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Survey Mode as a Source of Instability in Responses across Surveys

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Changes in survey mode for conducting panel surveys may contribute significantly to survey error. This article explores the causes and consequences of such changes in survey mode. The authors describe how and why the choice of survey mode often causes changes to be made to the wording of questions, as well as the reasons that identically worded questions often produce different answers when administered through different modes. The authors provide evidence that answers may change as a result of different visual layouts for otherwise identical questions and suggest ways to keep measurement the same despite changes in survey mode.

Keywords: *survey mode; questionnaire; panel survey; measurement; survey error*

Most panel studies require measurement of the same variables at different times. Often, participants are asked questions, several days, weeks, months, or years apart to measure change in some characteristics of interest to the investigation. These characteristics might include political attitudes, satisfaction with a health care provider, frequency of a behavior, ownership of financial resources, or level of educational attainment. Whatever the characteristic of interest, it is important that the question used to ascertain it perform the same across multiple data collections.

In addition, declining survey response rates, particularly for telephone surveys, have encouraged researchers to use multiple modes of data collection during the administration of a single cross-sectional survey. Encouraged by the availability of more survey modes than in the past and evidence that a change in modes produces higher response rates (Dillman 2002), surveyors

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are increasingly using mixed-mode methods to collect information from their respondents.

Considerable evidence now exists that the choice of survey mode affects respondents' answers to survey questions that are worded the same (e.g., de Leeuw and Van Der Zowen 1988; Dillman et al. 1996; Fowler, Roman, and Di 1998). This means that differences in answers to some survey questions between Time 1 and Time 2 may be the result of mode change rather than an actual difference in the behavior or opinion of interest. In addition, Internet and Interactive Voice Response (voice or touchtone data entry by telephone in response to prerecorded interview questions and instructions, hereafter IVR) modes of collecting data are now taking their places beside the traditional alternatives of mail, telephone, face-to-face, and group self-administration modes. Both of these new methodologies introduce the possibility of mode effects that are not yet well understood.

Our purpose in this article is to discuss why mode changes are increasingly likely to occur in panel studies and the consequences of those changes. We review the nature of likely mode differences and the reasons for their occurrence and make suggestions for how differences in answers between modes might be reduced. In addition, we present evidence that suggests that within-mode differences may result from variations in the visual layout of questions used in both mail and Web surveys. Such changes may also have an impact on comparisons between visual and aural modes of surveying.

WHY MODE OF DATA COLLECTION OFTEN CHANGES

Mode change happens frequently in panel studies after the initial wave of data collection. Decisions to change mode are often made with little consideration of whether such changes might influence substantive answers to the survey questions. Several reasons may explain the desire to switch modes for subsequent data collections.

First, the locations of panel respondents often change between data collections. Some panel surveys extend over many years, or even decades. For example, students who initially responded to a paper survey in a classroom cannot easily be reassembled several years later for follow-up contacts. Thus, the researchers may decide to survey those respondents by telephone at their new locations. Whereas group administration may be the most cost-effective procedure for the initial wave of data collection, the telephone is likely to be far more efficient for the follow-up. Also, when surveying young people, a face-to-face interview or classroom setting may be the most appro-

priate survey environment, but as people age they may be better surveyed using postal mail or the Internet.

In addition, the introduction of new modes creates new possibilities for conducting surveys. Specifically, the emergence in the 1990s of Internet and IVR provide more ways of contacting and surveying respondents. In many cases, these modes offer substantial cost and speed advantages and may not have been available at the time of initial data collection.

Furthermore, when follow-up studies are done, researchers may have either telephone numbers or mailing address information, but not both, so that the method of follow-up is influenced by the kind of contact information available. Traditional contact information (i.e., postal addresses and home telephones) has now expanded to include e-mail addresses and cell phone numbers.

In recent years, response rates to traditional modes of surveying, in particular the telephone, appear to be declining. As a result, surveyors have become interested in providing panel members choices so respondents can decide whether to respond by one mode or another. This possibility is encouraged by technological advances, which allow efficient transfer of questionnaire word files from one mode to another. Moreover, the particularly low marginal costs of collecting additional questionnaire responses over the Internet are encouraging surveyors to collect as many responses in this manner as possible, saving telephone interviews for those who do not respond.

The mode choice for follow-up surveys can often be less restrictive. The coverage and/or sampling procedure constraints necessary for initial data collection may determine the mode of surveying. Household personal interview methods are often used for initial data collection because it is necessary to identify truly representative samples of general public populations. For example, the monthly U.S. Current Population Survey, which is relied on to estimate nationwide unemployment rates, depends on the use of face-to-face interviews to contact households and conduct the initial interviews. This survey then switches to telephone interviews for households with telephones to reduce costs.

And the influence of the personal preferences of researchers on choosing the follow-up survey mode often makes a difference. Researchers may have little experience with particular modes resulting in a higher comfort level for some survey modes than for others. Also, some organizations have a tradition of doing telephone surveys, whereas other firms have a tradition of working with self-administered methods and choose modes based on their skills and infrastructure. Firm specialization is increasing as new firms emerge that only do Internet or IVR surveys. Some researchers, who desire to

stay on the cutting-edge methodologically, may also choose a new mode in hopes of making a methodological contribution to panel research methods.

In recent years, another kind of mode change has emerged, which may create even more complex mode comparison issues. Instead of only changing modes between data collections, surveyors sometimes design individual data-collection efforts that use one mode for some respondents and others for the remaining respondents. An example of this strategy is the National Survey of Earned Graduates, for which data-collection procedures were tested in 1992 (Shettle and Mooney 1999). It began with mail, switched to telephone, and finally relied on face-to-face interviews, each of which added a significant amount to response rates. Modes were similarly mixed in later data collections. Thus, not only do some respondents answer by different modes in the initial data collection period than in other periods, the potential also exists for respondents to answer using a variety of modes during later data collections.

Intramode differences within data-collection periods may be increasing (Dillman 2002). One reason is the concern that the response rates are lower for some modes than in the past and offering a second mode may help improve them. Another contributor is the widely different costs associated with modes of data collection. For example, if respondents can now be induced to go directly to the Internet, the marginal costs for each additional interview completed in that way may be far less than for any of the other methods. Whereas the costs of providing the opportunity to respond by more than one mode was once substantial, computer software now makes such efforts much less difficult and costly.

Thus, a variety of reasons, ranging from personal preferences and the changing nature of the available mode choices to cost considerations, may influence decisions by investigators to switch modes either between or within data collections periods. In addition, changing modes has often been viewed as a minor consideration for deciding how to collect data for panel studies. However, this position needs to be reevaluated. In some instances, changing modes may produce results that provide a false indication of change having occurred between waves of data collection.

HOW SURVEY MODE AFFECTS THE WORDING OF QUESTIONS

Surprisingly, one of the main reasons for differences in answers to questions when the survey mode is changed is that each mode encourages survey-

ors to ask questions differently. There are various ways in which question wording is shaped by each survey mode.

Face-to-Face Interviews

The face-to-face interview is quite flexible, providing the potential to make full use of both visual and aural communication. Researchers who rely on face-to-face procedures are able to use long, complex scales, with word labels for each of the categories or scale points. To accommodate long questions with many answer choices, show cards are typically used where respondents are handed a card with answer choices and asked to choose a category after the interviewer reads the question.

Face-to-face interviews also encourage the use of longer questionnaires because once begun, it is often difficult for respondents to terminate the interview. The use of open-ended questions for which interviewers can follow-up with additional probes in order to gather more complete and interpretable answers is also encouraged for this survey mode. The presence of an interviewer who can read body language as well as respond to silences and incomplete answers makes it possible to obtain long, complete answers.

Telephone Interviews

The advent of telephone interviewing in the 1970s produced significant changes in how researchers composed questions. To simplify the interview task, scales were shortened and the wording was frequently limited to anchored endpoints rather than providing a word description for each category. Thus, a question that might have been asked in a face-to-face interview using a fully labeled scale with response choices of *not at all satisfied*, *slightly satisfied*, *somewhat satisfied*, *mostly satisfied*, and *completely satisfied* would be changed to a 1 to 5 scale, with “the endpoints of 1 being not at all satisfied and 5 being completely satisfied and you can also use any number in between” (Dillman et al. 2001).

Complex questions with longer scales are sometimes divided into steps for telephone surveys (Miller 1984). For example, respondents were first asked if they were satisfied, dissatisfied, or somewhere in the middle. Then a follow-up probe for the satisfied and dissatisfied respondents asked whether they were completely, mostly, or somewhat satisfied (or dissatisfied). Those in the middle were asked whether they were closer to being satisfied, dissatisfied, or right in the middle. Similarly, respondents might be asked whether their income was above or below a given amount, and then asked repeatedly with different amounts to allow the income level to be measured with reasonable precision.

The need to simplify questions for the telephone also led to an increase in the use of screen questions from which the respondent branched different ways depending on their answer. This procedure allowed less information to be communicated in each interviewer utterance, and the respondent was unaware of the extensive and complex branching patterns that resulted. When telephone questionnaire programmers encounter questions with many words and/or answer choices, they often break them into smaller parts so respondents can skip past unnecessary information. The compelling reason for seeking question simplification on the telephone is the reliance entirely on aural communication.

The use of telephone interviews also places pressure on researchers to shorten their interviews. Twenty minutes is deemed a long interview for most telephone studies but not for face-to-face interviews. For example, one national survey organization has a policy of not conducting telephone surveys that are more than eighteen minutes long.

Telephone interviews are also quite similar to face-to-face interviews in certain respects. One important similarity is that both interview methods rely on aural communication. Open-ended questions can be asked in telephone interviews, just as in face-to-face interviews, with follow-up probes being used to get interpretable answers. Both the telephone and face-to-face methods also tend to hide the possibility of certain answers (e.g., "no opinion" or "don't know" categories) from respondents but instead allow the interviewer to record such answers only when offered by the respondent. Refusals to answer may also be recorded as a separate category.

Interactive Voice Response Surveys

IVR surveys may use voice technology to recognize spoken answers or require the respondent to enter data using numbers and/or symbols on the telephone's touchtone keypad (Dillman 2000; Tourangeau, Steiger, and Wilson 2002). This mode is used with increasing frequency for very brief routine surveys where respondents are highly motivated to respond (e.g., certain employee and customer satisfaction surveys). It has even been tested for possible use as an alternative to the 2010 Decennial Census mail-back form (Stapleton, Norris, and Brady 2003).

The early use of IVR surveys has witnessed efforts to make question wording brief, even shorter than in regular telephone surveys. Researchers also seem to be attempting to reduce the lengths of scales, and keep questionnaires extremely short. In addition, prerecorded instructions on what the respondent should do if he or she wants to have an item reread, and to

solve other potential problems, must be developed along with a protocol for their use.

Mail Surveys

The use of mail surveys has encouraged respondents to write questions in ways that differ from the construction practices for both face-to-face and telephone interviews (Dillman 1978). Many users try to avoid as many branching questions as possible because respondents are prone to making errors when attempting to follow branching instructions (Redline et al. 2003). Thus, instead of asking a series of questions, such as “Do you own or rent a home?” followed by “Do you have a mortgage on this home, or is it owned free and clear?” a mail survey question is likely to ask the question in this manner: “Is the home in which you live: (1) owned free and clear, (2) owned with a mortgage, (3) rented, or (4) occupied under some other arrangement?”

The self-administered nature of mail surveys also encourages researchers to use check-all-that-apply questions, rather than asking for a yes or no answer to each of many items on a list as done for interview surveys. Check-all formats are likely to produce fewer affirmative answers than are the yes/no formats (Rasinski, Mingay, and Bradburn 1994; Dillman et al. 2003).

Mail surveys also remove the pressures to shorten questions that are common in telephone surveying. Fully labeled scales with many categories, similar to those used in face-to-face interviews and displayed as show cards, can be used with equal ease in self-administered mail surveys.

In addition, users of mail surveys are often discouraged from asking open-ended questions because of the inability to encourage more complete answers by probing or asking additional follow-up questions. This concern often leads to breaking individual open-ended questions into multiple parts. For example, an interviewer can ask for one’s occupation and then probe for enough details to allow for coding. On mail questionnaires, designers may feel compelled to ask a series of questions (e.g., “What is your occupation? What kind of work do you do? Is there a minimal educational requirement? What is the name of the company for which you work?”). Thus, the mail version tends to explicitly seek information that may or may not have been offered as responses in the open-ended version.

Similarly, the use of mail questionnaires also requires that researchers decide what to do with the typically hidden interview categories (i.e., Refused, Don’t Know, No Opinion, or Does Not Apply that are available for use by telephone interview but are not offered to the respondent as part of the question stimulus). Frequently, such categories are left off the mail question-

naire, resulting in respondents skipping the question or leaving it blank in the self-administered survey mode. Alternatively, they may be explicitly listed. Either method changes the stimulus from what is typically provided in telephone or face-to-face interviews.

The reliance of mail surveys on visual communication provides a means by which respondents can interpret context and review previously read questions while formulating an answer to later questions. Thus, in certain ways self-administered questionnaires make possible the communication of greater complexity than telephone surveys. At the same time, order effects frequently observed in telephone surveys may be reduced (Bishop et al. 1988).

Internet Surveys

Internet surveys also rely on the use of visual instead of aural communication used in interview surveys. Some similarities exist in how questions are constructed for mail and Internet, but important differences also exist. One difference is that Internet surveys allow the use of audio, video, color, and other dynamic features, which are generally not used in other types of surveys.

Internet surveys can be programmed using a page-by-page construction whereby each question is displayed on a different screen or a scrollable display where respondents can scroll through all the questions at once. One of the potential difficulties of using separate screens for each question is a loss of context that is provided in mail surveys because respondents cannot review previous answers and survey designers may wish to keep respondents from being able to go back and change answers to previous questions. However, the inability to go backward may result in respondents getting mentally lost in a closely related series of items (e.g., a series of questions asking about each job held since graduating from college).

Check-all-that-apply questions are also used frequently in Internet surveys. HTML programming that is employed to construct Internet surveys allows two types of answer category formats to be specified: a set of radio buttons that lets only one choice be marked or HTML boxes that let more than one answer from each group be marked. Check-all-that-apply formats are awkward to ask in an interview and, as noted earlier, are not used in telephone surveys. Instead, they are converted to a series of yes/no items, which are likely to result in an increase in the selection of individual items over the check-all-that-apply format (Dillman et al. 2003). Furthermore, Internet surveys also allow the use of longer scales with full labeling, as is normally done in mail and face-to-face surveys.

Branching instructions do not present a significant problem for Web surveys inasmuch as when page-by-page construction is used, branching becomes transparent to respondents, much as it is on interview surveys. Internet surveys are also similar to telephone surveys in that longer surveys are typically discouraged and not likely to be tolerated by many respondents. Another similarity to telephone interviews is that item nonresponse, which represents a major concern in mail surveys, can be overcome by programming that requires each question to be answered. However, a consequence of this programming may be that it produces respondent frustration and fewer completions (Dillman 2000).

WHY RESEARCHERS OFTEN CHANGE QUESTION STRUCTURES FOR FOLLOW-UP MEASUREMENT BY A DIFFERENT MODE

It is desirable to keep question wording the same across modes. Yet, changes are often made. Some of them are quite simple, even accidental. For example, an open-ended question was asked in a large-scale national telephone survey, "What is your current marital status?" where interviewers were instructed to check the appropriate category based on the response provided. This question was changed for a Web survey so that respondents chose either: "single, married, separated, divorced, or widowed." The result was to significantly decrease the number of single and married respondents while increasing the percentage that were separated, divorced, and widowed (Robert Tortora, personal communication, May 9, 2002). The simple explanation is that some respondents may fit appropriately into more than one category but tend to simplify their response (single or married) unless the additional detail of separated, divorced, or widowed is explicitly offered.

Survey designers may change question structure between rounds of data collection in panel studies simply because of a mode change. These changes may occur because of the belief that a different question format will work better for the new survey mode. For example, check-all-that-apply formats used in self-administered questionnaires are frequently converted to a series of yes/no items in telephone interviews because the check-all format is awkward if not impossible to ask over the telephone. However, as we discussed earlier, these two formats produce quite different response distributions when asked in self-administered questionnaires.

These changes in question structure may happen because a preferred mode of constructing survey questions has evolved for each of the different modes and tends to be shared across organizations. Thus, when questions are

designed, especially in large organizations in which there are specialized units for telephone, face-to-face, Web, mail, and IVR data collection, each unit may have developed a style of question design that they feel is best for their mode. Telephone questionnaire designers are especially sensitive to the problems of length and verbal comprehension. Mail questionnaire designers are especially sensitive to the problems of getting respondents to follow branching instructions. And those who implement particular modes tend to want to avoid situations in which their mode does not perform well.

When designing questions for single mode studies, possible differences across mode are rarely discussed. Surveyors who have learned over the years to design for one mode may find it difficult to accept the need to optimize across modes, rather than to maximize efficacy for their own mode. The argument that “this is how telephone (or mail or face-to-face) questions are usually written” often becomes a powerful force when designing survey instruments, and sponsors of panel surveys are often unaware of these consequences.

WHY IDENTICALLY WORDED QUESTIONS OFTEN PRODUCE DIFFERENT ANSWERS ACROSS MODES

Even if one succeeds in maintaining the same questionnaire stimulus across survey modes, differences in answers may occur. However, mode differences for identically worded questions are more likely to occur for some types of questions than others. In addition, there are a number of likely causes for these mode differences.

Some Questions Are More Subject to Instability across Modes than Are Others

Schwarz (1996) argued that the survey process is governed by the conduct of conversation that is used in everyday life and as such respondents act as cooperative communicators trying to make sense of the information provided to them. The interview or questionnaire exhibits many of the same characteristics as a conversation in which the meaning assigned to later items is based on earlier information being transmitted between the respondent and questionnaire sponsor (Schwarz 1996). Thus, respondents actively try to make sense of the survey questions by drawing on all the information the researcher provides, including the context of the survey. Respondents will systematically make use of context information on some questions more so than others.

When respondents are asked an opinion question such as “How satisfied are you with your choice of careers?” they are being asked a question for which a ready-made answer may not exist. In addition, surveyors are likely to offer a set of vaguely quantified response categories from which to choose (e.g., “Completely satisfied, Mostly satisfied, Fairly satisfied, Slightly satisfied, Not satisfied”). To answer these questions, the respondent must think about how to respond to the question, including trying to figure out the meaning of the response categories to determine the answer that comes closest to expressing their opinion. Thus, the stem of the question and the response categories are important sources of information for respondents, especially when they are answering questions to which they may have not previously formed an answer.

In addition, for ordinal scales in which respondents must choose where they fit along an implied continuum, the response categories become very important cues in helping respondents decide how to answer the question. In these types of scalar questions, the meaning of the individual categories (e.g., fairly satisfied) comes in part from the order in which the choices are displayed or read to the respondent. Thus, respondents draw on information provided in the description of the category (verbal or numeric labels) and its position in relation to other categories.

CONTEXT AND ORDER EFFECTS

Since respondents are actively making sense of the survey or interview, they may also be affected by the order in which questions are presented. In panel studies, new questions are often added to follow-up surveys to ask respondents about change or differences from the last time they were contacted. Whether a question is located before or after certain other questions can affect how respondents answer. Depending on the situation, respondents may decide to include or exclude information when answering a question based on what information they have already provided to the researcher in previous questions (Schwarz 1996). If the previous question has asked about satisfaction with something related to the city or state in which one lives, one’s profession, or even one’s marriage, there may be some carryover effects that influence one’s answers (Schwarz, Strack, and Mai 1991; Schwarz 1996). Thus, questions that use vague quantifiers and require the formulation of an answer on the spot seem more likely to be influenced by context and mode effects.

On the other hand, when respondents are asked questions about things that they know precisely, such as their age or date of birth, they hold previously

formulated answers to these types of questions and do not need the categories to help prepare their answer. If categories are provided, the respondents need only to select the response choice that corresponds to their preformulated answer. For the most part, we do not expect that questions on age, gender, whether a home is rented or owned, or others for which respondents carry around obvious answers that they are willing to reveal to others will produce significant changes when asked by a different survey mode.

Other Contributors to Mode Differences

Researchers have identified many examples of mode differences, as well as many reasons for their occurrence. We provide a brief review of some of the most frequently observed differences (i.e., social desirability, acquiescence, and primacy/recency effects).

Social desirability is the tendency for people to offer responses that are based on the perceived cultural expectations of others (de Leeuw and Van Der Zowen 1988). Such expectations are more likely to influence answers in interview surveys than in those that use self-administration because of the presence of an interviewer. One example is the frequently observed tendency for respondents to give more positive answers when asked to rate their health. In the classic study on this topic, Hochstim (1967) found that in a face-to-face interview, 43% of respondents ranked their health as excellent, whereas 38% did so over the telephone, and only 30% chose that category when asked using a mail survey. Paul Biemer (personal communication, October 18, 2002) found that 15% of a national sample of people over sixty-five ranked their health as very good (the top choice) on a self-administered questionnaire, but 27% did so in a follow-up face-to-face interview a month later in which an identically worded question was asked.

Since it is a cultural expectation that a person offers a casual "fine" or other positive answer when asked about one's health, it should not come as a surprise that respondents in an interview survey give somewhat more positive answers than they do in a self-administered questionnaire. Similarly, researchers have shown that respondents to interview surveys are less likely to admit to drug use or other socially undesirable behaviors (DeLeeuw 1992; Fowler, Roman, and Di 1998).

Acquiescence is the tendency to agree when interacting with another person because, in general, people find it easier to agree than disagree. A limited amount of research has suggested that people are more likely to agree than disagree with questionnaire items such as "Well-groomed individuals make better leaders" in interview surveys. To avoid possible acquiescence, and

thus mode differences, it has been suggested that questions not be formulated using agree/disagree categories (Schuman and Presser 1981).

Recency is the tendency for respondents in interview surveys to choose from the last-offered answer choices, while primacy is the tendency for respondents in self-administered surveys to choose from among the first-offered categories. The primacy/recency phenomenon has been noted by a number of authors, notably Krosnick and Alwin (1987). Recency effects were found in telephone surveys conducted by Schuman and Presser (1981). Other authors have also presented evidence supporting the existence of primacy/recency effects, but their results have not always been consistent. In eighty-four experiments reported by Dillman et al. (1995) that used a variety of question structures, evidence for the existence of primacy on mail surveys and recency on telephone surveys was quite inconsistent.

Although the last word has certainly not been written about mode differences, it is apparent that they occur frequently, and the reasons for their occurrences also differ. Much remains to be learned about how mode influences answers to survey questions.

IN SEARCH OF SOLUTIONS

Just as mode differences do not flow from a single problem, there is no single solution that will facilitate switching modes when conducting panel studies. Rather, there are a set of issues that need to be addressed, some simple, and some of which are much more complex and in need of careful research.

Unimode Construction and Its Limitations

One way of attempting to limit mode effects is to write survey questions in a manner that will work satisfactorily across different survey modes and to make sure that questions remain exactly the same in later data collections, regardless of modes. Procedures aimed at accomplishing the same stimuli across modes have been described elsewhere as unimode construction (Dillman 2000:ch. 6). An example of unimode construction is to avoid using “don’t know” as an available but unread category in the telephone mode, while preventing its use altogether in mail or Web surveys. Instead, one could make it explicitly available in all modes. Unimode construction also means resisting the temptation to change from an open-ended question in an interview to a close-ended question for a mail follow-up, simply because open-ended questions do not perform as well in such surveys. And if one uses

yes/no formats for interviews, one needs to resist changing to a check-all-that-apply format for paper or Web self-administered surveys. Further, if one asks occupation through a series of mail questions, then one needs to keep the same format for telephone.

Unimode construction requires conductors of surveys to use question styles that are different from those generally accepted for the various modes. For example, if one wants to maintain the same stimulus on telephone and face-to-face, they should forego the use of so-called show cards that are often considered standard procedure for face-to-face interviews. Accomplishing unimode construction suggests the need to optimize questionnaire design across modes rather than to maximize for individual modes.

However, unimode construction is not a solution to some of the issues noted earlier, notably social desirability and acquiescence. These effects stem from the presence of an interviewer, and despite common wording, telephone and face-to-face interviews are likely to produce different answers to such questions than do self-administered questionnaires. In addition, the fact that recency effects have been associated with the verbal presentation of answer categories, while primacy effects are associated with the visual presentation of answers, presents a dilemma to questionnaire designers. It has sometimes been proposed that the answer categories be rotated randomly to deal with potential effects, and this may be appropriate for some cross-sectional surveys in which the main objective is to make point estimates. However, when applied to a panel survey in which the objective is to measure change between data collections, changing the category order threatens accurate measurement of that change. Thus, one must balance the potential benefits of randomly changing category order with undesirable consequences.

The adoption of unimode construction procedures suggest that consideration be given to such practices as reducing the length of scales and perhaps avoiding the use of verbal labels for each scale point. Switching to scales having verbal labels only for the endpoints would seem to facilitate their administration over the telephone, where interviewers often struggle to read scale points consistently. However, recent research on the effects of visual design and layout reveals that such attempts at finding commonality in construction across modes may be more difficult than it seems.

How Visual Design and Layout Affect Respondent Answers

It has long been recognized that question meaning in interview surveys does not come from words alone; voice and interviewer effects act as a paralanguage that give additional meaning to questions. These influences

underlie the occurrence of social desirability and acquiescence effects. Evidence is now accumulating that self-administered questionnaires, which depend on visual as opposed to aural processing by the respondent, may also be subject to paralanguage affects.

Considerable research has suggested that when surveys are administered visually, respondents draw information from more than words. To determine question meaning, respondents may also draw information from the visual appearance and layout (Smith 1993; Schwarz 1996). It has been proposed that nonverbal languages such as numbers, symbols, and graphical features (such as variations in size, spacing, shapes, and brightness) act as a paralanguage that gives additional meaning to words (Redline and Dillman 2002).

Recent experiments confirm that these nonverbal languages do influence how respondents interpret the meaning of questions and instructions on questionnaires in a wide variety of situations. Redline et al. (2003) found in a large-scale national experiment included in the 2000 Decennial Census that respondent errors in following mail survey branching instructions, which directed them to skip ahead, could be reduced by one-third, from nearly 20% to 13%. This was accomplished through the joint use of additional symbols (arrows), changes in the graphical appearance of the skip instruction (larger, darker font), and an additional word instruction placed at the beginning of the question to be skipped. The design of that experiment did not allow the individual effects of each change to be measured but did show that combined changes could produce a large reduction in errors.

Experimental research indicates that individual manipulations in the visual presentation or layout of questions can influence respondent answers similarly across mail and the Web. These experiments were conducted using random samples of undergraduate students at Washington State University in the spring of 2002 and 2003. The spring 2002 paper survey was conducted by mail using two different versions, and 1,042 students completed the survey, for a response rate of 58%. A total of 1,591 students completed one of four versions of the Web survey conducted in spring 2003, for a response rate of 53%. A \$2 incentive was mailed to all students sampled for both the mail and Web survey, and multiple contacts were sent to nonresponders.

One set of experiments demonstrated that independent manipulations of symbols and graphics can change respondent answers to paper questionnaires (Christian and Dillman 2004). For example, changing the layout of scales from a vertical linear display of categories to a nonlinear display, arranging the same categories so that the first two were in one column, the next two in a column to the right, and the fifth to the right of that column, significantly affected the response distributions. In addition, changing the dis-

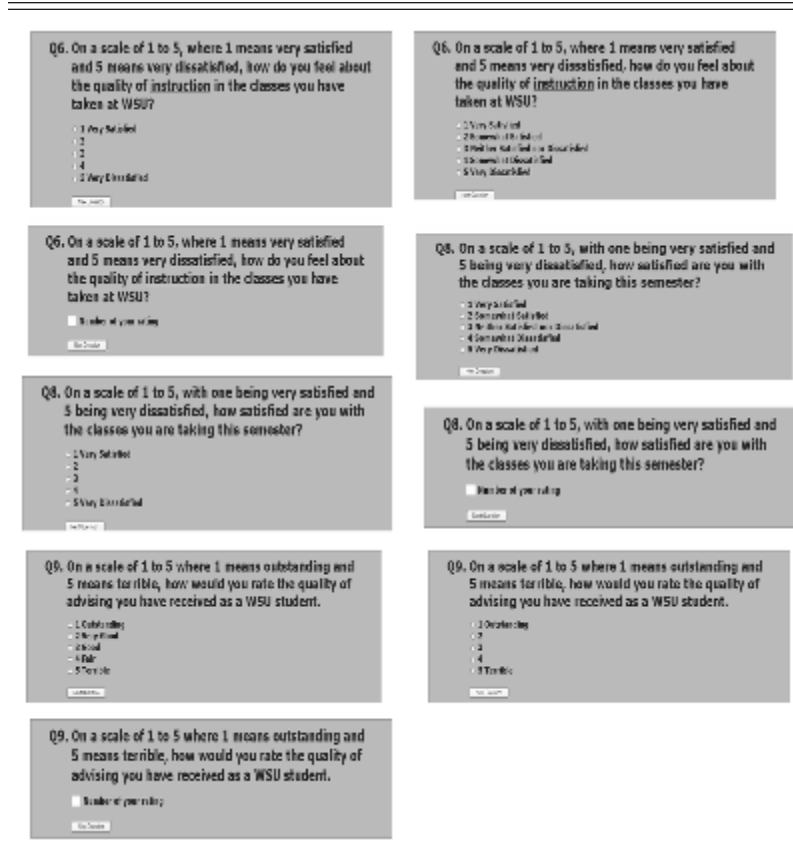
FIGURE 1A
Question Wording and Formats Compared in Paper and Web Experiments
(Mail Experiment)

<p>4. On a scale of 1 to 5, with one being very satisfied and 5 being very dissatisfied, how satisfied are you with the classes you are taking this semester?</p> <p><input type="checkbox"/> 1 Very Satisfied</p> <p><input type="checkbox"/> 2</p> <p><input type="checkbox"/> 3</p> <p><input type="checkbox"/> 4</p> <p><input type="checkbox"/> 5 Very Dissatisfied</p>	<p>4. On a scale of 1 to 5, with one being very satisfied and 5 being very dissatisfied, how satisfied are you with the classes you are taking this semester?</p> <p><input type="text"/> Number of your rating</p>
<p>7. On a scale from 1 to 5 where 1 means very satisfied and 5 means not at all satisfied, how do you feel about the quality of <u>instruction</u> in the classes you have taken at WGSU?</p> <p><input type="checkbox"/> 1 Very Satisfied</p> <p><input type="checkbox"/> 2</p> <p><input type="checkbox"/> 3</p> <p><input type="checkbox"/> 4</p> <p><input type="checkbox"/> 5 Not at all Satisfied</p>	<p>7. On a scale from 1 to 5 where 1 means very satisfied and 5 means not at all satisfied, how do you feel about the quality of <u>instruction</u> in the classes you have taken at WGSU?</p> <p><input type="text"/> Number of your rating</p>
<p>9. On a scale of 1 to 5 where 1 means outstanding and 5 means terrible, how would you rate the quality of advising you have received as a WGSU student.</p> <p><input type="checkbox"/> 1 Outstanding</p> <p><input type="checkbox"/> 2</p> <p><input type="checkbox"/> 3</p> <p><input type="checkbox"/> 4</p> <p><input type="checkbox"/> 5 Terrible</p>	<p>9. On a scale of 1 to 5 where 1 means outstanding and 5 means terrible, how would you rate the quality of advising you have received as a WGSU student.</p> <p><input type="text"/> Number of your rating</p>

tance between answer spaces, placement of a large arrow (vs. no arrow) that would direct respondents to a subordinate question, and changes in the size of open-ended answer spaces all significantly influenced people's answers.

Another experiment in this study revealed the considerable dependence of respondents on graphical layout for providing meaning to questions and raises additional concerns about possible mode differences. Respondents were asked to answer using a five-point scale with polar point labels that was presented in one of two formats: (1) a linear layout with numbers and boxes for each category and (2) a layout that conveyed information about the scale in the query, but required respondents to put the number of their choice in a box (see Figures 1A and 1B). The latter version removed the graphical and symbolic languages that may have helped communicate the continuum of the scale. Respondents to the number box version gave consistently more negative answers than did respondents to the linearly displayed check box version. These results are summarized here in Table 1A. Examination of completed questionnaires revealed numerous erasures and answer changes from 1 to 5 and 2 to 4 or vice versa, suggesting that respondents had become confused when interpreting the direction of the number box scale, because of the removal of the other supporting languages (Christian and Dillman 2004).

FIGURE 1B
 Question Wording and Formats Compared in Paper and Web Experiments
 (Web Experiment)



A subsequent study repeated this experiment in a Web survey using the same three questions (Christian 2003). The test was also expanded to include a treatment in which the same questions were asked, using the same categories with all five-scale points labeled. As shown in Table 1B, the polar point versus number box comparison results are quite similar to those found for the previous paper experiment. For all three questions in both experiments, the number box produced more negative answers than did the polar point version. The fully labeled versions produced even more positive answers for two of the three items than did the polar point scale (see Table 1C).

TABLE IA
 Percentage of Respondents Choosing Each Category
 in Paper and Web Experiments for the Same Questions
 (Paper Experiment: Polar Point versus Number Box Comparisons)

Response	Question 1		Question 2		Question 3 ^a	
	Polar Point	Number Box	Polar Point	Number Box	Polar Point	Number Box
1 <i>Very satisfied</i>	15.9	9.8	10.8	6.3	15.2	14.2
2	43.5	29.2	47.6	35.4	31.8	23.8
3	31.0	34.5	31.3	33.8	31.6	29.6
4	7.7	21.3	9.5	20.9	15.4	21.7
5 <i>Very dissatisfied</i>	1.9	5.3	0.8	3.7	5.9	10.7
Total	100	100	100	100	100	100
<i>n</i>	517	513	517	512	506	466
Mean	2.4	2.8	2.4	2.8	2.7	2.9
Difference of means	$t = 7.7 p = .000$		$t = 6.9 p = .000$		$t = 3.5 p = .000$	
Chi square	$\chi^2 = 63.4 p = .000$		$\chi^2 = 48.1 p = .000$		$\chi^2 = 18.0 p = .001$	

a. Response categories to this item were 1 (*outstanding*) to 5 (*terrible*).

TABLE IB
 Percentage of Respondents Choosing Each Category
 in Paper and Web Experiments for the Same Questions
 (Web Experiment: Polar Point versus Answer Box Comparisons)

Response	Question 1		Question 2		Question 3 ^a	
	Polar Point	Number Box	Polar Point	Number Box	Polar Point	Number Box
1 <i>Very satisfied</i>	19.4	17.2	10.5	6.9	14.0	15.8
2	40.0	32.8	43.6	38.0	29.3	21.8
3	30.6	27.5	35.2	40.4	30.0	31.7
4	8.2	18.5	9.8	12.4	19.0	18.8
5 <i>Very dissatisfied</i>	1.8	4.0	0.9	2.3	7.8	11.9
Total	100	100	100	100	100	100
<i>n</i>	438	302	438	305	437	303
Mean	2.3	2.6	2.5	2.7	2.8	2.9
Difference of means	$t = 3.48 p = .000$		$t = 2.86 p = .002$		$t = 1.34 p = .091$	
Chi-square	$\chi^2 = 21.9 p = .000$		$\chi^2 = 8.72 p = .068$		$\chi^2 = 7.63 p = .010$	

a. Response categories to this item were 1 (*outstanding*) to 5 (*terrible*).

These differences suggest clearly that variations in how a five-point scale is supported by words, numbers, symbols, and graphics can influence answers to scalar satisfaction questions that use visual communication, and

TABLE 1C
 Percentage of Respondents Choosing Each Category
 in Paper and Web Experiments for the Same Questions
 (Web Experiment: Fully Labeled versus Polar Point Comparisons)

Response	Question 1		Question 2		Question 3 ^a	
	Fully Labeled	Polar Point	Fully Labeled	Polar Point	Fully Labeled	Polar Point
1 <i>Very satisfied</i>	29.3	19.4	14.3	10.5	16.2	14.0
2	50.2	40.0	63.1	43.6	26.3	29.3
3	9.5	30.6	13.4	35.2	26.1	30.0
4	9.2	8.2	8.8	9.8	20.3	19.0
5 <i>Very dissatisfied</i>	1.8	1.8	0.5	0.9	11.1	7.8
Total	100	100	100	100	100	100
<i>n</i>	434	438	434	438	433	437
Mean	2.0	2.3	2.2	2.5	2.8	2.8
Difference of means	$t = 4.5 p = .000$		$t = 5.2 p = .000$		$t = .80 p = .211$	
Chi square	$\chi^2 = 62.6 p = .000$		$\chi^2 = 61.6 p = .000$		$\chi^2 = 5.27 p = .260$	

a. Response categories to this item were 1 (*outstanding*) to 5 (*terrible*).

these features must be taken into account when using the same visual mode across data collections. Removing word support (shifting to a polar point scale) or graphical and symbolic support (shifting to a number box) results in different answers for self-administered visual surveys. These results raise the question of which of these formats may translate most effectively across visual and aural survey modes.

An earlier experiment conducted by the Gallup Organization compared answers to similar five-point satisfaction scales using polar point word labels for respondents surveyed by telephone, IVR, Web, and mail (Dillman et al. 2001). In this survey, respondents to the aural modes (telephone and IVR) provided significantly more positive answers, as reflected in greater use of the extreme positive category, than did respondents to the visual modes (Web and mail). These results provide evidence that the polar point scale did not translate equivalently between visual and aural presentation. Whether better equivalency might be achieved between fully labeled questions remains to be seen.

SUMMARY AND CONCLUSIONS

Mode changes between the initial data-collection period and follow-up data collections for panel studies should be evaluated carefully. There is a

considerable likelihood that such changes make it difficult to accurately measure change between survey waves. Nonetheless, mode changes are common in panel studies and are the result of many considerations from cost and budget concerns to personal and organizational preferences. Furthermore, cross-sectional studies that mix modes should also be aware of how the choice of mode may be influencing respondents' answers to survey questions.

Multiple factors may contribute to different measurements being obtained solely as a result of mode change. One of the most frequent causes of change is inadvertent revision in the structure of questions to follow suggested design procedures for one mode. Each mode favors the construction of questions in ways that differ from those favored by each of the other modes. When data collection for panel studies is left to technical staff associated with each mode, it is likely that question structures will be changed. Furthermore, the insertion of new questions for follow-up studies between questions from previous waves may produce unintended order or context effects.

A third set of factors that appear to contribute to measurement differences across modes—social desirability, acquiescence, and primacy/recency—present particularly difficult challenges because it may not be possible to completely eliminate these differences, leaving adjustment or indexing as the only solution.

The construction of questions to provide a more equivalent stimulus across modes (i.e., unimode construction) seems desirable when conducting mixed-mode surveys. However, to do this will likely require writing questions in ways that optimize their use across all modes rather than allowing what is best (or traditional) for one mode. This may be quite difficult to accomplish in our complex survey world in which there are many different modes to use and established procedures for constructing questions for each mode exist.

Recent experimental evidence that the visual presentation of questions can significantly influence people's answers raises important questions that remain to be answered. The results reported here show that three different versions of five-point satisfaction questions—polar point labels using a linear scale layout, a number box without visual layout support for answer categories, and a fully labeled scale with verbal labels for each category—produced significantly different answers for each of the layouts. These results suggest that differences in layout within visual modes must also be considered a possible source of measurement error and that research is needed on how various visual representations compare when used in aural modes of surveying.

Survey researchers face substantial challenges because of the variety of modes from which they can choose. However, the theoretical and empirical work that has been performed thus far offers a rich source of ideas for finding appropriate solutions and directions for future research. The mistake would be to ignore mode, and now visual design effects, as if they did not really matter.

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