely address this with more diverse and representative samples.

Third, this study focused exclusively on static scrolling navigation and since its thesis is based on a principle of scrolling as the primary form of navigation, any device (hardware or software) that bypasses this, makes the results inapplicable. For example, computer mice are increasingly being manufactured with devices that act like a wheel allowing its user to scroll through pages with great ease and without moving the body of the mouse itself.

Another limitation of this study is that we did not construct a middle ground to compare left and right alignments with. Perhaps a third treatment for a text aligned in the middle is appropriate. If the right format is truly more efficient than the left, then we would expect the middle to be at least minimally better than the left if for no other reason than the fact that the navigational effort is reduced for respondents.

Limitations notwithstanding, one of the most obvious and consistent findings in this study is the general lack of difference—across several dimensions—afforded by the two formats, particularly in the distributions of the questionnaire items. While some respondents had difficulty filling out the questionnaire, were confused about what to do at times, and even rated the layout and design unfavorably, the vast majority had no problems completing the survey, knew precisely what to do (and when), and remarked positively about the questionnaire. This suggests that either format produces desirable outcomes with respect to item response rates and the quality of measurement.

Though not large, the differences between experienced and less experienced users and how comfortable they felt using computers, clearly warrant further investigation. For users who have little experience with the web, the right aligned format may not be appropriate. However, because it does reduce the response effort, tailoring the form for experienced users might be appropriate. Conceivably one could screen participants by having experienced users directed to an alternative format. That we discovered no substantive differences between the responses in each form suggests that such a procedure would not have any negative effects on the outcome of the study.

As a result of the alignment, the blank space to the left or right of the main body of the questionnaire, particularly for those completing the right aligned form, was distracting for some respondents. This suggests that regardless of which format used, something should be done to minimize the presence of this white space. In this study we attempted to emulate paper surveys as closely as possible by restricting the total number of characters that were displayed in any one line in the questionnaire. As a consequence, we may have distracted respondents by leaving the area blank. A potential solution would be to change the figure ground color scheme such that the “background” is of slightly darker color. Alternatively, several respondents suggested placing pictures or additional instructions in the open space.

Finally, it appears that the simplicity of the format and ease of navigating through the document are of paramount importance to respondents. Thus the principles for navigational guides and information organization that Jenkins and Dillman (1997) advanced for paper surveys may well be applicable to web surveys.

REFERENCES

- Bowker, Dennis. 2000. "Minimizing Survey Error Establishing Protocols for Web Survey Design." Paper presented at the International Field Director's and Technologies Conference in Portland, Oregon.
- Dillman, Don A. 2000. **Mail and Internet Surveys: The Tailored Design Method**. New York: John Wiley & Sons.
- Jenkins, Cleo R. and Don A. Dillman. 1997. "Chapter 7: Towards a Theory of Self-Administered Questionnaire Design." In L. Lyberg et al., **Survey Measurement and Process Quality**. New York: Wiley-Interscience, pp. 165-196.
- Schneiderman, Ben. 1997. **Designing the User Interface** (3rd Edition). Reading, MA: Addison-Wesley.

Figure 1. Example of Left and Right Justified Web Survey Formats

Left Justified

(3.) In your opinion, how much progress have we made in dealing with environmental problems in this country in the past few decades—say since 1970?

- A great deal of progress
- Moderate progress
- Some progress
- Little progress
- Almost no progress at all
- Don't know

(4.) How would you rate the environmental laws and regulations that are currently on the books?

- Quite adequate
- Adequate
- Inadequate
- Quite inadequate
- Don't know

Right Justified

(3.) In your opinion, how much progress have we made in dealing with environmental problems in this country in the past few decades—say since 1970?

- A great deal of progress
- Moderate progress
- Some progress
- Little progress
- Almost no progress at all
- Don't know

(4.) How would you rate the environmental laws and regulations that are currently on the books?

- Quite adequate
- Adequate
- Inadequate
- Quite inadequate
- Don't know