Exploiting Computer Automation to Improve the Interview Process and Increase Survey Cooperation[1]

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Keywords: burden, conversational norms, efficiency, flow, nonresponse/attrition, questionnaire design

Abstract: Computer-assisted survey questionnaires present special opportunities to improve efficiency, "flow," and naturalness, and in general make the interview experience a more pleasant one for all participants. Such improvements offer the potential for an important practical benefit – increased cooperation. Although the research literature is surprisingly scant, there is some evidence that improved instrument design can reduce nonresponse. A recent effort by the U.S. Census Bureau to redesign the core instrument for the Survey of Income and Program Participation (SIPP) offers additional support. Many of the redesign changes to improve the SIPP interview would not have been feasible without computerization. This paper summarizes the major technology-based changes implemented in the SIPP instrument, and briefly describes a set of field experiments used to develop and refine the new procedures and to evaluate their success in achieving SIPP's redesign goals.

I. Interviews as Social Interactions

Abundant everyday evidence suggests that, in general, people tend to enjoy talking about themselves. A minor mystery, then, is why they are not more eager to participate in surveys. Despite recent advances in understanding survey nonresponse (e.g., Groves and Couper, 1998; Groves, Dillman, Eltinge, and Little, 2002), little work has addressed this seeming contradiction. This paper suggests that a solution may lie in the long-recognized fact (e.g., Converse and Schuman, 1974) that an interviewer-administered survey interview is a social interaction, and not merely a neutral measurement process. And as an interaction, an interview is often difficult and unsatisfying to the participants – perhaps, some would argue, inevitably so (Suchman and Jordan, 1990; Shober and Conrad, 1997; Lynch, 2002; Maynard and Schaeffer, 2002).

Recent linguistic studies provide much evidence of the social nature of survey interviews (e.g., Suchman and Jordan,1990; Maynard et al., 2002), but such evidence has long been available from more traditional survey methods research. For example, Cannell, Marquis, and Laurent (1977) tallied verbal behavior in an interview and found evidence for a "reciprocal cue-searching process," in which both interviewers and respondents respond to cues from the other as to the appropriate nature of their interaction. Cannell et al. also note that a large amount of an interview's verbal behaviors are "non-programmed." In one study, they report that one-third of all behaviors occurred in the presumed void between a respondent's adequate answer and the interviewer's beginning to read the next question.

Respondents may be particularly ill-prepared to treat an interview as simply a neutral conduit for information transmission. Schegloff (2002), Briggs (1986), Clark (1979), and others have noted the tendency of respondents to apply the rules they have learned in acquiring the skills of normal social conversation to the interview setting. Even respondents who are aware of the goals of survey interviews and the rules that guide them may have difficulty overcoming years of over-learning of the norms and practices of regular social situations. But, as Cannell et al. (1977) show, interviewers also feel the pull of an interview's social interaction qualities – after all, they, too, are well-trained in the rules of social interaction, and just as likely as respondents to accept the notion that "conversational etiquette is ... a central feature of proper comportment" (Briggs, 1986, p. 57). In addition, interviewers also have a clear stake in keeping respondents happy, leading to heightened sensitivity to anything likely to increase respondent distress.

For surveys sponsored by the U.S. government, the official operational definition of a survey's "burden" on respondents has always been a direct function of interview length (U.S. Office of Management and Budget, 1976). Research supporting this notion, however, is scant (see, e.g., Bogen, 1996; Sharp and Frankel, 1983, provide an exception). The inescapably social/interactional character of an interview suggests that a survey's true burden may derive less from the sheer number of questions asked than from the extent to which those questions are vague and ill-defined, or unnecessary, or repetitive, or have already been answered, or are unanswerable, or which are ill-matched to the understood and agreed-to nature of the survey. This line of thought offers clues as to what constitutes

[1]This paper is a much-condensed version of Moore (2004). It is released to inform interested parties of research and to encourage discussion. The views expressed are the author's, and not necessarily those of the U.S. Census Bureau.

good questionnaire design, an issue that is surprisingly rarely considered in survey methodology: a good questionnaire is one which, all else equal, supports a smooth and appropriate social interaction. Those factors, it turns out, are reasonably well established in linguistics – see, for example Grice's (1975) "conversational maxims." But a questionnaire's social interaction qualities are rarely accorded high priority during its design, and thus it is not surprising that survey participants often find survey interactions unsatisfying, or even actively annoying.

II. Why Interaction Quality Matters

There are at least three practical reasons to be concerned about questionnaires that are insensitive to interaction quality:

(1) Threats to standardization. The goal of standardized administration of survey questions is poorly served by giving interviewers questionnaires that they cannot possibly read exactly as worded if they hope to maintain any semblance of a normal human interaction.

(2) Threats to data quality. Suchman and Jordan (1990) helped open the eyes of the survey research world to the extent to which "interactional troubles" can bedevil the standardized interview task, and, through interactional blundering and miscommunication, yield lower quality data. A more motivated data quality impact is also possible. To the extent that an interview runs roughshod over interactional niceties, one might expect that respondents – and perhaps interviewers, too – would de-value the importance of the enterprise, and be less engaged in the task of producing good data. Lowered engagement may lead to "satisficing" (e.g., Krosnick et al., 1996) – producing and recording minimally acceptable replies for the purpose of simply getting through the interview as quickly as possible.

(3) Threats to survey cooperation – the primary focus of this paper. The evidence is clear that interviewers and respondents can't prevent the rules of "normal" conversational interaction from spilling over into the survey setting. Relative to a smooth and satisfying interaction, an interaction marked by violations of those rules is no doubt more distressing and off-putting, and less likely to produce a desire to repeat the experience (e.g., Stocké, 2004). Such effects could operate even in a first-visit or one-time-only survey, due to interviewers' awareness of the likely poor quality of the interaction should they secure the cooperation of an initially reluctant respondent.

III. Evidence that Interview Interaction Quality Matters for Survey Cooperation

A. Survey Introductions

One strand of evidence that interaction quality matters for survey cooperation can be found in research on survey introductions and other behaviors that occur in the opening seconds of a survey interaction. Houtkoop-Steenstra and van den Bergh (2000), for example, have experimented with unscripted survey introductions, hypothesizing that a read-from-a-script introduction will almost always be perceived as such by respondents, who will realize that what follows will not be "real" talk, and thus not a satisfying interaction. An unscripted introduction, on the other hand, permits interviewers to adapt their speech offerings to the respondent, increasing the likelihood that the respondent will view the upcoming interaction as potentially positive. Houtkoop-Steenstra and van den Bergh find that a conversational introduction yields significantly more completed interviews than a standard scripted one, more appointments, and fewer refusals. Morton-Williams (1991, 1993) also finds a positive impact of improvised introductions.

Research on "tailoring" survey introductions can be seen in the same light. "Tailoring" seeks to reduce survey nonresponse by training interviewers to attend carefully to respondents' doorstep comments, to distill the information contained in them concerning reluctance to cooperate, and to respond to the comments with appropriate counter-arguments. A large body of evidence finds that tailoring techniques reduce survey refusals (see, e.g., Couper, 1997; Couper and Groves, 2002; Groves, Cialdini, and Couper, 1992; Groves and Couper, 1998; Groves, McGonagle, and O'Brien, 1999; Mayer and O'Brien, 2001; O'Brien, Mayer, Groves, and O'Neill, 2002).

B. Characteristics of 2nd Wave Nonrespondents

Another strand of evidence pointing to the importance of interaction-sensitive survey procedures comes from quasi-experimental examinations of "attritors" in longitudinal surveys – respondents to the initial survey administration who nonrespond in the next survey wave. Kalton et al. (1990) report a significant association between interviewers' ratings of a positive wave 1 interview experience for the respondent and successful completion of the second interview 2½ years later. Lepkowski and Couper (2002) take a different analytical approach to the same data, and extend the analysis to another, similar data set, but their refinements in fact yield quite similar results.

C. Questionnaire Design Experiments

1. Topic-based vs. person-based design

Moore and colleagues (e.g., Moore, 1996; Moore and Moyer, 2002) have conducted research on "topic-based" questionnaire design (see also Couper, Fuchs, Hansen, and Sparks, 1997; Fuchs, 2002). A topic-based

interview completes one topic for all persons before proceeding to the next topic. This design stands in contrast to a conventional "person-based" design, which completes all topics for one person before proceeding to the next person. One key benefit of the topic-based interview is the opportunity it affords for severely truncating the text needed for subsequent question administrations after the first, full one, e.g.:

> Is [person1] currently married, widowed, divorced, separated, or has he/she never been married?
> How about [person2]...?
> And [person3]...?

Moore (1996) demonstrated the potential benefits of this design in a small pilot test in which a topic-based questionnaire, compared to person-based, resulted in shorter interviews, was judged by respondents to be less repetitive than the person-based format, elicited reduced feelings of impatience, and was the strongly preferred format among all experimental subjects. In addition, interview observers found that topic-based respondents displayed significantly less confusion than their person-based counterparts, less annoyance, and less boredom or fatigue. These results were later replicated in a large-scale field experiment – see Moore and Moyer (2002) for details. Most important for present purposes, the experiment's topic-based treatment also yielded a significantly higher response rate. As Moore and Moyer note, this result, in a one-time survey, underscores the critical role of interviewer behavior in determining survey cooperation outcomes, since respondents were not aware of any instrument differences at the time of their (non)cooperation

2. Household screener vs. person-level questions

Hess et al. (2001) used a split-panel RDD/CATI survey to compare household-level screening questions with person-level questions. The latter, as the label implies, uses strictly person-level questions to assess the characteristics of interest ("Does John have a disability?" "Is Susan covered by health insurance?"). In some applications the person-level approach has been perceived as both tedious and burdensome (Hess and Rothgeb, 1998; Hess, Rothgeb, and Zukerberg, 1997). The household-level screening approach, in contrast, starts by determining whether anyone in the household has the characteristic: "Does anyone in this household have a disability?" Follow-up questions to determine who has the characteristic are asked only if the answer to the household screener is positive.

Hess et al. report that household screener interviews were significantly shorter than person-level interviews, and that interviewers gave more positive ratings of the household-level questionnaire version; most notably, they judged the household-level screening form to be a significantly better instrument to use when dealing with reluctant respondents. This judgment was confirmed in the interview outcome data, in which the household screener treatment resulted in a significantly lower refusal rate. Given respondents' blindness to the type of interview to be administered, and interviewers' awareness, Hess et al. conclude that this difference "suggests that interviewers invested less effort in persuasion [in person-level treatment cases], perhaps because they were less eager to conduct that type of interview" [p. 581].

IV. Computer-Assisted Questionnaires – Problems and Potential for Interview Interactions

Couper (2002) summarizes the myriad ways in which technology – including, of course, the computerization of survey questionnaires – is reshaping survey research. The obvious benefits of computerized questionnaires, especially for administration in the field (e.g., automatic adherence to the correct interview "path;" no more missing entries), and data capture (e.g., immediate editing of extreme values; no more data keying), have led to their widespread adoption; virtually all of the U.S. government's major survey programs are now administered with automated questionnaires.

With regard to their ability to guide a satisfying social interaction, computerized survey questionnaires carry both problems and potential. Many observers (e.g., Groves, Berry, & Mathiowetz, 1980; Groves & Mathiowetz, 1984; House, 1985; Couper et al., 1997) have noted the "segmentation" problem in CAI instruments – each question is presented separately, so the interviewer never sees the whole questionnaire (or even large parts of it) all at once. This can cause interviewers to lose track of the relevance of the individual questions to the interview's "big picture," and, similarly, the relationship of individual questions to each other. The absence of this information can damage an interviewer's ability to maintain a smooth, natural interview "flow." Another problem is the rigid control of the flow of the instrument by the computer, restricting interviewers' ability to improvise when the unexpected occurs (Couper et al., 1997; Groves and Mathiowetz, 1984). The rigid control of the interview flow also forces interviewers to record an answer before asking the next question; in contrast, interviewers using paper-and-pencil questionnaires often begin asking the next question while still recording the response to the previous one (Groves and Mathiowetz, *op cit.*). Fuchs (2002) notes another problem – the interviewer's divided attention. He or she must pay substantial attention to the computer, at the expense of attention to the respondent and to the interview interaction. Fuchs

finds that one negative impact of divided attention is that interviewers often ask questions that have already been answered.

The problems inherent in computer-assisted questionnaires, however, are counterbalanced by their potential for design improvements. Those benefits include: (1) Employing with ease complex structures which have been shown to improve the interview process, and which present major administration difficulties in the absence of automation. (2) Better tailoring of the question sequence to the respondent's circumstances. Automated instruments can employ complex logic to determine an appropriate question sequence, without adding burden to the interviewer, or increasing the likelihood of sequence errors. (3) Increased flexibility. A questionnaire need no longer stick rigidly to a single strategy to obtain some particular information, but can instead tailor the task to an option best suited to the respondent's situation. (4) Better long-term "memory." Computerization vastly expands the possibilities for use of dependent interviewing procedures in longitudinal surveys, which both interviewers and respondents have been found to favor (Mathiowetz & McGonagle, 2000; Polivka and Rothgeb, 1993; Pascale and Mayer, 2004).

V. SIPP Improvements and Testing Results

The Census Bureau launched a research program in the late 1990's to improve the core questionnaires for the Survey of Income and Program Participation (SIPP). The primary goal of this program was to produce a less burdensome SIPP questionnaire that would encourage greater cooperation with the survey, without causing harm to the survey's important estimates.

A. SIPP and its Nonresponse Issues

SIPP is an interviewer-administered, longitudinal survey conducted by the U.S. Census Bureau. It provides nationally-representative data on income, wealth, and poverty in the United States, the dynamics of program participation, and the effects of government programs on families and individuals. A SIPP panel consists of multiple waves (or rounds) of interviewing, with waves administered at four month intervals, typically over a period of three or four years. Since 1996 all SIPP interviews have been conducted with a computer-assisted instrument. Early interview waves are administered in-person; later waves are generally conducted by telephone. The SIPP core instrument (i.e., the content that is repeated in every survey wave) is detailed, long, and complex, collecting information about household structure, labor force participation, income sources and amounts, educational attainment, school enrollment, and health insurance over the prior four-month period. A typical SIPP interview takes about 30 minutes per interviewed adult (anyone age 15 or older). See U.S. Census Bureau (2001) for a more complete description of the SIPP program.

As with other government surveys (Bates and Morgan, 2002), SIPP's nonresponse levels rose noticeably in the late 1990s. The nonresponse increase, and the absence of a "magic bullet" in traditional procedural fixes, coincided with a renewed conviction on the part of Census Bureau methodologists that the SIPP questionnaire made the interview more burdensome than it needed to be. These joint concerns led to a redesign program whose primary goal was to make the SIPP interview more efficient and less tedious, to develop clearer and "friendlier" wording, to simplify response tasks, and in general to make it a more pleasant experience for all participants – without harming data quality. The hope was that these "interview process" improvements would improve survey cooperation. The resulting research program, the SIPP Methods Panel Project, developed and refined a large set of improvements to the core SIPP questionnaire, and evaluated those improvements in a series of three split-panel field experiments. See Moore et al. (2004) for a detailed description.

B. Using Computerization to Improve the Interview

The redesign effort sought a questionnaire which would minimize interactional difficulties, focusing special attention on improvements made feasible only with the advent of computer-assistance. Some of the major new features which survived the Methods Panel's testing process are as follows:

- a smoother and more natural rostering process to identify household members, one which accepts multiple names and permits the capture of volunteered sex and relationship information;
- a topic-based design to capture basic demographic information about household members (in place of the strictly person-based design of the old instrument), and household-level screening questions for several variables of interest (in contrast to the strictly person-level nature of the old questionnaire);
- behind-the-scenes logic to avoid asking questions whose answers are completely determined by prior information – e.g., the race of a biological child of two parents of the same race;
- for characteristics that don't change, or that change predictably, the use of a single verification in the second interview wave to make sure that the

information is correct, and, if successfully verified, no further questions in subsequent waves;

- the use of logical assumptions (e.g., about marital status and educational attainment across interview waves) to avoid repeated reasking of questions whose answers are obvious;

- the use of screening procedures to avoid asking wealthy respondents large numbers of questions about their participation in need-based programs, and low income respondents large numbers of questions about their asset holdings;

- the use of flexible reporting periods for earnings amounts and asset income – instead of insisting on monthly amounts (earnings) or 4-month totals (assets), the new instrument offers respondents an array of choices so they can pick the one most convenient for their own circumstances;

- the availability of prior wave income amount reports for use in dependent follow-up questions in the next wave to overcome an initial nonresponse ("Things may have changed, but I have recorded from the last interview that [income source] produced about [X] dollars per [time period]. Does that still sound about right?");

- much more extensive and precise use of dependent interviewing procedures, most notably in questions about health insurance, asset ownership, school enrollment, and financial aid for education;

- new procedures for capturing health insurance information without question repetition – e.g., asking either 15-to-21-year-olds themselves, or their parents (but not both), about coverage under SCHIP; and using information obtained from policy-holders about dependents on their policy (and from dependents about policy-holders).

C. Testing the New Instrument Procedures

The Methods Panel employed three field experiments to test and refine these and many other new procedures prior to their implementation in the 2004 SIPP panel instrument. Each experiment interviewed about 2000 sample households, with random assignment of sample cases to test and control groups. The control treatment used the current production SIPP questionnaire. Interviews were administered by personal visit, and were conducted by experienced SIPP interviewers. In each field test, interviewers' assignments included a mix of both control and test cases. We refer to the three experiments by the year in which they were conducted – MP2000, MP2001, and MP2002. The control instrument remained virtually constant across the three experiments, unlike the test instrument, which was modified and refined considerably over the test series. MP2000 consisted of only a wave 1 interview; both MP2001 and MP2002 included a wave 2 interview four months after the wave 1 interview. See Doyle, Martin, and Moore (2000) for a detailed description of the MP field tests.

D. Results of the Field Experiments

1. Interviewer evaluations

Interviewer debriefing questionnaires were used to assess reactions to the control and test instruments. In general, interviewers reacted quite positively to most of the wave 1 test instrument's new features – and increasingly so over the three experiments. With regard to the new wave 2 instrument, first introduced in MP2001, interviewers' attitudes were substantially favorable from the beginning, and remained so through MP2002 as well. Interviewers also expressed highly positive attitudes toward most features of the new instrument design in several in-person debriefing sessions. See Moore (2004) for details. We attribute the emphatic shift toward more positive attitudes from MP2000 to MP2001 and MP2002 to both instrument refinements and increased interviewer familiarity.

2. Unit (and other) nonresponse results

The goal of the SIPP improvements was not just to make the interview experience more positive – we hoped that improving the interview process would yield improved cooperation. Separate analyses of the wave 1 and 2 unit nonresponse rates in each experiment found none of the test-control comparisons to be statistically significant. However, a logistic regression analysis of the wave 1 results across the three field experiments revealed a significant decline in nonresponse across the three experiments in the test treatment – from 17.2% to 16.4% to 12.2% in MP2000, MP2001, and MP2002, respectively – as contrasted with an essentially flat trend (14.8%, 15.2%, 13.2%) in the control. See Moore, et al. (2004) for details.

By observation, the wave 2 results suggested a similar sort of interaction, although analysis found no significant effect of questionnaire treatment on unit nonresponse. The predicted trend did appear, however, in the interview outcomes for individuals. The test instrument treatment in the MP2002 experiment resulted in a significantly lower rate of person nonresponse in the wave 2 interview (9.9%) than the control (14.2%). (In MP2001 the observed difference is in the same direction but falls short of statistical significance.) Thus, while found in a slightly different place than expected, there is also evidence in the wave 2 results that instrument

design can have a significant impact on survey cooperation.

VI. Conclusions and Discussion

With two important caveats, the Methods Panel's wave 1 unit nonresponse and wave 2 person nonresponse results are consistent with other work which suggests that instrument design improvements can exert a significant positive impact on cooperation, even in an initial contact interview. The caveats are that there may be some trial-and-error in the development of an improved design, and that the impact of the design improvements may not become apparent until interviewers become familiar and comfortable with them. The results also suggest that some rethinking may be in order concerning the different forms of the effect at different survey waves. Unit nonresponse may predominate in wave 1, where only the interviewer is aware of the nature of the to-be-administered questionnaire. In wave 2, however, once respondents' experience with the wave 1 interview can be factored into the response/nonresponse decision, it seems logical to find impacts at the individual respondent level.

The present study adds to a small body of research which offers some support for the notion that "interaction-friendly" questionnaire design is important, and can yield improved survey cooperation. It is likely that this has always been the case. But now a new feature on the survey research landscape – the use of computers in the administration of survey questionnaires – has opened up new possibilities for making the interview interaction more pleasant for all participants, while still adhering to the cornerstone features of scientific survey methodology: scripted and controlled question wording and sequencing.

A more interaction-friendly computerized questionnaire can be a mixed blessing, however, if the improvements add greatly to the complexity of the instrument code. Greater complexity increases the risk of programming errors, and makes instrument testing and debugging more difficult. These costs must be weighed against the benefits. If the results of the present study are generalizable, the benefits of improved questionnaire design may not be large. Reaping more substantial benefits from improved survey interactions may require the active assistance of interviewers, who would need new skills beyond reading questions exactly as worded. They would need to be trained to anticipate interaction "strains," and how to manage them effectively to the benefit of both the survey interaction and the quality of the data. Shober and Conrad (1997) offer a glimpse of the sorts of new skills interviewers would need in order to be of real assistance.

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