Using Audio-Visuals in Surveys

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September, 2008

GSS Methodological Report No. 112

Introduction

Surveys are increasingly using computers and other new technologies in more innovative ways (Couper, 2005). The advances are especially notable in the utilization of audio-visuals for both the presentation of questions and the collection of responses. These innovations have the potential to fundamentally change the nature of survey research and expand on the data that can be captured.

In some ways there is little new in the use of audio-visuals in social-science research. For example, psychologists for sixty years or more in pretest/posttest designs have shown subjects film clips as the treatment between the tests (Lorge and Ordan, 1945). Likewise, surveys for decades have regularly used visuals in the form of show cards with response options (e.g. depictions of the feeling-thermometer scale) and less frequently have presented still photographs of people or places for evaluation (Davis, 1955).

But in other ways the change has been profound. The rise of both web-based surveys and computer-assisted personal interviews (CAPI) has enormously increased the capacity of surveys to use audio-visuals. First, audio-visuals have moved out of the psychologists' laboratory and into people's living rooms. This greatly increases the external validity of the audio-visual studies both by reaching larger and more representative samples and by collecting the data in more natural settings. Second, the technological advances mean that audio-visuals in the field can show and capture a full range of sounds and images. Computer-generated visuals and high-quality, moving audio-visuals can be displayed and recordings during the interviews can capture time-stamped, digitized audio-visuals as well.

Typology of Audio-Visual Surveys

The use of audio-visual recordings in surveys can be broken down in several ways. First, the medium of recording can be audio, visual, or audio-visual (combined). These media can either be real (i.e. recording of actual sights and/or sounds), virtual (i.e. machine-generated graphics and sounds), or a combination of the two (e.g. real images and/or speech that have been altered by computers). If real, the images could be staged with actors following a script or natural involving people actually engaged in the activity of interest. Additionally, the visual medium can be static (still images) or dynamic (moving images). Second, the audio-visual recordings can be used as stimuli as part of the question-asking process or for recording responses as part of the data-capture and preservation stage.

These two dimensions form a framework for illustrating the use of audio-visuals in surveys:

1. Stimulus/Audio – On the 2002 General Social Survey (Davis, Smith, and Marsden, 2007) recordings representing doctors discussing medical matters with patients were plays for respondents who were then asked several questions about the staged, doctor/patient interchange that they had just heard (Levinson et al.,

2005). Another example is audio computer assisted self interviewing (audio-CASI) in which the computer "reads" questions to respondents and respondents directly enter their answers into the laptop without having to verbally or directly disclose their answers to an interviewer. The development of audio-CASI won the 2002 Innovators Award of the American Association for Public Opinion Research. It has been shown to increase truthful responses to sensitive questions (Couper, 2005; Couper, Singer, and Tourangeau, 2003; Renker and Tonkin, 2007; Tourangeau and Smith, 1996 & 1998) and it also an alternative to written self-completion when the target population is illiterate or poorly educated (Hewett, Erulkar, and Mensch, 2004).

2. Stimulus/Visual – Harris (2002) studied how respondents classified people racially using computer-altered images of actual people to mix physical characteristics. A NORC housing study used actual pictures of garages, walls, and other structural features of buildings to guide people in their ratings of the condition of their own property. Loftus (1999) showed people video of staged accidents and other scenes and tested their ability to accurately recall details under various conditions.
3. Stimulus/Audio-visual – Rasinski and associates (1999) recorded eight staged interviews of a person being asked about sensitive topics (abortion and driving under the influence). The interviews experimentally varied elements like whether a third party was present during the interview and the age of the interviewer. Respondents shown the recordings were asked how truthful they thought the person being interviewed would be and other questions about the recorded interview. McKinlay and associates (2006; 2007) recorded staged consultations between patients and doctors. Their physician respondents were asked to diagnose and prescribe treatment for the presented conditions (See also Kales et al., 2005.) Furthermore, they used a factorial design with 16 combinations of patient age, gender, race, and socio-economic status to ascertain the impact of these patient characteristics on their assessments. Southwell (2005) had a national sample of teens evaluate health campaign advertisements and Valentino, Hutchings, and White (2003) in the Detroit Area Study showed political, campaign ads on laptops. Studies in Chicago and Detroit have showed videos of neighborhoods with actors of different races (Krysan et al., 2005).
4. Data Capture/Audio – This procedure is known as Computer Audio Recorded Interviewing (CARI) and is discussed in detail in the following section.
5. Data Collection/Visual – A number of studies have asked interviewers to rate the physical attractiveness of respondents. Such ratings are subject to great interviewer variability (Cable and Judge, 1997; Macintyre and West, 2008). A digital camera or a laptop with a webcam could be used to record respondent images and these could then be rated in a consistent manner by a team of evaluators. In a NORC study of Human Development in Chicago Neighborhoods, videos were shot of 27,000 block faces covering the 80 sampled areas. These were used not only to allow researchers to get a qualitative "feel" for where people lived, but also so objective facts about the area could be observed and coded (e.g. % of windows broken, amount of trash on the streets). The recordings also allowed researchers to have raw data that would be analyzed in various

different and unanticipated ways rather than just extracted information that had been observed and counted (e.g. number of broken images), but which had not been visually recorded.

6. Data Collection/Audio-visual – The NORC Nonshared Environment in Adolescent Development Study (1988-1992) made recording of interactions between family members in addition to conducting interviews and using self-administered questionnaires. Suchman and Jordon (1990) recorded several GSS interviews (but not with actual GSS respondents) and analyzed them to assess cognitive problems with the questions and/or interviewer behavior.

CARI

To more fully illustrate the nature and utility of the new audio-visual approaches, the example of CARI will be considered. The focus here is on the development and use of CARI including 1) what CARI is and how it works, 2) the development of CARI, 3) what technological challenges have been resolved and what challenges remain in its usage in field surveys, 4) how CARI is currently used, and 5) future developments, including suggestions on how CARI can be most effective.

CARI is an exciting technological advance which has the potential to both improve data quality (Edwards et al., 2008; Herget, Biemer, Morton and Sand, 2005, Arceneaux 2007 and McGee, 2007) and expand substantive analysis (Grogger, 2008). CARI allows survey researchers insights into the in-person interview respondent/ interviewer exchange never before possible. CARI allows for the digital recording of in-person interviews capturing the verbal exchange between the interviewer and respondent. CARI allows field survey researchers the advantage telephone survey researchers have long enjoyed where data-quality monitors have had the ability to listen-in on the interviewer/respondent exchange. While telephone survey researchers can typically monitor interviewer sessions in real time, field survey researchers using CARI can monitor snippets of an in-person interview after the interview has been completed and the audio files have been received by data-quality monitors. In terms of data quality, CARI can be used to ensure the validity of the interview, provide interviewing protocol feedback to interviewers, provide survey-questionnaire designers insights into how well interviewers administer questions and how well respondents comprehend the questions asked, and offers the ability to digitally record the respondent's responses to open-ended verbatim questions (Biemer, Herget, Morton, Willis, 2000).

CARI also opens up new avenues of research using paradata which were previously unavailable. These data can be obtained from the coding of the verbal exchange between the interviewer and respondent. For example, researchers can determine the number of times a question needed to be repeated by an interviewer or the number of times the respondent needed a question clarified.

Finally, CARI can be used for substantive research. For example, Grogger (2008) examined 520 validation interviews from the 1997 National Longitudinal Survey of Youth. He found that Black respondents with distinctly Black voice patterns earned less than Whites with comparable job skills and also less than other Blacks with less distinction Black speech. Other research areas that depend on audio records such as can

be delivered by CARI are discourse analysis and response-latency studies (Bassili and Scott, 1996; Muulian at al., 2003; Yan and Tourangeau, 2007).

How CARI works. CARI works through the audio-recording mechanisms on an interviewer's laptop, namely the laptop microphone and soundcard. Each laptop is equipped with either an internal or external microphone and a command file indicates which portions of the interview are recorded, that is the command file contains programming code instructing the laptop to record a certain set of questions or the entire interview. The command information can be programmed directly into the CAPI instrument software such as Blaise (Thissen and Rodriguez, 2004) or it can exist independently of the CAPI instrument software. For the 2008 GSS, NORC computer scientists successfully implemented the CARI command file to work independently from the main questionnaire which was programmed in SPSS' MR Interview software. The command file can be written to a survey's specifications. The recording time can be specified to stop the recording after the interviewer administers a specific question which was set for recording by proceeding past the CAPI screen which contained the question to the next question screen or the recording can be set to stop after a predetermined length of time regardless if the interviewer completed the administration of the question and proceeded to the next screen. The command file can also be written with instructions to record random portions of the interview, if so desired. The command file also has the flexibility of being updated throughout a data-collection field period. If, for example, researchers wanted to record a variable that was not specified for recording when data collection began, an updated command file including instructions to record the new variable(s) could be sent to an interviewer's laptop through a remote update. The computers are typically connected via a secure encrypted Internet connection. One advantage of having the command file work independently from the questionnaire is that should researchers decide on updating the command file, they do not have to update the questionnaire software to do so. Theoretically, researchers could be recording different questions for different interviewers if that was the research goal by placing different command files with different instructions on each interviewer's laptop.

At the beginning of a CARI interview, respondents are read a statement contained in the informed consent statement typically required by an organization's Institutional Review Board (IRB) which indicates that portions of the interview will be recorded for quality-control purposes and this will not affect the strict confidentiality of the respondent's responses. If the respondent consents to the interview and recording, the recording mechanism is turned on. If the respondent consents to the interview, but does not consent to recording, the recording mechanism is turned off. The interviewer also can have the recording mechanism turned off part-way through an interview, if after initially consenting to recording, the respondent changes his or her mind.

The recording files are then transmitted over the Internet through a secure encrypted connection along with the questionnaire and other survey data to the organization's central office computer. If the survey organization does not have this capability, or if the audio files are too large to transmit remotely as might be the case if an entire in-depth interview was recorded, interviewers could transfer the audio files from their laptop to a Zip disk and ship the recordings to a centralized location where the audio files can be uploaded and reviewed. Initial deployments of CARI utilized this technique (Herget, Biemer, Morton, and Sand, 2005). With dial-up connections being the norm for

interviewers during initial deployments of CARI, the sending of large audio files over the Internet was not entirely feasible. Improvements in file-transfer technology and compression, and more widespread use of broadband Internet connections in the homes of field interviewers have made the remote transfer of audio files to a centralized computer via the Internet much more feasible today.

CARI Development. The first deployment of CARI took place in 1999 on the National Survey of Child and Adolescent Well-being (NSCAW). The NSCAW was conducted by Research Triangle Institute (RTI). NSCAW was a national study of children in the child welfare system which included other children in the U.S. who were at risk of abuse or neglect. Survey respondents included children, their caregivers, the child welfare caseworker and teachers. This initial deployment of CARI on a major national field project acted as the first significant CARI field test to determine the feasibility of the application. In the years that followed, RTI and NSCAW's sponsor, the U.S. Department of Health and Human Services (DHHS) collaborated on a number of CARI feasibility studies (Biemer, Herget, Morton and Willis, 2000, Herget, Biemer, Morton, and Sand, 2005). The U.S. Census Bureau also conducted CARI laboratory tests to evaluate the potential implementation of CARI into all of the Census Bureau's Computer Assisted Personal Interview (CAPI) surveys (Arceneaux, 2007). From these feasibility studies, lab tests, and evaluations, the following key issues were addressed:

System Performance. No degradation of CAPI performance was found. This was the consensus across the research organizations. Initial concerns that the implementation of CARI would lead to laptop hardware or software performance degradation were invalidated. There were no signs that interviewers could determine when CARI recording was occurring. The CARI system appeared to unobtrusively operate on the interviewer's laptop computers.

Data Security. It was found that when CARI files were transmitted remotely over the Internet that the files could be subject to the same type of encryption that other survey and questionnaire data are subjected to.

Audio Quality. The only notable discrepancy between the RTI feasibility studies and the Census Bureau's lab tests is the reported audio quality of the recordings. The Census Bureau did note positive findings in their CARI evaluation in regards to audio quality, but did indicate that more research is needed before CARI can be implemented for use in current Census Bureau surveys. While RTI reported that 90% of the audio files collected in NSCAW where of the highest audio quality it suggested CARI technology does produce high quality recorded interviews, although the Census Bureau observed a high quality audio file rate of 85.6%. The Census Bureau deemed this audio quality rate unacceptable. Complicating the matter further is additional research on the quality of CARI recordings collected on the National Centre for Social Research's (NatCen) English Longitudinal Study of Ageing (ELSA) in the UK. NatCen found for more than a third of the completed cases that random, individual sound files were inaudible. While for most cases the interviewers themselves were clearly audible, most likely because they were sitting close to the laptop and thereby the microphone, respondents

were generally much quieter making it difficult to understand what respondents said (McGee, 2007).

What is not clear is the configuration setting of the laptops used to record the audio files of the organizations using CARI. RTI has noted that its standard configuration is 16 bit bandwidth, 11.25 KHz sampling rate and a single channel. Recording two channels (stereo) requires twice the storage space and provides no extra quality since a single laptop microphone is generally used. Audio quality is also affected by sampling rate, compression, and audio file format (Thissen, Sattaluri, McFarlane, Biemer, 2007).
The location of the microphone, whether it is external or internal, and if it is an internal microphone, where it is located within the laptop, and the quality of the microphone and soundcard can also affect the quality of the recordings. Despite all of the CARI audio files collected by survey research organizations to date, more research into the quality of the audio files and what are the system requirements and specifications required to produce high quality CARI audio files is needed as clear and audible audio files are critical to the success of CARI applications.

Respondent's Reactions. Respondent reactions to CARI have been positive. In terms of respondent CARI consent rate a variety of organizations have found that generally 90% of respondents agree to CARI recording. RTI found 85% of caseworkers, 83% of caregivers, and 82% of child interviews consented to CARI recording in the NSCAW. These results were seen as rather positive given the sensitive nature of the survey. On a much less sensitive survey RTI found that 93% of respondents agreed to CARI recording (Wrenn-Yorker and Thissen, 2005). NatCen's ELSA survey yielded an 89% CARI cooperation rate. And on the 2008 GSS, 85% of respondents agreed to CARI recording.
Overall it has been found that more 70% of respondents reported that they had no reaction one way or the other when initially requested for permission to record portions of the NSCAW interview. In the same survey nearly 69% of respondents reported that their answers were not influenced by the audio recording, 16.4% reported that their answers were influenced "A little," and about 15% reported that their answers were influenced "Somewhat" or "A lot." Those respondents who answered "A lot," "Somewhat," or "A Little" were asked a follow-up item on how they thought their answers were influenced. Over 47% of the respondents reported that their awareness of the recording probably influenced them to provide more accurate responses, 36.8% reported that the recording had no effect, and 15.8% reported that it influenced them to provide less accurate responses. This research showing that CARI has little influences on respondent answers is supported by similar research regarding the recording of telephone interviews (Basson, 2005) showing no social-desirability effects, and to the extent that CARI does influence respondent answers it is more likely to improve data accuracy.

Interviewer Reactions. On the positive end, approximately 82% of NSCAW interviewers felt positive or neutral about the use of CARI overall. About 87% of

interviewers were positive or neutral about using CARI to detect case falsification and 89% of interviewers were positive or neutral about using CARI as a tool to evaluate and provide feedback to interviewers. The more negative feelings toward CARI tended to come from more experienced interviewers. More experienced interviewers were more likely to exhibit negative feelings toward CARI. Experienced interviewers exhibited negative feelings toward a change in the status quo and saw CARI as a sign that 'management' does not trust the interviewers.

CARI Validation System. Reviewing three 30-second audio files was found to be sufficient for monitors to reach a consensus on the validity rating of the interview. Additional analysis showed that the CARI-based verification approach was less expensive than traditional approaches by 20-30%.

CARI Performance Monitoring. It was also found that through a review of an interviewer's audio files that CARI would be a useful tool when combined with performance monitoring procedures to successfully evaluate performance and provide feedback to field interviewers.

To date, CARI has primarily been used to detect inappropriate interviewer behavior including data falsification, and to evaluate interviewing protocols and provide feedback to interviewers.

Current Use as a Validation Tool. Of its many usages, CARI has been used primarily to detect falsified interviews. To detect falsification data-quality monitors listen for no voices on the audio file while room noises are audible, instances when the interviewer can be heard, but appears to be speaking to himself or herself, instances when the respondent answers too quickly or laughs in inappropriate places, and instances when the respondent makes comments suggesting the interview is being falsified, or the same respondent's voice is heard in recordings of multiple interviews (Thissen and Rodriguez, 2004).

In addition to acting as a detection tool to identify falsified cases, CARI also acts as a deterrent. Interviewers on CARI surveys certainly know CARI is being used to monitor their work and to ensure interviews are not falsified. To the extent that CARI acts as a deterrent to case falsification is difficult to quantify and this issue has not yet been thoroughly explored to date.

Exclusively using CARI for validation on field projects can lower validation costs by 20-30%, although there are a number of issues that currently prevent it from being used as the primary tool to identify interviewers who are falsifying interviews. While CARI can be used to detect falsification and acts as deterrent to falsification, it has not shown that it can fully replace traditional validation methods such as call backs. The type of survey utilizing CARI is an important factor in determining how well CARI can be utilized by survey researchers for interviewer validation. Area Probability (AP) samples are the perfect example of a type of survey which still requires traditional call back validation. While AP samples can certainly use CARI as a validation supplement, it is difficult to see how AP samples can solely use CARI as the primary tool to detect case falsification. Through call-back validation for AP surveys, survey researchers are able to

confirm that the interviewer contacted the correct sampled address and correctly selected the appropriate respondent. To verify that these two key study protocols for AP surveys were correctly followed by an interviewer, these items would need to be confirmed with the respondent through either a telephone call back or the receipt of a paper validation questionnaire. With CARI these two items would have to be confirmed with the respondent and recorded using CARI in the main questionnaire. This would be difficult to achieve as it would be very apparent to the interviewer what researchers would be trying to accomplish with these questions.

For panel and other reinterview type field projects capturing CARI audio files of respondents during the first wave of the survey would prove invaluable for validation of interviews on future waves of the survey. Implementing strict-validation, call-back procedures during the first wave of data collection would ensure the CARI audio files collected do in fact contain the respondent's voice. Implementing CARI on subsequent waves of the survey would allow for decreased validation costs and more efficient validation as survey research organizations would have the respondent's voice on record from wave 1 of the survey for quick and accurate comparison during subsequent waves. In order for survey-research organizations to save CARI audio files from round to round for ongoing surveys, it would require clearance from the organization's IRB. If one were reasonably taking the view that the audio files are just another piece of survey data, such as respondent address or gender, it is hard to imagine an IRB having an issue with this procedure especially if an organization's CARI audio files are subjected to the same stringent, data-protection protocols as more traditional response data.

One other limitation of CARI as a validation tool is that the best data available have shown that researchers can reasonably expect that 10% of respondents will refuse audio recording. This is coupled with the fact that an undetermined percentage of the CARI audio files will be of low and unusable quality. Even if a panel or reinterview survey has a repository of respondent audio files from a prior round of the survey for comparison in future survey waves, there will be a significant percentage of the cases where there are no or inaudible audio files for comparison and some other kind validation method will need to be utilized.

Current Use as a Performance Monitoring Tool. Combining CARI and interviewer-behavior coding provides a very useful tool for highlighting interviewer training needs (McGee, 2007). Indeed, a major benefit of CARI is its extremely high potential to improve interviewing methods under a quality-improvement initiative. The mere presence of CARI is likely to exhibit a positive effect on an interviewer's behavior knowing they will be receiving feedback on the audio files captured. Interviewers who know they are being recorded are more likely to stick to study protocols and not to exhibit behavior they know is inappropriate. Through a review of CARI audio files, trained, data-quality monitors can listen to the interviewer/respondent exchange and assign a predetermined code based on what was heard. Based on the codes assigned to an interviewer's audio files either positive or negative feedback will be received. Feedback to the interviewer would generally be provided by his or her manager. On the 2008 GSS, NORC field supervisors had access to all of the CARI recordings for all interviewers he or she supervised through the NORC Case Management System (CMS), CM Field. Field supervisors found these recordings to be an extremely effective management tool to verify the authenticity of completed interviewers and to monitor interviewer performance.

CARI can identify areas where interviewers need re-training and can highlight areas interviewers excel for future project assignments. CARI can work to correct the inappropriate behavior of experienced interviewers and works as an extension of training for new interviewers.

In order for timely and accurate feedback to be provided to interviewers some kind of CARI coding application would be required. The coding application would provide a link to the audio file and code frames with the ability of the coder to assign a code which indicates the quality of the audio file and an interviewer-performance code (Sokolowski, Daquilanea, Fennell, 2008). Examples of interviewer performance codes would include; question not read, question misread, improper prompt, insufficient probe, etc. The type of questionnaire and the kinds of quality initiatives desired by the researchers can inform the type of feedback given to interviewers and the contents of the code frames. Quality-improvement methods such as these may supplement other validation activities, evaluate interviewing techniques and assess data quality.

The costs of implementing a full-blown, CARI-monitoring system can be significant. On the 2008 GSS it was estimated that if the project were to monitor and code an average of 5 minutes of audio per case for all completed cases the task would comprise 4% of the project's total budget. Cost is an issue for survey researchers as CARI is a new technology which many existing surveys have not fully incorporated into their budgets. Survey researchers need to find ways to balance the benefits of CARI coding and find ways to incorporate this work into their surveys.

Survey-research organizations have taken great strides to incorporate CARI into their validation protocols and have worked to initiate CARI monitoring systems to enhance interviewer performance. While these areas have seen the utilization of CARI's potential, there are relatively large holes in the literature regarding the two other areas where CARI has the potential for a significant impact: (1) using CARI to identify questionnaire and data problems, and (2) using CARI to capture responses to open-ended questions.

Future Use. There has been precious little literature which has documented how CARI can aid in the identification of questionnaire problems and how it can help with questionnaire design. Although the recording of the interviewer/respondent exchange has the potential to aid questionnaire designers and cognitive psychologists in the development of sound survey questions. The recording of questionnaire administration has shown itself to be a great tool for question pretesting (Basson, 2005).

CARI can also be used to collect verbatim responses, although no literature presently exists which documents how effective CARI can be in the area. The 2008 GSS used CARI to record respondent responses to the standard Census Industry/Occupation (I/O) battery of questions (Sokolowski, Daquilanea, Fennell, 2008). The results of this initiative are forthcoming. NORC researchers will be examining the audio file coding of I/O responses v. the interviewer coding of the same responses to determine what, if any, the differences are and which is the better vehicle for collecting this type of information.

Advances of Audio-Visuals

The main benefits of using audio-visuals in surveys is that both the questioning and the data collection can become more extensive and complete. In many cases simple

spoken survey questions are poor substitutes for what the researcher really wants to measure. For example, asking about a campaign theme or slogan may be useful, but showing actual political ads greatly increases what can evaluated. Similarly, asking directly about race or gender may not be nearly as powerful nor valid as having respondents view visuals in which the race and/or gender of people have been randomized. In many cases the audio-visual presentation can be closer to the real world phenomenon of interest than a traditional, ask-and-answer question. At the data-collection end, audio-visual recording can capture much more detail (e.g. full verbatims of open-end responses) and valuable ancillary information (e.g. body language in addition to verbal responses) than traditional modes. In many cases, such as in discourse analysis or response-latency studies (Bassili and Scott, 1996; Muulian at al., 2003; Yan and Tourangeau, 2007), the data of value can only be analyzed from recorded data.

Another benefit of the current, advanced forms of audio-visuals comes from them being computerized and digital. The development of computer-assisted interviewing in general and its integration with audio-visual programs in particular have of course been the conduit for their expanded use in surveys. This means that the audio-visual components can interface with other elements of the survey. For example, on the presentation side it is increasingly becoming possible to artificially generate audio from text is what is known as text-to-speech systems (TTS)(Couper, 2005; Couper, Singer, and Tourangeau, 2004). At the data-collection end, responses are more directly and easily amenable to computerized and quantitative analysis. For example, discourse analysis is done more easily and reliably with CARI and computerized analysis routines than with analog recordings and hand transcriptions and data coding (Kendall and French, 2006) and time stamps can be used to measure response latency (Couper, 2005).

One more benefit of audio-visuals is their versatility. Traditional question modes have to narrowly predefine what information is to be collected and in what form it is to be coded and analyzed. Audio-visuals of course still have to be used to address relevant issues in meaningful ways, but because more information is captured and preserved in its unedited form, it has more utility and can more readily be used for multi-purposes and in ways beyond those initially intended. For example, the recordings of collected data can be used for both methodological and substantive purposes. CARI can be used as a quality-control device to assess how well interviewers are administering and recording responses to questions and as a cognitive tool to assess questions with the object of improving their design (Bassili and Scott, 1996). At the same time, CARI can be used to capture fuller responses to open-ended questions, including preserving natural language, and to record precise verbal responses for detailed discourse analysis (Bauer and Gaskell, 2000; Schober and Bloom, 2004).

Cautions Involving Audio-Visuals

While the gains of using audio-visuals in surveys are clear and compelling, their use does raise a number of cautions. First, there will be mode effects (Hecht, Corman, and Miller-Rassulo, 1993; Muller and Scott, 1984; Tourangeau and Smith, 1996 & 1998; Trapl, 2007). Questions using audio-visual stimuli will certainly produce different results that analogous measures without using audio-visuals or using only more limited forms (e.g. real, still photographs). These differences are not necessarily a problem, especially if

the enhanced, audio-visual measures are more reliable and valid. But a) their improved measurement capacity has to be proven, not merely assumed, and b) for trends analysis the mode differences are especially problematic. In addition, since the use of advanced, audio-visuals in surveys has been limited to date, the mode effect of various different versions is largely unknown. For example, do people respond to computer graphics differently than real images, what is the difference between color vs. black-and-white presentations, and what difference does accents and gender make in audio recordings?

Second, at the data-collection end, privacy is a major concern. Recording respondent's faces and voices not only means that more identifying information beyond such traditional identifiers as name, telephone number, and/or birth date are being stored, but that detailed, verbatim responses to specific, possibly sensitive, questions are being preserved. These increased privacy issues mean respondents must be fully informed of the risks involved and give explicit consent to the audio-visual recordings and that the survey researchers must have strict, security protocols to prevent the disclosure of the identifying recordings.

Third, surveys are already complicated endeavors involving such experts as sampling statisticians, survey methodologists, substantive specialists, data-collection managers, and quantitative analysts. Major use of audio-visuals necessitates the adding of experts in these technologies (Couper, 2005) and, if staged presentations were being used, of working with of directors and thespians (Rasinski et al, 1999; McKinlay et al., 2006).

Finally, while the basic technological issues (e.g. programming, sound and visual quality, backing-up recorded data) have been adequately worked out at both the presentation and data-collection ends, such technical matters still need careful consideration and testing. The more complicated a survey application is, the more development effort is needed to "debug" it and field test it under real-world conditions. Moreover, even when technologically sound, extra challenges are inherit in using these approaches. For example, CAPI interview files are usually transmitted by interviewers back to the central office over the Internet. Since CARI can enormously increase the size of interview files, this can create a problem especially when interviewers have only slow web-connectivity. MORE??

In addition, one must also be cautious about the different varieties of audio-visuals and what differences they may make. For example, the use of either computer-morphed, actual images or entirely computer-generated images has both advantages and disadvantages over using real images. One potential advantage of using computer-generated graphics is the minimization of unintentional variance. For example, much social-science research wants to compare how respondents evaluate different types of people (e.g. varying in terms of race, gender, age, etc.). Thus, job discrimination studies want to determine to what extent race is a factor in hiring decisions. This is often examined by having applicants who are "identical" on all relevant attributes except race and then finding out whether one race is treated more or less favorably than others. With real-world recordings it is very difficult to match the applicants on all their non-racial attributes (e.g. height, body mass, voice, eagerness, well-spokenness, etc,). With computer-imaging all factors beside racial features can be more easily held constant. Similarly, computerized, voice-generation and modification techniques can be used to change accents, volume, timbre, pitch, and other vocal traits while visuals (if any were

used) are held constant. Another advantage is that machine-generated images may be less expensive to prepare than actual visuals involves actors, sets, etc.

Probably the largest potential disadvantage is that computerized images are still recognizable as virtual rather than real. While there is some evidence that people may process and respond to computer-generated and real images in a similar manner, this is far from established (Couper, 2005). Thus, there is less face validity for survey questions using the virtual rather than the actual.

Future

The use of audio-visuals in surveys will continue to expand. In the near term several factors are encouraging this. First, the computing power and versatility of laptops will continue to advance as will Internet-based applications. While so far the use of audio-visuals in Internet-based surveys have primarily been on the stimulus side, the expansion of VOIP, webcams, and related devices will increasingly make their use at the data-collection side practical.

Second, their use will migrate from the cutting edge to the standard-product center; a transition that is already well along for CARI and audio-CASI. Other audio-visual uses will diffuse in a similar manner.

Third, while stimulus and data-collection usages have essentially been separate to date, there is nothing that necessitates this. It is already possible to have survey questions that both contain audio-visual presentations and capture verbal and visual responses.

Finally, since the audio-visuals are digitized and computer driven, they can be easily used in versatile and powerful ways. McKinlay and associates (2006; 2007) of course already have used a factorial-vignette design. Not yet adopted, but already entirely practical with existing equipment and programs is the use of interactive, audio-visual presentations (Couper, 2005). For example, item-response-theory (IRT) techniques could be utilized to decide which follow-up audio-visual items would be administered based on responses to the earlier IRT items. Similarly, in an audio-video display a respondent could be presented with an argument for a particular position. Then the respondent would evaluate the argument (e.g. agreeing or disagreeing with the advocated position and/or assessing the strength of the presented case). In response to those evaluations, the respondent could then be given selected follow-up audio-video arguments. These might be counter-arguments to try and dissuade the respondent from supporting the original proposition or new arguments in favor of the proposal to win over the unpersuaded. In the longer term developing technologies offer even more possibilities such as the voice-recognition processes of audio survey responses and face-recognition and other visual techniques for analyzing the images involving survey responses.

In sum, audio-visual have become a valuable tool in survey research and will make increasing contributions as innovative technologies are developed and then their use diffuses to surveys in general.

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