

Instrument Design for a Blaise Multimode Web, CATI, and Paper Survey

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In this paper we discuss the design implications involved in collecting and processing data via three disparate survey modes: mail, Web, and computer-assisted telephone interviewing (CATI) for the National Survey of Recent College Graduates (NSRCG). We provide a brief background of the study and outline the design and development process. Also discussed are the similarities and differences between the modes, examples of questions that posed particular challenges, and survey management implications. We conclude with lessons learned and advice for future multimode surveys of this nature.

1. Background and History of the NSRCG

The NSRCG is sponsored by the National Science Foundation (NSF) Division of Science Resources Statistics. It is one of a family of three NSF sponsored surveys designed to collect information to estimate characteristics of the population of scientists and engineers in the United States. Together, the three surveys constitute the Scientists and Engineers Statistical Data System (SESTAT). The first NSRCG (then called the New Entrants Survey) was conducted in 1974. Since then, subsequent surveys have been conducted about every two years. The 2003 NSRCG is the 16th survey in this series and was conducted in recent fieldings as a CATI-only survey. Mathematica proposed to cut costs and increase response rates for the 2003-2004 NSRCG by utilizing three modes of data collection. The survey was designed as a mail survey with a Web option and CATI follow-up for non-respondents.

1.1 Purpose of the NSRCG

The main purpose of the NSRCG is to provide estimates of the number of recent science, social science, and engineering graduates, and their recent employment experiences, salaries, and demographic characteristics. The first section of the questionnaire includes questions about the graduate's education, including their primary and secondary majors, degree types, degree dates, and the institutions from which their degrees were received. The middle sections ask about the graduate's employment situation as of the reference date (October 1, 2003), including detailed questions about their employer and type of work, as well as questions about their job satisfaction, and how closely related their job is to their field of study. The final section of the questionnaire includes key demographic questions.

1.2 Survey Population and Study Modes

The 2003 NSRCG utilized a stratified, two-stage sample design. In the first stage, a nationally representative sample of 300 colleges and universities was selected. During the second stage, individuals who graduated from the selected institutions with a master's or bachelor's degree in science, social science, engineering, or a health related field between July 1, 2000 and June 30, 2002 were randomly selected within cohort (year of graduation), type of degree received (bachelor's or master's), and major field of study (science, social science, engineering, and health related field). In order to provide reliable estimates of female and minority scientists, these groups were sampled at higher rates.

Graduates were sent an advance letter and an address verification form in September of 2003 explaining that they had been selected for the survey and asking them to provide updated contact information. A paper questionnaire and cover letter were sent in early October. Reminder postcards were sent two weeks later to non-respondents. After four weeks, non-respondents were sent another paper questionnaire and a cover letter offering an option to complete the survey on the Web. Each sample person was assigned a unique username and

password that was included in the mailing with instructions for completing the survey online. A post-it note with the pre-printed message “Try something new. Respond by Web!” was attached to the paper questionnaire to encourage Web participation. Sample persons who had not yet responded by Web or paper were contacted by telephone beginning in early February. Three e-mail reminders containing a link to the Web survey were sent over the course of the field period – four weeks after the onset of CATI data collection, twelve weeks later, and then two weeks before the close of the data collection period. Clicking on the link took the graduate to the Web survey and automatically filled in the login id and password.

1.3 Comparison of Single versus Multimode Administrations

An experimental group of 2,000 graduates were not offered the mail or Web survey option. Since previous rounds of the survey had used CATI as the primary mode of data collection (only sending a paper questionnaire if the respondent requested it), this group acted as a control group to assess the effectiveness of the multi-mode design.

1.4 One Blaise Instrument, Database, and Survey Management Scheme

One Blaise instrument was designed to collect CATI and Web data and was used to enter data from paper questionnaires. This approach to data collection offered several advantages including: it reduced programming effort by eliminating the need to program three separate instruments; all data were written to a single database which eliminated the need to merge databases after data collection (e.g., partial responses from Web could also be incorporated into and completed in CATI); and survey management was simplified.

2. Review of Attributes of Modes

Paper, Web, and CATI surveys differ in several fundamental ways. Differences include the way that questions are worded and displayed, data definition, and in some instances question order. Much of these design differences are the result of issues related to presentation, manner of responding, segmentation of the questionnaire, the dynamic versus passive nature of the questionnaire, administration (self versus interviewer), pace of interview, the medium of the interview, and the training of the person recording the responses. We discuss each of these issues and how they affected our design considerations briefly below.

2.1 Visual versus Aural Reception

One of the most obvious differences between CATI, paper, and Web surveys is their channel of presentation. CATI surveys are presented aurally, while paper and Web surveys are presented visually. The CATI respondent is totally dependent on the linear presentation of the survey by the interviewer. In Web and CATI modes, the respondent can rely on the layout of the questionnaire or browser screen to understand the entire content of a question with sub-items at a glance. The different channels of presentation also decrease the level of standardization across modes, as the CATI scripts need to be modified to reduce the cognitive complexity of responding and fit conversational norms. Section 4.1 below gives an example of how one question was worded differently based on its reception.

2.2 Oral versus Written versus Typed Transmission

The manner in which participants respond differs by survey mode, as well: CATI respondents speak, mail respondents write or check, and Web respondents type or click. Because each channel has the potential to affect respondent behavior, care must be taken when designing each mode. For example, the self-administered questionnaire (SAQ) is generally considered the best method to collect information on socially undesirable behaviors such as illicit drug use (Aquilino 1994) and the number of lifetime sexual partners (Tourangeau and Smith 1997) because it offers the greatest level of privacy. To be sure, these effects are moderated by respondent level of trust, whether the SAQ is self-administered or interviewer-administered, and

the presence of family members during the interview (Aquilino, Wright, and Supple 2000; Wright, Aquilino, and Supple 1998; Aquilino 1994). Thus in designing a multimode survey such as the NSRCG, researchers are faced with how best to collect comparable information across channels that are public (i.e., spoken) and thus more prone to social desirability bias and private channels. This may involve offering more assurances of confidentiality in CATI or integrating such technologies as telephone data entry to record the frequency of sensitive behaviors in a live telephone interview.

2.3 Segmentation

Whereas segmentation has been traditionally viewed as a known side effect of CATI and CAPI surveys (Groves, Berry, and Mathiowetz 1980; Pierzchala and Manners 2001), Web surveys can also limit one's ability to examine the survey instrument as a whole. Since there are no intervening interviewers or supervisors in the Web mode, the concept of segmentation must be expanded to include *the respondent* when discussing multimode surveys. CATI surveys lie on one end of the overview-segmentation continuum in that survey participants do not have the ability to determine how responses affect future questioning, and their memories must serve as the method by which they access former responses. Conversely, paper respondents are able to scan the entire questionnaire before responding and therefore have complete access to previous responses. Where Web surveys fall on this continuum depends on programmatic decisions. For example, Web surveys that present just one question per browser screen would be considered very similar to a CATI survey on the continuum. On the other hand, Web surveys that present several or many questions per browser screen and allow users to navigate through previous responses and future questions freely would be considered more similar to paper questionnaires.

2.4 Dynamic versus Passive

CATI and Web modes are dynamic modes in that routing, question wording, edits, and computations can all be adapted, executed, and enforced during the survey administration. This dynamism introduces several advantages, such as tailoring questions to the respondent, skipping unnecessary questions, following up on suspicious situations (e.g., no bachelor's degree recorded), and proceeding through difficult sections in very methodical ways to ensure no important data are missed. The passive paper mode relies on visual cues such as arrows, column headings, and the like to elicit correct responses. Dynamic displays may lead to further segmentation. For example in question B3 below (section 4.2.1), the year of retirement appears on an ensuing browser screen only if the retirement box is checked on the previous screen. In question A18 (section 4.2.4) the fact that graduate expenses may or may not always be asked was one reason the undergraduate and graduate expenses were handled on different browser screens.

2.5 Self Administration versus Interviewer Administration

Web and paper modes are self-administered modes while CATI is an interviewer-administered mode. Question wording may differ based on this attribute (see 4.2.1 below) as great care is made to make question text clear in any mode. Further, the interviewer is an intermediary and can be the source of error. On the other hand, the interviewer can explain, persuade, and otherwise facilitate the successful completion of the item or interview. Section 4.2.4 below gives an example where the interviewer-administered mode may aid in the collection of sensitive data.

2.6 Pace of the Interview

In addition to the differences described above, CATI, paper, and Web modes also vary in terms of the pace of the interview and in the determination of the pace. The pace of a self-administered questionnaire is wholly driven by the respondent's ability to comprehend the question, access the appropriate information, and respond. While the survey researcher can

design the questions and instrument to reduce comprehension and retrieval times (see, for example, Mangione 1995), they have no control over the process once the survey is in the respondent's control. The pace of the CATI mode is determined first by manner of question construction (e.g., don't repeat question stems every time) and secondly by implicit negotiation between the interviewer and the respondent. On the other hand, the pace of the Web mode can vary greatly between respondents, due solely to the hardware and software infrastructure between them and the Web survey server. Poor connect speeds can introduce several-second delays between browser screens and contribute to premature exits. One way to try to compensate for this possibility is to add more than one question at a time to one browser screen.

2.7 Medium

The medium of the CATI interview is the phone, the medium of the mail questionnaire is paper, and the medium of the Web survey is the browser. As opposed to other media, many aspects of the browser-as-medium are out of the control of the survey organization, including whether or not cookies are allowed, presence of a pop-up blocker, screen resolution, color rendering, processor speed, and the quirks of each individual Web browser. The need to accommodate this variable environment encourages a "lowest common denominator" approach to Web browser display, which in turn makes it more difficult to match the browser display to paper. Section 4.2.4 gives an example of a question where browser could not match the display of a paper questionnaire.

2.8 Trained versus Non-Trained Recorders

At MPR, CATI interviewers are highly trained and capable of executing a variety of complex actions such as handling edits, navigation, and correcting answers. On the other hand, the paper and Web respondents are untrained so the media must be clear and virtually foolproof. Web and paper respondents cannot be given the full range of operability that the CATI interviewer has. In Web mode, for example, the respondent would not be expected to be able to handle a consistency edit or to engage in navigation beyond one browser page at a time. (In some other surveys such as required, repeated, and frequent surveys, it would be possible to train a paper or Web responder in higher order actions.)

3. Multimode Instrument Design and Development

The development of the data collection instruments and CASIC modes was done in succession starting with the paper questionnaire, followed by a conversion to CATI, then adaptation to the WEB mode, and finally further modifications to accommodate data entry and follow up and completion of some cases.

3.1 Development of the Paper Questionnaire

The paper questionnaires for all three SESTAT surveys are reevaluated before every administration in a separate SESTAT coordinating contract from NSF currently held by MPR. The main objective of the coordinating contract is to develop standard instruments and methods between the surveys. In addition to the paper questionnaires, MPR developed web guidelines, proxy guidelines, and coding manuals among other products. From the standpoint of MPR's instrument development effort for the 2003 NSRCG, the already-existing paper questionnaire was taken as an established starting point.

3.2 Development of the CATI Mode

The Blaise instrument was first programmed with the CATI survey in mind. The paper questionnaire provided the basis for the CATI instrument routing and response options. However, the question text from the mail survey needed to be adapted to an interviewer-administered format. In addition, the computer-assisted technology of CATI meant the telephone survey could take advantage of dynamic text fills, enforced routing, calculations, and

edit checks. Since the CATI survey was the first step in translating the paper questionnaire into a computerized mode and involved moving from a self-administered to an interviewer-assisted mode, the transition from paper to CATI proved to be the most complex design challenge.

NSF provided guidelines based on previous iterations of the survey, that specified question text and any routing or response options deviations that were specific to the CATI survey. In addition to specific minor wording changes to take into account the interviewer administered nature of the CATI survey, in some instances a question was added that did not appear in the paper version. For example, if the response to “Were you working for either pay or profit during the week of October 1, 2003?” was “No”, the follow-on question “Were you not working for any of the following reasons: you were a student on paid work study, you were self-employed and did not get paid that week, you were on vacation from work or traveling while employed, you were on paid sick leave, personal leave or other temporary leave, or you were on a job that did not pay but had other benefits.” was asked to make sure the respondent counted these experiences as employment. In the paper version this was simply reflected as an instruction.

In addition, some items were split into sub-parts to accommodate the aural nature of the CATI survey. For example item B14 was split into four questions in CATI (including a filter) to identify whether the type of employer was private, a government agency, self-employed, or other before obtaining more detailed information (Figure 1). In any CATI text displayed below, the interviewer is required to read bolded text; text that is not bolded is optional.

Figure 1 CATI Succession of Yes / No Sub-Items

B14_1	Was your principal employer during the week of October 1, 2003 a private company or individual, a government agency at any level, were you self-employed, or did you work for some other type of employer?	Yes / No
(If self-employed) B14_2	Were you self-employed in your own not incorporated business, professional practice, or farm?	Yes / No
(If private company) B14_3	Was that a private for-profit organization or individual paying your wages, salary or commissions, or a private not-for-profit, tax-exempt, or charitable organization?	Yes / No
(If government) B14_4	Was that local government, such as city or county government, state government, U.S. military service, active duty or commissioned corps, such as USPHS or NOAA, or U.S. government as a civilian employee?	Yes / No

The paper questionnaire asked B14 in one question as shown in Figure 2.

Figure 2

<p>B14. Which one of the following best describes your principal employer during the week of October 1?</p> <p><i>Mark (X) one answer.</i></p> <ul style="list-style-type: none"> 1 <input type="checkbox"/> SELF-EMPLOYED in own NOT INCORPORATED business, professional practice or farm 2 <input type="checkbox"/> SELF-EMPLOYED in own INCORPORATED business, professional practice or farm 3 <input type="checkbox"/> A PRIVATE FOR-PROFIT organization or individual working for wages, salary or commissions 4 <input type="checkbox"/> A PRIVATE NOT-FOR-PROFIT, tax-exempt, or charitable organization 5 <input type="checkbox"/> Local GOVERNMENT (e.g., city, county) 6 <input type="checkbox"/> State GOVERNMENT 7 <input type="checkbox"/> U.S. military service, active duty or Commissioned Corps (e.g., USPHS, NOAA) 8 <input type="checkbox"/> U.S. GOVERNMENT (e.g., civilian employee) 9 <input type="checkbox"/> Other – <i>Specify</i> <input style="width: 100px; height: 15px;" type="text"/> 	
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The NSF guidelines in conjunction with the mail version were used to program a CATI instrument that would function well as a stand-alone telephone survey, but that would maintain comparability to the paper question and permit data entry of returned mail surveys.

Fills were also used in the CATI version to simplify questions for respondents. For example rather than asking “Between the most recent degree you earned prior to October 1, 2003 and October 1, 2003, did you enroll or take any courses at a college or university?” the CATI version calculated the most recent degree the respondent reported earning prior to October 1, 2003 and filled it so that the item read “Between the {bachelor’s / master’s} degree and October 1, 2003, did you enroll in or take any courses at a college or university?”

Unlike the paper version of the survey, the CATI program prevented routing errors and out-of-range responses. The computer-assisted nature of the CATI survey also meant that errors could be minimized during data collection by including range, consistency, and logic checks in the survey. To take advantage of this capability, edit checks were programmed into the CATI instrument, which required interviewers to verify responses for particular items. These checks were based on the Westat CATI instrument and methodology report from the previous iteration

of the survey. In addition, checks were built in for items that were considered “critical” by NSF. These checks required interviewers to repeat certain questions, stressing the importance of obtaining a response to the item, if the response “don’t know” or “refused” was given. Without responses to these items, the interview could not be considered complete and the respondent would need to be called back later in an attempt to collect the missing data.

Instrument testing was particularly intensive at this stage since the CATI was the first computerized version of the survey. Testing was focused on making sure that the CATI instrument skips matched those in the paper version and that all additional CATI items, fills, conditional text, edit checks, and calculations were operating correctly.

3.3 Development of the Web Mode

Web development was generally based on a set of guidelines that were issued by NSF and intended to ensure comparability across contractors conducting the three SESTAT surveys. These guidelines addressed such issues as background color, font, placement of navigational buttons, the use of links, and inclusion of special pages that were not part of the actual instrument. Examples of such pages included the login screen, the survey information screen, a quit screen for users who chose to suspend before finishing the survey and a final, or “good-bye” screen. The guidelines ensured that all contractors had a common approach to handling such issues as whether to display question numbers, whether to use progress indicators, and how many questions to display on a screen.

CATI specifications provided the initial basis for programming the Web survey. The instrument was subsequently modified in response to usability testing findings and client review. The usability testing protocol followed either a *talk aloud* or a *retrospective* format. In the talk aloud format, an observer and the participant were in the same room while the participant completed the survey online. Participants were asked to express any thoughts or reactions they had to each screen as they progressed through the survey, and occasionally, the observer would ask more directed questions about particular features or screens in the instrument. This format had the advantage of enabling observers to capture each participant’s impressions of the survey as they occurred.

During the retrospective testing sessions, the participant completed the Web survey without interruption while observers watched the participants’ screen from a remote computer in a separate room. Because participants were not being watched or interrupted while completing the survey, this approach had the advantage of being more natural, while demonstrating how long it would typically take respondents to complete the survey. Once the participant completed the survey, the observers would review each screen with the participant to uncover potential problems or issues.

Usability testing findings led to changes in layout, question numbering, and question wording. Regarding layout, we tried to assess the best way to display questions that were difficult to fit on a single screen due to lengthy instructions or numerous response choices. For example, based on participants’ feedback, we determined that splitting a question with 14 sub-items across two browser screens was preferable to displaying the entire question on one screen with little white space or with a scrolling browser page. Usability testing was also instructive in determining the best way to format instructions for individual questions so that respondents would be most likely to read them.

We also investigated issues related to question numbering during usability testing. Although some Web surveys do not display any question numbers in an effort to simplify the page, we determined that question numbers were necessary for two reasons. First, if respondents contacted the help desk about a problem they were having with a particular question, the question number would make it easier for them to communicate which question was posing a problem. Second, when errors or problems were identified during testing, displaying the question numbers made it easier to document which questions were affected.

Although displaying the question numbers on the Web made good sense for the aforementioned reasons, this decision also raised other challenges relating to sequence. Because some questions were asked in a different sequence in the Web survey than on the paper questionnaire, we were faced with the decision of whether to maintain the original question number, resulting in questions sometimes appearing out of sequence on the Web, or whether to re-number the Web questions so they appeared in sequential order. If we chose the latter option, the Web question numbers would not coincide with the paper question numbers. Through testing, we learned that participants rarely paid attention to the question numbers, so we opted to maintain the paper question numbers within the Web mode. A note on the instructions page explained that some questions might appear out of sequence, and some questions would be skipped entirely if they were not applicable, as determined by previous answers. This explanation and approach to question numbering seemed to work well in facilitating identification of questions without introducing unnecessary confusion.

Usability testing also helped us to refine CATI-based question wording that proved awkward in the Web environment. For example, the first verification question in the CATI screener was “Are you {name}?” Usability testers reported that the question seemed too conversational for a Web survey so the wording was changed to read, “Is your name {name}?” in the Web mode.

3.4 Development of Data Entry

The instrument was adapted to accommodate data entry resulting in changes in routing and application of edits, and implementation of verification.

There are subtle differences in instrument routing between data entry and the other modes that is necessary to facilitate data entry. The data entry capability allows heads-down data entry; that is the operator is not required to look up at the computer screen in order to capture data. In some spots in the instrument, CATI and Web modes can determine the answer to a subsequent question and auto-fill and skip over that item. If, however, the item is present on paper, the operator has to be able to enter it, even if auto-fill and skip are programmatically possible. Otherwise, heads-down operators could soon find themselves out of sync with the instrument as they enter what they see on paper.

Data entry operators were required to verify that a blank response had been left missing by the respondent. In addition, items governing branching required a valid response. If a routing item was blank and its value could not be determined from other values, the entry for the case was suspended and held for follow up or data retrieval.

To facilitate data entry, a so-called ‘fan edit’ was conducted for each paper form before data entry. Mail survey respondents could commit a variety of errors (such as leaving on-route items blank and recording off-route information; recording ranges instead of a single numeric value; and checking two or more values for a “mark one” question). Rules were pre-defined for each possible respondent error that the data entry instrument would not be able to handle and cleared up ahead of time based on NSF guidelines for data editing. The ‘fan edit’ concentrated only on problems that could affect data entry, it was not a complete manual hand edit; that is, many edits were reserved for machine editing downstream after data entry.

The staff that conducted the fan edit performed the data entry. They were capable of stopping data entry on a case to clear up errors that may have been missed in the fan edit. This method of reducing the time spent on the fan edit and allowing some errors to be cleared up by the data entry operator was implemented with the aim of reducing time spent on the overall process.

Verification was required for 5% of cases. To accommodate this, the instrument randomly selected cases based on the system time when the case was brought into memory. These cases were flagged for verification and were then accessible for double entry. Selected cases were completely verified for all items. This was accomplished by conducting double data entry for

each item with immediate detection and resolution whenever a difference in values was detected. The second operator was the adjudicator. For any difference, the first entered and the second-entered values were displayed and the adjudicator could choose one or the other, or enter yet a third value if necessary.

4. Collection Instrument Similarities and Differences Between Modes

In this part of the paper we discuss specific examples of issues we encountered in designing one instrument to collect data in three modes. We were faced with several challenges due to differences in data definition question order, routing, and the mechanics of coding state, education, and occupation; as well as browser display issues, auto-fill and skip-over items, the number and order of collection of university degrees, and the re-asking of critical item questions across modes.

General conventions we adopted to handle these issues include the formulation of question text and question format, handling of non-response, implementation of edits, acquisition of Critical-Complete items, and implementation of remarks. Some questions were treated the same for all modes, some were treated the same for two modes and differently for the third, and some were handled differently between all three modes. Additionally, some questions were present in only one or two modes.

Appendix A illustrates question-specific similarities and differences between modes for the NSRCG instrument. A visual scanning of Appendix A illustrates that accommodating differences between modes for each question was done for about half the questionnaire. Some of these differences were driven by globally applied conventions. Other differences stem from inspection and assessment of each question.

While this paper focuses more on differences between questions between modes, a nice example of a question (A14) where all three modes are handled similarly, is given in the companion MPR paper *System Implementation for a Blaise Multimode Web, Cati, and Paper Survey* by Hart, Foster-Sardenberg, and Okada. A14 is rendered as a series of Yes/No sub-items in all three modes.

4.1 Question Text

Different features and capabilities of the three modes typically dictated whether questions had to be worded differently or whether they could use the same format. Two major distinctions that affected question text formulation were whether the mode was self-administered (Paper/Web) or interviewer-administered (CATI) and whether text could be dynamically modified (CATI/Web) or was passive (Paper).

For the self-administered modes, several questions used a “Mark all that apply” response format whereby respondents would select their responses from a displayed list. Paper and Web respondents would mark check boxes to select all applicable responses as shown in Figure 3 for question B3.

Figure 3 Example of Similar Displays on Paper and for Web Modes

<p>B3. What were your reasons for not working during the week of October 1?</p> <p><i>Mark (X) all that apply.</i></p> <p>1 <input type="checkbox"/> Retired → <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">Year</td> <td style="border: 1px solid black; padding: 2px;">retired</td> </tr> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> </table></p> <p>2 <input type="checkbox"/> On layoff from a job</p> <p>3 <input type="checkbox"/> Student</p> <p>4 <input type="checkbox"/> Family responsibilities</p> <p>5 <input type="checkbox"/> Chronic illness or permanent disability</p> <p>6 <input type="checkbox"/> Suitable job not available</p> <p>7 <input type="checkbox"/> Did not need or want to work</p> <p>8 <input type="checkbox"/> Other – <i>Specify</i> <input style="width: 100px;" type="text"/></p>	Year	retired			<p>B3. What were your reasons for not working during the week of October 1?</p> <p><input type="checkbox"/> Retired</p> <p><input type="checkbox"/> On layoff from a job</p> <p><input type="checkbox"/> Student</p> <p><input type="checkbox"/> Family responsibilities</p> <p><input type="checkbox"/> Chronic illness or permanent disability</p> <p><input type="checkbox"/> Suitable job not available</p> <p><input type="checkbox"/> Did not need or want to work</p> <p><input type="checkbox"/> Other</p>
Year	retired				

To translate such items into an interviewer-administered environment, the question stem was reworded and the interviewer presented each response as a separate question in a series, to which the respondent replied yes or no. For example, question B3 used the following wording in CATI (Figure 4, all required-to-read text is in bold):

Figure 4 CATI Succession of Yes / No Sub-Items

B3_1	For which of the following reasons were you not working during the week of October 1, 2003? Please answer yes or no for each of the following. Were you not working because you were retired?	Yes / No
B3_2	Were you not working because you were on layoff from a job?	Yes / No
B3_3	Were you not working because you were a student?	Yes / No

NOTE: Not all sub-items are not shown.

Whereas paper and Web used identical question wording for some items by virtue of their common attribute of self-administration, Web and CATI followed the same wording for other items that rely on dynamically filled text. For example, Question B12 (Figure 5) asks about the number of people working for the principal employer. In Web and CATI this question had custom fills depending on the answer to B14, (which was asked before B12 in these two modes but after B12 in the paper mode). B14 provides a classification of employer type (see Figure 2 in section 3.2 above).

Figure 5 Dynamic versus Static Text in Question B12

CATI and Web modes	Counting all locations where {you operate / this employer operates}, how many people work {for your business / for your principal employer}? Your best estimate is fine.
Paper mode	Counting all locations where this employer operates, how many people work for your principal employer? Your best estimate is fine.

4.2 Question Format

Differences among the three modes affected the format and layout of questions as well as question wording. In this section we give specific examples of questions that required different formats between modes.

4.2.1 Education and Occupation Coding

Because the main purpose of the NSRCG is to collect information regarding the educational and employment experiences of recent graduates, correctly categorizing and coding primary majors and occupation titles is of key importance to NSF. Coding of education and occupation was executed dynamically in CATI and Web in the same way while coding on the paper questionnaire was done altogether differently because of its passive nature and need to save space. NSF provided pre-defined coding dictionaries for mapping educational majors and occupation titles to numeric codes. These dictionaries were linked to the CATI and Web instruments so that verbatim responses could be auto-assigned a code during the interview. For example, the response “mechanical engineering” mapped to code 735. If the respondents’ major field of study exactly matched one of the major fields listed in the educational dictionary, then the field of study was automatically assigned the appropriate code designated in the educational dictionary. If the verbatim major or occupation title did not map to a major or occupation in the coding file, respondents were asked a full or partial set of branching items to classify the response (see Appendix C).

Because of space limitations and the static nature of paper, a hierarchical branching scheme for determining occupation and education was not possible. On paper, respondents were asked to write in their verbatim major and occupation and then refer to the back pages of the questionnaire to look up the three-digit code that most closely matched their response. They were then asked to write this code in the space provided (see Appendix D). This method had the advantage of allowing respondents to view all of the majors and occupations and select the code that was the best match, but some respondents left the code blank or entered more than one code. In addition, some respondents entered codes that did not match the verbatim responses.

4.2.2 Degree Grid Differences

Collecting education background is also of key importance. On paper, this information was collected in a degree grid that allowed respondents to fill in information concerning their first bachelor’s degree, and their most recent and second most recent degrees (see Appendix B). The dynamic nature of CATI and Web allowed the Section A degree grid to be handled much more systematically than in the passive paper medium that also had space constraints. Section A contains a degree grid roster where all respondent degrees of Bachelor’s level or above are entered. The paper questionnaire allows a maximum of 3 degrees as this is all that can fit on one page.

While the vast majority of respondents have less than 3 degrees, previous rounds of the survey have shown that the respondent could have earned more than 3 degrees. For this reason, CATI and Web modes allow up to 9 degrees. After information for each degree is recorded CATI and Web modes probe for additional degrees, listing already-recorded ones. These two modes also probe for a bachelor’s degree if one is not recorded.

On paper, none of the column headings refer to the sample degree (which was the degree which determined the respondent's eligibility for the study). Indeed, as the paper questionnaire has no sample-degree information attached or included, the respondent is free to enter degrees in any order, and there is no guarantee that the sample degree will even be recorded. It was often difficult to programmatically determine if the sample degree was reported on the paper form, or if reported, where it was included, because the sampling frame information and respondent-supplied information for the same degree did not always agree. In CATI and Web, the screener confirms sample degree information and this degree becomes the first degree recorded in the grid.

Thirteen items are collected for each degree, divided into 5 subsections. On paper, the subsections are collected in the order of: a) School name and location; b) month and year; c) type of degree; d) verbatim text of primary field of study and second major; and e) code for primary and second major (verbatim-verbatim | code-code). For CATI and Web, the subsections are collected in the order of: c) type of degree; b) month and year; a) school name and location; and then d) and e) intermixed (verbatim-code | verbatim-code). The reason for the difference in the order of collection for degree information is to accommodate the most natural flow and wording of each mode.


4.2.3 Salary

Another example of differences in question layout is salary. In collection of salary, interviewer-mediation in CATI allows probing items to follow Don't Know or Refusal for a reluctant respondent. All three modes followed the same format for the salary question, offering respondents an open-ended field for entering an exact dollar amount. The CATI instrument used the same wording as Web and paper, but the CATI mode allowed interviewers to probe for a salary range in an effort to avoid missing data on this sensitive item. If the respondent answered Don't Know or Refused to the salary question, the interviewer asked whether the salary was above or below \$35,000 a year. If the respondent answered this question, the interviewer would try to get the respondent to report the salary within a ten thousand dollar range. Although this approach resulted in mode differences with salary ranges being collected in one mode only, the trade-off of reducing item non-response was thought to outweigh any drawbacks of the mode differences.

4.2.4 Borrowed versus Still-Owed Educational Expenses

All three modes also handled educational expenses differently due to passive versus dynamic media, interviewer- versus self-administered modes, and space limitations for both paper and browser. For example, question A18 asks about types of financial support received for both graduate and undergraduate degrees. The Web (Figure 6) and paper (Figure 7) modes used a "Mark All" for data definition while CATI (Figures 8 and 9) used a series of Yes / No sub-items for the 9 response possibilities. In this case, visual presentation was particularly important for the self-administered modes in order to make clear the distinction between financial support for undergraduate versus graduate degrees. In the Web mode, we found that putting the two sub-questions in consecutive browser screens could be confusing because the screens were virtually indistinguishable, with only one word difference ("undergraduate" or "graduate"). However due to browser limitations and the fact that the Web mode handled the display of graduate expenses dynamically, we placed undergraduate and graduate questions on separate screens.

Figure 6
Web
mode



2003 National Survey of Recent College Graduates

**A18. Thinking of any undergraduate degrees you completed before October 1, 2003:
From which of the following sources did you receive financial support?**

Check all that apply

- Financial support from parents, spouse, other relatives, not to be repaid
- Loans from the school you attended, banks, federal or state government
- Loans from parents or other relatives
- Financial assistance from your employer
- Tuition waivers, fellowships, grants, scholarships
- Assistantships or work study
- Earnings from employment
- Other - specify

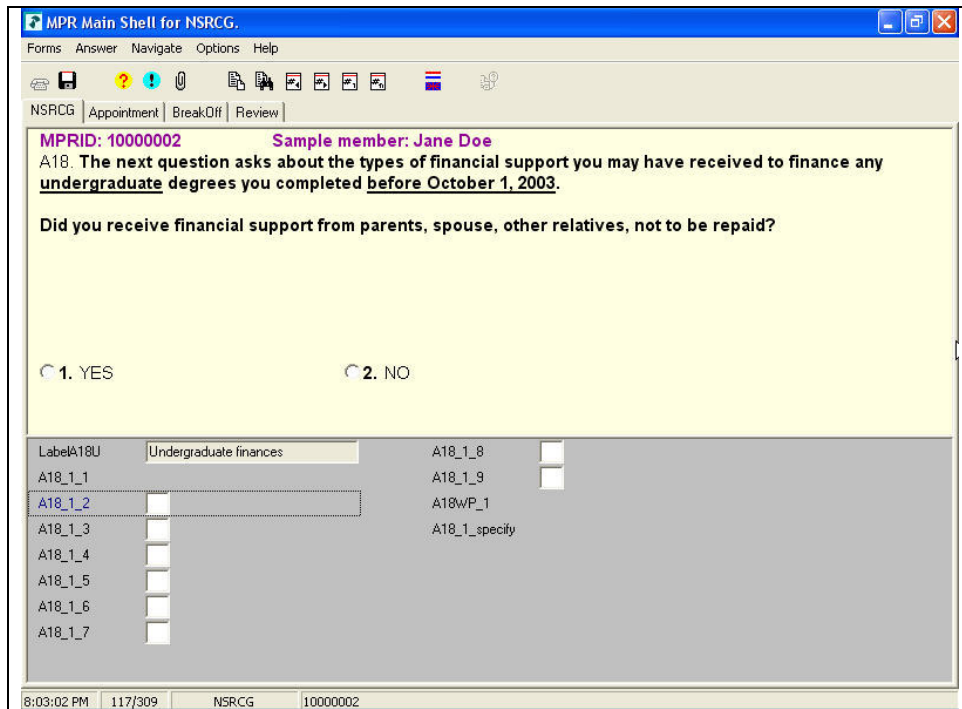
Figure 7
Paper
mode

A18. The next question asks about the types of financial support you may have received to finance any undergraduate or graduate degrees you completed before October 1, 2003.

Mark (X) all that apply for each undergraduate and graduate column.

	Undergraduate ↓	Graduate ↓
1 Did not earn a degree at this level	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 Financial support from parents, spouse, other relatives, not to be repaid	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 Loans from the school you attended, banks, federal or state government	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 Loans from parents or other relatives	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 Financial assistance from your employer	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 Tuition waivers, fellowships, grants, scholarships	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 Assistantships or work study	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 Earnings from employment	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 Other – <i>Specify</i>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		

Figure 8
CATI
mode



Note: A similar screen appears for graduate expenses if a graduate degree was recorded.

Figure 9 illustrates the question sequence for the first 3 CATI questions.

Figure 9 CATI Succession of Yes / No Sub-Items for A18

A181_2	The next question asks about the types of financial support you may have received to finance any <u>undergraduate</u> degrees you completed <u>before October 1, 2003</u>. Did you receive financial support from parents, spouse, other relatives, not to be repaid?	Yes / No
A181_3	The next question asks about the types of financial support you may have received to finance any <u>undergraduate</u> degrees you completed <u>before October 1, 2003</u> . Did you receive loans from the school you attended, banks, federal or state government?	Yes / No
A181_4	The next question asks about the types of financial support you may have received to finance any <u>undergraduate</u> degrees you completed <u>before October 1, 2003</u> . Did you receive loans from parents or other relatives?	Yes / No

Notes: Not all sub-items are shown. A similar set of sub-items followed in CATI for graduate degree financing.

Question A19 provides another example of some of the challenges inherent in translating a question that was developed for paper (Figure 10) into one that works equally well in the CATI and Web modes. Having 4 columns of data points side-by-side on paper, this question posed one of the biggest challenges during Web development. The browser display (Figure 11) was again divided into two consecutive screens (undergraduate and graduate) but this time with two columns each while the CATI version was rendered with 4 numeric (currency) questions.


Figure 10
Paper mode

A19. The next question asks about the **TOTAL** amount you have **borrowed** to finance undergraduate and graduate degrees you completed **before October 1, 2003**, and how much you **still owed** as of October 1, 2003.

Mark (X) one answer in each undergraduate and graduate column.

	UNDERGRADUATE		GRADUATE	
	Total Amount Borrowed	Amount Still Owed as of October 1, 2003	Total Amount Borrowed	Amount Still Owed as of October 1, 2003
1 Did not earn a degree at this level.....	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 None	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 \$1 - \$5,000.....	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 \$5,001 - \$10,000.....	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 \$10,001 - \$15,000.....	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 \$15,001 - \$20,000.....	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 \$20,001 - \$25,000.....	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 \$25,001 - \$30,000.....	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 \$30,001 - \$35,000.....	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
10 \$35,001 or more	10 <input type="checkbox"/>	10 <input type="checkbox"/>	10 <input type="checkbox"/>	10 <input type="checkbox"/>

Figure 11
Web mode



2003 National Survey of Recent College Graduates

A19. The next question asks about the **TOTAL** amount you have **borrowed** to finance undergraduate degrees you completed **before October 1, 2003**, and how much you **still owed** as of October 1, 2003.

<p>Total Amount Borrowed</p> <p><input type="radio"/> Did not earn a degree at this level</p> <p><input type="radio"/> None</p> <p><input type="radio"/> \$1 - \$5,000</p> <p><input type="radio"/> \$5,001 - \$10,000</p> <p><input type="radio"/> \$10,001 - \$15,000</p> <p><input type="radio"/> \$15,001 - \$20,000</p> <p><input type="radio"/> \$20,001 - \$25,000</p> <p><input type="radio"/> \$25,001 - \$30,000</p> <p><input type="radio"/> \$30,001 - \$35,000, or</p> <p><input type="radio"/> \$35,001 or more</p>	<p>Amount Still Owed as of October 1, 2003</p> <p><input type="radio"/> Did not earn a degree at this level</p> <p><input type="radio"/> None</p> <p><input type="radio"/> \$1 - \$5,000</p> <p><input type="radio"/> \$5,001 - \$10,000</p> <p><input type="radio"/> \$10,001 - \$15,000</p> <p><input type="radio"/> \$15,001 - \$20,000</p> <p><input type="radio"/> \$20,001 - \$25,000</p> <p><input type="radio"/> \$25,001 - \$30,000</p> <p><input type="radio"/> \$30,001 - \$35,000, or</p> <p><input type="radio"/> \$35,001 or more</p>
--	--

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[Frequently Asked Questions \(FAQs\)](#)
[Instructions](#)

A drawback of splitting the question across two screens on the Web survey was that respondents who moved through the question quickly would not notice the distinction between the two screens. An advantage of the Web and CATI modes was that the question about graduate degrees was not asked if the respondent had already indicated that the highest degree earned was an undergraduate degree.

4.3 Allowing and Not Allowing Don't Know, Refusal, and Empty Values

Non-response is defined here as a Refusal or Don't Know response, or as leaving an on-route field EMPTY. The CATI mode required a non-empty response for every on-route question but allowed Refusal or Don't Know. The Web mode did not present or allow Refusal and Don't Know but the respondent could leave answers empty. The passive paper questionnaire allowed the respondent to answer, skip questions, or record a Refusal or Don't Know. The difference between modes with respect to RF, DK, or EMPTY resulted in mode-dependent interpretation of these kinds of non-responses. CATI is the only mode that can reliably differentiate between a

Don't Know and a Refusal. In Web mode an empty answer can mean either Refusal or Don't Know but it cannot mean an inappropriate skip. On paper, an empty may mean Refusal, Don't Know, or an inappropriate skip. A ramification of these response/non-response conventions between modes is that routing specification depends on a combination of both mode and particular data values.

4.4 Data Definition, Range, and Consistency Edits

Data definition edits (allowable values) are enforced during administration for CATI and Web and after the fact for paper-collected data. Range edits (univariate suspicious answers within allowable range) and consistency edits (multivariate comparisons between two or more items) were applied only in CATI mode during data collection. As with most social surveys, the mere fact of keeping the respondent on route and within data definition eliminates the vast majority of problems (Baker, Bradburn, and Johnson, 1995, discuss this in a CAPI context; O'Reilly, Hubbard, Lessler, Biemer, and Turner, 1994, discuss this for self-administered audio- and visual-CASI). Thus data quality in the Web mode is high as long as the respondent answers each presented item. But if the Web respondent left an item blank, some questions would not even appear. For example, if the Web respondent refused to answer the first question in Section B, they skipped all of Section B and went directly to Section C. It is technically possible to introduce consistency edits into the Web mode, but practically speaking this would work only for items that appear on the same browser page. However, even this kind of Web edit was avoided for fear of dissuading the respondent from continuing.

In paper, if the respondent leaves an item blank, data editors may be able to back-code the item based on subsequent answers. If on paper a respondent answered inappropriately (e.g., multiple responses for a code one, or a range for a value) the manual inspection would apply well-defined rules to allow the most appropriate value to be entered.

4.5 Question-Level Remarks

CATI and data entry allowed for remarks at each question, but the Web respondent did not have the option to enter remarks (this was an explicit design decision). For CATI and paper there was the possibility of review of remarks that may help with coding or determination of proper response, but this is not a possibility for the Web.

4.6 Screener

Both the CATI and Web mode included a brief screener to assess whether the correct person had been contacted and was eligible for the survey. Information obtained from the sampled schools was used in text fills to verify that graduates had attended the sample institution or an affiliated campus, that they had received a bachelor's or a master's degree there, and that they had received their degree within one or the two eligible time frames (2001-2002). If a graduate failed to confirm any of this information, the interview ended and the case was coded as ineligible.

It was not practical to include these items on the paper questionnaire. Rather, eligibility determinations needed to be made during post-processing. The degree grid was reviewed to assess whether the degree the graduate had been sampled for had been reported. The institutions, degree types, degree dates, and majors were compared to the information provided by the schools. Cases that had not included a degree that matched on these variables were coded as ineligible.

5. Additional Capabilities

The instrument was adapted to execute post-collection follow-up of critical items and unfinished Web cases, and in the last days to conduct an abbreviated interview if the respondent would not agree to a full interview.

5.1 Critical Item Follow Up

The NSRCG includes several questions that are regarded as critical items, or items that are of particular importance to NSF. There were two types of critical items. *Critical-complete* items were required for the case to be considered complete. That is, all critical items required a valid response; a Refusal or Don't Know did not count. *Critical-callback* items were of secondary importance. A response was not required for the case to be considered a complete, but an attempt to obtain these data was made if the case was called for critical-complete items. The term *critical item* is used below to refer to both critical-complete and critical-callback items.

In both CATI and Web modes critical-callback item non-response was followed up with a repeat question giving the respondent a second chance to enter the value. However, if the respondent still chose not to give a response, the interview continued with the hope of retrieving critical items at a later time. In this case, the instrument was programmed to detect that a critical item was missing and would flag the case for data retrieval. While paper did not have the possibility of prompting for critical-complete items during administration, cases missing critical items were flagged during data entry. For all modes however, there was the possibility of determining the value of some critical-complete items from other collected data such as verbatim responses (e.g., job description). However, it was not always possible to programmatically determine if a case had a critical-item problem, and data inspection was often necessary.

5.1.1 Critical Item Data Retrieval, Melding of Mode With CATI Platform

The NSRCG multi-mode instrument was programmed to facilitate critical-complete item retrieval. This allowed interviewers to re-contact critical-item cases via CATI (no matter what mode the original data collection was in) and follow-up on the missing critical items only. This also ensured that any newly determined critical items (e.g., due to a new path opening up) would be collected at the same time.

All critical item retrieval was interviewer-administered using the CATI capability of the instrument. However, the internal mode of processing was maintained. This meant that while the presentation to the interviewer resembled CATI, the routing and data definition of the originating mode was maintained. If the critical items could be retrieved, then the case was given a final status code corresponded to the originating mode.

Critical items occurred at scattered places in the almost-complete record (these are noted in column 1 of the Appendix A table). At the start of the case, the interviewer could view a summary of all critical items using a Blaise edit-summary dialog. The interviewer secured cooperation through the normal CATI contact screens. Once contact was made and cooperation secured, the interviewer pressed the End key to get to the next critical item in the order of appearance in the questionnaire.

5.2 CATI Follow Up of Partial Web Responses

A similar follow-up was conducted for partial Web responses. Web partial cases could be put into 3 broad groups: 1) the respondent had logged into the Web survey but few or no items had been answered, 2) the respondent had answered some items on the Web but broke off in the middle of the case, and 3) the respondent had almost completed the Web survey. Cases in the first two categories were shifted to pure CATI mode. Any data previously entered by the respondent on the Web were maintained and displayed in the CATI mode. This allowed the interviewer to go through the CATI introductory screens and then press the End key to arrive at the next appropriate unanswered question. From there, the interview could proceed normally as a CATI case.

The almost-complete Web cases were handled in two ways. In some of these cases, the respondent had merely neglected to end elegantly or to enter the last few questions. They may have exited through the browser rather than through the Web software. In these cases, staff could enter the case, navigate to the last question, and the case would be coded as complete. The other almost-complete cases could be considered critical-complete item cases and were handled as such.

5.3 Abbreviated CATI Interview

In the last 7 days of the survey, interviewers could offer to conduct an abbreviated interview on a CATI case if the respondent indicated lack of time for a full interview. They could go to a parallel tab and indicate a switch to an abbreviated mode. The instrument would at that point ask all critical items but require only the critical-complete items. However, interviewers could still collect all data if the respondent agreed to a full interview.

6. Blaise Features and Programming Techniques

The NSRCG Blaise instrument relied on native Blaise system features, (extensions of) commonly used programming techniques, and clever uses of existing language constructs to achieve the flexibility needed for this multimode survey.

The Web capability was achieved with the C2B system from CentERdata from the University of Tilburg in the Netherlands. C2B is a 3rd party add-on that makes use of the Blaise API. MPR is appreciative of the opportunity to use C2B to achieve the Web mode. CentERdata provided several new features and excellent support for this survey.

Limitations in browser technology, or the need to achieve some browser displays, occasionally forced adjustment to Blaise-language syntax and blocking conventions. Overall more Blaise blocks were declared than would otherwise be the case.

The standard Blaise windows interface was used for CATI and data entry, while the C2B browser interface was used for the Web. The fact that both interfaces were generated, not hand drawn, meant that the cost of producing the dual interface was very low. The extremely rich Blaise windows interface with its navigational, remark, and other capabilities, and its natural hooks to Blaise CATI management, was necessary for the interviewers and data entry operators to efficiently achieve their tasks. The browser interface was intended to be used on a wide variety of browsers with varying connect speeds, and can be considered to be a lowest-common-denominator display and collection solution, which while appropriate for this Web collection, has far less capability than the Blaise windows interface.

A field called *ModeOfProcessing* kept track of mode of administration. This tracking was maintained independently of actual Web or windows platform, and independently of Blaise keywords such as CATI, CAPI, and CAWI. As a result, for example, we could follow up an original Web case while in Blaise CATI and yet keep the Web routing and data definition for the case.

In order to allow empty values in both paper and Web modes, the Blaise EMPTY was used for all subject-matter fields. In CATI, edits were used to enforce an answer for all fields. These edits were turned off for follow up of paper, CATI, or Web; follow-up-specific edits were activated to collect critical item information. Double data entry and verification were achieved through Blaise-language programming. The Blaise LANGUAGES feature was used to declare a Web language separate from the CATI language.

The unique Blaise checking mechanism executed constant re-evaluation of route, computation, and answer throughout the case; that technology and the related End key and pop-up edit dialogs, were essential in the capability of conducting critical item follow-up and the abbreviated interview.

6.1 Multimode Survey Management

CATI management relied on Blaise out-of-the-box capability with significant MPR additional infrastructure to implement the MPR outcome coding scheme, links to *MPR Survey Manager*, modifications to case delivery, and appointment handling among other added features. *MPR Survey Manager* is an overall survey management system based on .NET technology and the SQL Server database system. *MPR Survey Manager* was used for locating, mailings, producing reports, and sending of email reminders among other survey tasks. MPR extended CATI management to account for three simultaneous modes of survey administration in one instrument and in one database. This included an expanded status coding system, adapted rules for sequencing status codes through attempts and outcomes, the ability to switch cases between modes, withholding cases from the call scheduler or putting them back into the scheduler depending on specific events in any of the three modes. Maniplus was used extensively as a supervisory review system and to implement data entry and critical-item follow-up control systems.

7. Lessons Learned and Advice

Following is a list of the three most important lessons learned from the development of the NSRCG multimode instrument, and a suggestion for a most fruitful area of future research.

7.1 Specify Early For All Modes

While each mode of administration must be considered on its own merits with respect to the proper conduct of the survey, such a multimode CASIC instrument is far easier to develop if CASIC specification formally takes into account all three modes before programming begins. Otherwise you may constantly revisit all the source code to accommodate it to additional modes.

Decide early in the process which browsers, connect speeds, and client configurations the Web mode should support. In a general population survey (such as the NSRCG) with a true Web alternative, it may be necessary to support a large number of situations. In order to achieve browser displays that will work for all respondents, you may not achieve rich presentations that are typically found in the workplace. Section 508 guidelines may also limit browser display options. (Section508 links are in section 9.1.)

7.2 Leave Time for Prototyping and Reworking

The rendering of a data collection instrument into such disparate modes as paper, CATI, and Web, is not necessarily a straightforward process. Adjustments to each mode are likely in order to achieve 'cognitive equivalence' between the modes in the mind of the respondent. These adjustments may include changes in question text, data definition, routing, fills, and so forth. Thus it may be necessary to leave time for prototyping and assessment, and reworking of the instrument. As each mode is implemented, retesting of previously implemented modes is required to make sure existing capability is not broken. It is likely that conducting a multi-mode Web survey will be new to most or all staff; the survey sponsors, the project staff, the programmers, and the operations personnel. It is necessary to keep open the lines of communication throughout the development and survey-conducting process. As this capability is developed in the survey industry, all staff involved should expect that there will be revision and re-consideration of implementation, and that this is a natural learning process that takes time.

During development of the instrument, we conducted extensive testing to ensure that the routing was correct, that skips and fills were working properly, and that updates did not introduce other problems. Over the course of the field period, we made revisions as necessary, resulting in over 20 iterations of the production instrument. All revisions were made in a test environment to

make sure the live instrument was not damaged. Following each revision, we tested all three modes (CATI, Web and the data entry instrument) to make sure that changes in one mode didn't adversely affect the proper functioning of another.

7.3 Consider Effects on Survey Management

Survey management must be capable of handling all three modes simultaneously. In a survey such as NSRCG, it is the respondent who has the choice of mode. The call scheduler must be adjusted to account not only for calling outcomes, but also be able to turn off cases that have just been accessed or completed in Web mode, or a paper questionnaire that has just been checked in. There are times when a CATI respondent expresses a preference for another mode and the CATI management system must release the case immediately to the Web mode. At the same time, a follow-up with such respondents should be scheduled in case they fail to complete in another mode. There are numerous details associated with efficient multimode survey management. This is not trivial and is something you must plan for, develop, and test before production. You should be flexible enough to be able to emphasize one mode over another as the survey progresses.

7.4 Research is Needed in Staging Modes of Administration and Incentives

A fruitful area of research in such a multimode survey is the proper staging of the modes given the nature of the survey and the survey population, including the use of incentives. The possible combinations are numerous ranging from simultaneous release of all modes to using one or two modes to follow up a primary mode. A young, internet-savvy population should be approached differently than a mostly-elderly population for example. The use of incentives per mode should also be investigated including differentials between modes. The degree to which one mode substitutes for another is also worthy of research. The reasons to offer multiple modes are to accommodate respondent preference, to increase convenience, to target specific populations, to reduce costs, to accelerate data collection (Web allows this), and to raise overall response rate. The ideal product of such research would be a parameterized cost function that could be applied to CATI/Web/paper surveys to help determine the optimal mix and staging of modes.

8. Summary

The conduct of the NSRCG in paper, CATI, and Web in Blaise was a challenging yet successful and rewarding experience. Many of the challenges were in the nature of a learning experience and nearly all developed solutions can be applied to future surveys. While it is more costly to develop a three-mode instrument than a one-mode CATI instrument, it should be far less costly than conducting the three modes in different software. Additionally, survey management capability must be expanded, yet this is still far simpler than combining survey management across separate data flows. The use of one instrument does encourage that specification for all modes be done up front. Further it is methodologically advantageous that specification of all modes and uses be done in concert, because differences and similarities between modes become the result of explicit decision, not an artifact of the use of different software.

9. References

- Aquilino, W. (1994). "Interview Mode Effects in Surveys of Drug and Alcohol Use: A Field Experiment." *Public Opinion Quarterly*. 58:210-240.
- Aquilino, W., Wright, D., and Supple, A. (2000). "Response Effects Due to Bystander Presence in CASI and Paper-and-Pencil Surveys of Drug Use and Alcohol Use." *Substance Use & Misuse* 35: 845-867.
- Baker, R., Bradburn N., and Johnson, R. (1995). Computer-assisted Interviewing: An Experimental Evaluation of Data Quality and Cost. Pp. 413-431 in *Journal of Official Statistics*, Vol. 11, No 4, Statistics Sweden.
- Groves, R., Berry, M., and Mathiowetz, N. (1980). Some Impacts of Computer Assisted Telephone Interviewing on Survey Methods. Pp. 519-524 in *Proceedings of the Section on Survey Research Methods*. Alexandria, VA: American Statistical Association.
- Hart, L., Foster-Sardenberg, A., and Okada, Y. (2004). System Implementation for a Blaise Multimode Web, Cati, and Paper Survey. *Proceedings of the 9th International Blaise Users Conference*. Gatineau, Canada: Statistics Canada.
- Mangione, T. (1995). *Mail Survey: Improving the Quality*. Thousand Oaks, CA: Sage Publications.
- O'Reilly, J., Hubbard, M., Lessler, J., Biemer, P., and Turner, C. (1994). Audio and Computer Assisted Self-Interviewing: Preliminary Tests of New Technologies for Data Collection. Pp 197-214 in *Journal of Official Statistics*, Vol. 10, No. 2, Statistics Sweden.
- Pierzchala, M. and Manners, T. (2001). Revolutionary Paradigms of Blaise. Pp. 8-26 in *Proceedings of the 7th International Blaise Use's Conference*. Washington, D.C.: Westat, Inc.
- Tourangeau, R. and Smith, T. (1997). Collecting Sensitive Information with Different Modes of Data Collection. Pp 431-453 in Couper, M., Baker, R., Bethlehem, J., Clark C., Martin, J., Nicholls, W., and O'Reilly, J. (Eds.) *Computer Assisted Survey Information Collection*. New York, New York: John Wiley & Sons.
- Wright, D., Aquilino, W., and Supple, A. (1998). "A Comparison of Computer-Assisted and Paper-and-Pencil Self-Administered Questionnaires in a Survey on Smoking, Alcohol, and Drug Use." *Public Opinion Quarterly*. 62:331-353.

9.1 Section 508 Website Links

Home page: <http://www.section508.gov/>

A summary of the law: <http://www.section508.gov/index.cfm?FuseAction=Content&ID=3>

Appendix A: NSRCG Instrument Differences Between Modes

This table displays differences between modes excluding question text differences.

Question	Paper	CATI	Web	Notes
Section A – Education Background				
Model row	P	C	W	1/
Screener		C W		ID verification and eligibility 2/
A1	P C		W	Browser display and routing
A1a	P C		W	
A2_1	P C			Blaise coding for state / territory
A21			W	Browser drop-down for state / territory
A2_2	P C		W	Blaise coding for country vs. browser string type
A3		P C W		
A4		P C W		
A5_1	P C		W	Browser display and routing
A5_2	P C		W	
A6Branch		C W		Education coding. C/W : Auto-code on verbatim and/or ask series of branching questions. P : Enter 3-digit code.
A6Code	P			
A7		P C W		
A8		P C W		
A9		P C W		
A10		P C W		
A11		P C W		
A12		P C W		
A13Branch		C W		Education coding. C/W : Auto-code on verbatim and/or ask series of branching questions. P : Enter 3-digit code.
A13Code	P			
A14_1		P C W		
A15		P C W		
A16		P C W		
A17a CB 3/	P			Paper: Allow 3 degrees. - Sub-blocks in order of a-b-c-d-e. - Education coding: Enter 3-digit code for primary and secondary major. - Degrees entered in any order. * cc for sample degree, cb for other degrees
A17b CC *	P			
A17c CC *	P			
A17d	P			
A17e CC *	P			
A17c CC *		C W		CATI/Web: Allow 9 degrees. - Sub-blocks in order of c-b-a-d/e-d/e. - Education coding: Auto-code on verbatim and/or series of branching questions for primary and secondary major. - First degree is sample degree and is transferred in large part from the screener. * cc for sample degree, cb for other degrees
A17b CC *		C W		
A17a CB		C W		
A17d		C W		
A17e CC *		C W		
A18U	P	C	W	CATI: series of Yes/No.
A18G	P	C	W	Paper/Web: Mark all. CATI/Web: Auto-fill and route past if no degree at level. Paper: Fields on route regardless of degree level.
A19UBorrow	P	C	W	CATI: series of 4 numeric (currency).
A19Uowe	P	C	W	Paper/Web: Mark all.
A19GBorrow	P	C	W	CATI/Web: Auto-fill and route past if no degree at level.
A19Gowe	P	C	W	Paper: Fields on route regardless of degree level. Web: Side-by-side browser display.
A20		P C W		
A21		P C W		
A22		P C W		
A23		P C W		

Section B – Employment Situation				
B1 CC		P C W		
B1Convert		C W		C/W: Re-ask question for DK/RF (C) or if blank (W).
B2 CC		P C W		
B2Convert		C W		C/W: Re-ask question for DK/RF (C) or if blank (W).
B3	P W	C	P W	CATI: Series of Yes/No. Web / Paper: Mark all
B4		P C W		
B5		P C W		
B6Branch		C W		Occupation coding. C/W: Auto-code on verbatim and/or ask series of branching questions. P: Enter 3-digit code.
B6Code CC	P			
B7 CB		P C W		
B8		P C W		
B9	P W	C	P W	CATI: Series of Yes/No. Web/Paper: Mark all
B10		P C W		
B11		P C W		
B14 CATI CB		C		CATI: B14 placed between B10 and B11. CATI: Series of Yes/No. Web/Paper: Mark all
B12		P C W		
B13		P C W		
B14 CB	P W		P W	CATI: Series of Yes/No. Web DE: Mark all
B15 CB	P	C W		CATI/Web: Auto-detect whether employer is educational institution.
B16 CB	P	C W		Paper: On-route even if B15 not answered to allow B15 back-code.
B17 CB		P C W		
B18 CB	P W	C	P W	CATI/Web: May auto-code based on B17.
B19 CB	P W	C	P W	Paper: B18 and B19 on route if B17 blank.
B20		P C W		
B21Branch		C W		Occupation coding. C/W: Auto-code on verbatim and/or ask series of branching questions. P: Enter 3-digit code.
B21Code CC	P			
B20Desc		C W		CATI/Web: Occupation description
B22		P C W		
B23 CB		P C W		
B24		P C W		
B25		P C W		
B26	P	C W		Paper: No auto-fill and skip. CATI/Web: Possible auto-fill and skip past.
B27 CB		P C W		
B28 CB	P	C W		Paper: No auto-fill and skip. CATI/Web: Possible auto-fill and skip past.
B29		P C W		
B30		P C W		
B31		P C W		
B32		P C W		
B33		P C W		
B33Detail		C		CATI: Salary categories if B33 = NonResponse
B34		P C W		
B35		P C W		
B36	P	C	W	CATI/Web: Can auto-code and route past based on previous answers.
B37	P	C	W	P: On route if B36 blank to allow back code to B36. C/W: Possible auto-code and skip based on previous answers.
B38		P C W		
B38Detail		C		CATI: Salary categories if B38 = NonResponse
Section C – Other Work-Related Experiences				
C1		P C W		
C2		P C W		

C3				P C W	
C4				P C W	
C5				P C W	
C6				P C W	
C7				P C W	
C8				P C W	
C9				P C W	
C10				P C W	
Section D – Demographic Information					
D1				P C W	
D2	P				P: Working full time; Working part time; Not working.
D2_1				C W	CATI/Web: Was spouse/partner working
D2_2				C W	CATI/Web: Working full time; Working part time.
D3	P			C W	P: Allow on route if D2 empty for possible back code.
D4				P C W	
D5				P C W	
D6	P W	C	P W		Web: Accommodate side-by-side browser display. Paper follows Web.
D7 CC				P C W	
D8				P C W	
D9				P C W	
D10				P C W	
D11				P C W	
D12				P C W	
D13				P C W	
D14				P C W	
D15				P C W	
D16				P C W	
D17	P			C W	CATI/Web: May auto-fill and route past first or second most important reasons. Paper: Always on route. May back code to D16.
D16				P C W	
D19		P C	W		Blaise coding for state / territory
D19_			W		Browser drop-down for state / territory
D19_1		P C	W		Blaise coding for country vs. browser string type
D20				P C W	
D21				P C W	
D22				P C W	
D23				P C W	
D24 CB		P C	W		Web: Browser display
D24Convert				C W	CATI/Web: Ask if D24 blank.
D23				P C W	
D26	P			C W	Routing difference due to (lack of) auto-fill.
D27	P			C W	Routing difference due to (lack of) auto-fill.
D28		P C	W		Web: Browser display
D29 CB				P C W	
D31				P C W	

1/ Rows usually represent question numbers not items. For example, B27 has 14 parts, each a separate item in a CASIC instrument. At times, rows represent sub-questions where there are differences at this level.

2/ The screener is a complex block with sub-blocks with some differences between Web and CATI modes.

3/ **CC:** Critical-Complete item. **CB:** Critical Callback item.

Appendix B: NSRCG Degree Grid on Paper

A17. The next few questions ask about the degrees you received before October 1, 2003. Starting with your most recent college or university degree, please provide the following information for each degree you have at the bachelor's level or higher. *If you have more than three degrees, report your two most recent degrees and your first bachelor's degree.*

MOST RECENT DEGREE	SECOND MOST RECENT DEGREE	FIRST BACHELOR'S DEGREE																		
<p>a. From which school did you receive your most recent degree?</p> <p>College or University Name <input type="text"/></p> <p>Department <input type="text"/></p> <p>City/Town <input type="text"/></p> <p>State/Foreign Country <input type="text"/></p>	<p>a. From which school did you receive your second most recent degree?</p> <p>College or University Name <input type="text"/></p> <p>Department <input type="text"/></p> <p>City/Town <input type="text"/></p> <p>State/Foreign Country <input type="text"/></p>	<p>a. From which school did you receive your first bachelor's degree, if not previously reported on this page?</p> <p>College or University Name <input type="text"/></p> <p>Department <input type="text"/></p> <p>City/Town <input type="text"/></p> <p>State/Foreign Country <input type="text"/></p>																		
<p>b. In what month and year was this degree awarded?</p> <p>Month Year</p> <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>b. In what month and year was this degree awarded?</p> <p>Month Year</p> <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>b. In what month and year was this degree awarded?</p> <p>Month Year</p> <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>															
<p>c. What type of degree did you receive? Mark (X) one answer.</p> <p>1 <input type="checkbox"/> Bachelor's degree (e.g., BS, BA, AB)</p> <p>2 <input type="checkbox"/> Master's degree (e.g., MS, MA, MBA)</p> <p>3 <input type="checkbox"/> Doctorate (e.g., PhD, DSc, EdD, etc.)</p> <p>4 <input type="checkbox"/> Other professional degree (e.g., JD, LLB, MD, DDS, etc.) – Specify <input type="text"/></p> <p>5 <input type="checkbox"/> Other – Specify <input type="text"/></p>	<p>c. What type of degree did you receive? Mark (X) one answer.</p> <p>1 <input type="checkbox"/> Bachelor's degree (e.g., BS, BA, AB)</p> <p>2 <input type="checkbox"/> Master's degree (e.g., MS, MA, MBA)</p> <p>3 <input type="checkbox"/> Doctorate (e.g., PhD, DSc, EdD, etc.)</p> <p>4 <input type="checkbox"/> Other professional degree (e.g., JD, LLB, MD, DDS, etc.) – Specify <input type="text"/></p> <p>5 <input type="checkbox"/> Other – Specify <input type="text"/></p>	<p>c. What type of degree did you receive? Mark (X) one answer.</p> <p>1 <input type="checkbox"/> Bachelor's degree (e.g., BS, BA, AB)</p> <p>2 <input type="checkbox"/> Master's degree (e.g., MS, MA, MBA)</p> <p>3 <input type="checkbox"/> Doctorate (e.g., PhD, DSc, EdD, etc.)</p> <p>4 <input type="checkbox"/> Other professional degree (e.g., JD, LLB, MD, DDS, etc.) – Specify <input type="text"/></p> <p>5 <input type="checkbox"/> Other – Specify <input type="text"/></p>																		
<p>d. What is the primary field of study and second major (if applicable) for this degree?</p> <p>PRIMARY FIELD OF STUDY <input type="text"/></p> <p>SECOND MAJOR <input type="text"/></p>	<p>d. What is the primary field of study and second major (if applicable) for this degree?</p> <p>PRIMARY FIELD OF STUDY <input type="text"/></p> <p>SECOND MAJOR <input type="text"/></p>	<p>d. What is the primary field of study and second major (if applicable) for this degree?</p> <p>PRIMARY FIELD OF STUDY <input type="text"/></p> <p>SECOND MAJOR <input type="text"/></p>																		
<p>e. Using the FIELD OF STUDY list on pages 18-19, choose the code that <u>best</u> describes the primary field of study and second major (if applicable) for this degree.</p> <p>Code for Primary Field of Study <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p> <p>Code for Second Major <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>e. Using the FIELD OF STUDY list on pages 18-19, choose the code that <u>best</u> describes the primary field of study and second major (if applicable) for this degree.</p> <p>Code for Primary Field of Study <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p> <p>Code for Second Major <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>e. Using the FIELD OF STUDY list on pages 18-19, choose the code that <u>best</u> describes the primary field of study and second major (if applicable) for this degree.</p> <p>Code for Primary Field of Study <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p> <p>Code for Second Major <table border="1"> <tr> <td><input type="text"/></td> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table></p>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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NOTE: Education codes range from 801-995	NOTE: Education codes range from 801-995	NOTE: Education codes range from 801-995																		

Appendix C: NSRCG Education Coding Branching on Web

A17d. Please indicate your second major for the master's degree you earned at in 2001:

psych

A17e. We need to assign a standardized educational code to the field of study you just listed. From the list below please select one category that best describes the field of study for this degree.

- Health
- Psychology, social sciences or history
- Natural science, engineering, math or computer science
- Education
- Business
- Humanities or arts
- Or another field?

A17e. More specifically would you say...

- Psychology
- Social sciences or history
- Social work

A17e. More specifically would you say...

- Clinical
- Counseling
- Educational
- Experimental
- General
- Industrial/organizational
- Social
- OTHER psychology

Appendix D: NSRCG Education Coding on Paper

Paper:
Field of
Study
Verbatim
and
Code

A22. What was your primary field of study for this degree?

PRIMARY FIELD OF STUDY

A23. Using the FIELD OF STUDY list on pages 18-19, choose the code that best describes the field of study for this degree.

CODE

NOTE: Education codes range from 601 to 995

Paper:
Partial
image of
Field of
Study
Code
List

FIELD OF STUDY (Continued)	
<p>Languages, Linguistics, Literature/Letters</p> <p>760 English language, literature and letters</p> <p>771 Linguistics</p> <p>772 OTHER foreign languages and literature</p> <p>Health and Related Sciences</p> <p>781 Audiology and speech pathology</p> <p>782 Health services administration</p> <p>783 Health/medical assistants</p> <p>784 Health/medical technologies</p>	<p>Psychology</p> <p>891 Clinical</p> <p>892 Counseling</p> <p>704 Educational</p> <p>893 Experimental</p> <p>894 General</p> <p>895 Industrial/Organizational</p> <p>896 Social</p> <p>897 OTHER psychology</p>