Computer Assisted Recorded Interviewing (CARI): Experience Implementing the New Blaise Capability

Rick Dulaney and Wendy Hicks, Westat

I. CARI: What and Why

Computer-Assisted Recorded Interviewing refers to the collection, management, coding and other uses of sound recordings taken during data collection. Sophisticated CAPI and CATI software packages have combined with widespread availability of recording capabilities on laptop computers to produce a wealth of supporting survey data in the form of sound files. In particular, Blaise version 4.8.2 contains full support for CARI in the Blaise system.

The advent of CARI over the last several years allows field managers, methodologists, coders and others to be present at the moment of data collection in a way never before possible. Listening to the interaction between interviewer and respondent provides important new insight – into the instrument design, into training needs, and into the quality of the data collected. Listening to that interaction while seeing the data entered by the interviewer increases the value to the listener, and directly affects several survey processes:

- CARI supplements or replaces direct observation. In many CAPI surveys, a percentage of field interviews are observed by supervisory staff, normally as part of ongoing quality control efforts and possibly as mandated in contracts. Direct observation carries significant costs, and may have an observation effect on the cognitive interaction; that is, an observed interview may be a different experience for both interviewer and respondent from an unobserved interview. CARI capabilities allow observers to hear the interactions – at their own pace and with the ability to re-listen as needed – without interfering in the data collection. This becomes more effective if the recording technology includes no signal to the interviewer or respondent that the recording is active.

- CARI supplements or replaces interviewer validation. Most surveys use some form of validation to determine whether field staff have falsified interviews. In many cases this validation involves re-contacting the respondent and verifying that the interviewer was there, asking a few of the same questions again, recording the answers on a laptop, etc. CARI data allow validators to perform this function without additional burden to the respondents.

- CARI offers significant potential to assess data quality. There are many possible factors that may affect whether the data collected are of the highest possible quality. Recording the data collection allows survey designers to assess whether specific question design facilitates or hinders the collection of accurate data. Methodologists can also gain new insight into how interviewers work and how the interaction of the interviewers and the instrument affect the overall quality of the data.

- CARI provides an additional source for post-data collection processing, such as editing or coding. Often when editing inconsistent data or coding text strings back to a set of categories, the home office staff rely on text entered by the interviewer. This text may be in the form of remarks, or perhaps a response to an other-specify or similar text string. The data, however, are entered by the interviewer in the middle of an interaction that is focused on retaining respondent cooperation and moving through the questionnaire, and may not contain everything the respondent said.
Hansen et al (2005) demonstrated that text entered by interviewers during an interview is often less complete and even inaccurate as compared to the text data captured as a result of listening to audio-recordings of the survey interaction.

- CARI can assist with long open-ended responses. Many items that involve a longer answer are difficult for interviewers to record accurately while maintaining the momentum of the conversation. Having these items recorded can yield accurate and complete data while allowing the interviewer to concentrate on the quality of the interaction.

- CARI may augment or replace consent for subsequent data collection. Many organizations that require consent to release records, allow student participation, etc. will accept recorded consent. This recorded authorization may be easier, faster and more economical than other methods relying on paper forms, either mailed or collected in-person.

- CARI can also be used as a training tool. Interviewers in training can record their administration of a survey (or components of a survey), listen to the recordings and complete self-evaluations on their skills. Training staff can then use the recordings and the self-evaluation data to guide additional training and coaching.

Methodologists in particular may appreciate the value of CARI data, as these data are a rich source for understanding the specifics of data collection. The relative ease of use encourages experimentation, such as recording a large number of items or recording items only under certain circumstances. And one need not navigate the ocean of recorded data made possible by CARI technologies at one time; items can be “banked” for further analysis or comparison against future studies.

II. CARI Implementation Requirements

Over the course of several years, a set of implementation requirements has emerged for CARI:

- The technology should to the extent possible leverage existing hardware. This is made easier because virtually all laptops available in the last few years include built-in audio recording. On at least one occasion Westat has used a peripheral recording device to record both sides of a telephone conversation, but in general the recording capabilities of the laptop computer are sufficient for CARI. The emergence of CARI capabilities now influences laptop acquisition criteria and decisions.

- The recording function itself should be completely unobtrusive. Interviewers should not be “signaled” (overtly or through subtle cues) when the system is recording, and there should be zero effect on the respondent or the data collection.

- The CARI capability should be designed and implemented to provide the maximum flexibility for survey designers, reviewers, coders and other users. This includes the ability to designate certain items for recording but not other items and the ability to record items only for a certain percentage of the time they are encountered. This also includes the ability to record continuously for a period of time or for a set of items.

- CARI should work seamlessly with the data collection system, and should require minimal additional custom coding – and any custom work should be forward-compatible with future versions if possible. The system should also allow for “informed consent” in which respondents
are informed that portions of the interview may be recorded for quality control purposes, and should turn off the recording capability should the respondent wish not to be recorded.

- The CARI data should be highly usable for coders and other reviewers: they should be able to stop, start and restart the recordings; they should be able to listen to all recordings together for a single item (multiple recordings may be generated when an interviewer backs up and re-asks an item); and they should be able to see the data entered and the paradata associated with the recording. In addition reviewers might be anywhere, and should be able to review the recordings from wherever they might be.

- Because recorded data may contain virtually anything, all CARI data must be considered and treated as confidential.

Our core CARI implementation at Westat falls into three areas:

1. Recording items during the CAPI interview
2. Integration into field management systems
3. Reviewing and coding the CARI data

The remainder of this paper takes these up in more detail.

### III. Recording Questionnaire Items

For some years, Westat has implemented a Westat-developed recording capability built into the Blaise product. This capability, known as WesCARI, leveraged the audit.dll shipped with Blaise. Programmers specified in an .INI file which items were to be recorded (using the full Blaise path) and a percentage between 1 and 100, where 100% meant that we always recorded the item. Since the audit.dll program always knew the current item, we evaluated that against the items in the .INI file and generated a random number to determine whether to record the item. The audit.dll program typically writes records to the audit trail log as each field is entered and exited, and so we turned the recording capability on and off at those times. The .INI file also controlled the specifics of the recording, including the format and granularity of the sound files, and the maximum length of the recording.

This approach yielded the sound files we wanted, but had some drawbacks. First among these was the need to re-engineer the recording capability into the audit.dll file whenever a Blaise release changed the audit.dll. Although these system changes do not occur all that often, we still needed to evaluate each release and update which versions of WesCARI were appropriate for that release. Second, our review applications could display the questionnaire specification for a particular item and the data stored for that item, but we could not easily display the item as it was displayed to the interviewer and the data as entered by the interviewer at the time of the recording. In most cases, this latter shortcoming was not a problem, but when interviewers backed up and changed the data – thus generating two or more recordings – it became more difficult to evaluate the interviewer’s performance and the quality of the data. In addition, the mismatch between a questionnaire specification version of a screen hindered coders’ ability to accurately assess interviewers’ skill at reading scripted questions correctly since the appropriate fill logic was easily lost among all the fill alternatives.

With the advent of Blaise 4.8.2, the CARI capability is included directly in the Blaise system. From the control centre, you can invoke the CARI Specification Tool and specify sound recordings and/or screenshots:
Note that you may specify the file name; in the example above, we include the case ID (KEYVALUE) and the field name. In the example below, note that you may designate the “chance” that the question will be recorded; below on the left we would like the item recorded 30% of the times it is encountered, and on the right we can review all the items and the probabilities of recording.
In addition to the probability feature, the CARI Specification Tool includes the ability to specify maximum recording length, granularity, etc. In addition, Specification Tool users can specify which field indicates that the respondent has consented to be recorded; in the event this field is set to No – whether initially or if the interviewer backs up and changes it to No – then no recordings are made.
The CARI Specification tool also allows us to designate a CARI log file that contains an audit trail of recording activities. We may specify that the CARI log contain only fatal errors, or contain additional messages useful for reconstructing what occurred during data collection. Here is an example of the most extended messages:

Finally, the ability to take screen shots showing the response and all fills is a very useful feature of the Blaise CARI capability:
Note that this screen shot – this is a file stored with the other CAPI data on the laptop – shows the data as entered by the interviewer. This is particularly useful in the event the interviewer backs up and changes the response: recordings can be keyed to the exact screen rather than to the final data values. Additionally, the actual screen shot shows only the appropriate fills for the question, exactly as displayed to the interviewer, facilitating assessment of interviewer skills.

We are using the Blaise CARI for several reasons. First, it is tightly integrated with Blaise, which leads to straightforward and robust implementation in our Blaise applications, and provides an easily-understood structure for identifying the items and percentages to record as part of the questionnaire specification process. Second, this integration eliminates the maintenance burden of having versions of the CARI software that are sensitive to the version of Blaise. We expect that CARI will be forward-compatible with subsequent versions of Blaise. And finally, the screen shot capability allows for more accurate and detailed coding.

IV. Integration into Field Systems

Sound files present several challenges to survey field management systems. First, they can contain any data at all, and therefore may contain confidential information. As such, the sound files need the highest possible level of protection within the overall data and communications flow. Second, the files need to be named and stored in a way that makes them easy to process and to identify with the Blaise survey data,
stored separately. Third, the system needs to accommodate significantly larger data files, which need to be transmitted as necessary throughout the system.

With regard to the first challenge, our response is to treat the sound files like any other case data. Westat’s Baseline Field Operations System stores all survey data associated with a case in a single directory location, and keeps them all encrypted until they are needed for data collection. At survey time, when the interviewer has selected the case from a list in the management system and has started the survey, then BFOS decrypts the data files and starts the Blaise application. When the survey is finished, BFOS re-encrypts all the data files, including the sound files, and stores them in their case-specific location. The individual sound files themselves are named with the case ID, item or question number, date/time, and sequence number (if an item is recorded more than once).

The large data files generated by CAPI are a major challenge. First, the size cannot be accurately predicted, since the recording may be for just a second or two or may be minutes in length, particularly if the interviewer needs to probe or clarify a response. Second, one can estimate but not predict how many recordings there will be if the survey records only a percentage of the items. Third, many items scheduled for recording depend on prior skip patterns and therefore may not be reached at all (though the skip patterns are typically considered in setting the percentage for recording an item). Fourth, interviewers may back up an unlimited amount of times to the same item, thus generating many extra sound files.

It therefore seems prudent to plan defensively for a large amount of CARI data. On a recent small study at Westat, the Blaise data for an interview took 12-24 KB on average, while the complete case data including screen shots and sound files was in excess of 4 MB. This will have an effect on transmission times and on data storage and retrieval times. Data transmission is normally acceptable over broadband, even when several cases need to be transmitted, but if field staff are using phone lines they should transmit frequently and expect much longer transmission times than usual. Westat normally instructs field staff to transmit as soon as possible after performing any field work, but this is especially important for those staff who cannot or do not have a broadband connection and who need to use phone lines. On the laptop itself, Westat has historically not deleted completed cases after transmission until a natural break in data collection (such as the end of a round). We are now looking carefully at disk space usage and are ready to delete complete cases earlier if we suspect that the larger CARI files are having a negative effect on disk fragmentation and performance.

V. Coding Sound Files: CARICode

For some years projects at Westat have used networked applications to code CARI data. Recently, however, Westat has developed a broader capability available for distributed use across projects and known on projects as CARICode. The CARICode system allows authorized users to log in and securely perform specific coding functions using specific roles. CARICode functions include:

- Interviewer validation. Coders – generally field supervisors or staff dedicated to quality assurance – listen to recordings and fill out a coding form describing how well they heard the interviewer and respondent as well as other sounds they may have heard (or not heard) on the recording that can help provide clues as to the likelihood of falsifying data. By default, the coders listen to all the items designated for validation for a single case and fill out a form describing what they heard on the recording and then complete a case summary. The summary data are used further to categorize cases as potentially falsified and needing further review. CARICode is loaded with the recordings, screen shots and relevant paradata for the cases to be validated (e.g., CAPI timing data, start time/date of the interview, previous result codes for the case, etc) and the recordings are presented on the screen with the screen shots and
paradata. The coders use all of this information – the recordings and the paradata – to assess the likelihood of falsification.

- **Question assessment.** Coders – normally design staff and/or methodologists – sign in and listen to specific questions and code how well they are working in the field. By default, the coders will listen to a specific question across cases rather than all the questions recorded within a case. Additionally, the system allows for a sample of recordings to be double-coded or verified, and differences adjudicated as needed.

- **Interviewer performance.** Coders – generally field supervisors or their managers – log in and listen to how interviewers asked specific items and how they responded to and recorded different responses. Any quality issues are addressed directly with the field interviewers as part of our ongoing feedback to their development.

- **Survey data capture.** Coders – generally coding staff – log in and listen to the audio recordings of open-ended questions and capture the response verbatim, or use the recording to code the response into specified categories, such as with Industry and Occupation coding or some other classification scheme. This can be done as part of a field pretest to help develop defined response categories for full sample data collection, as part of a post-collecting editing operation, or as the actual data capture for a question.

For all of these functions, reports and other outcome materials are available for managers, methodologists and field staff as necessary.

An example of the screen used to code CARI data for interviewer validation follows. The screen is divided into four parts: The top section contains paradata from the field management system, the middle of the screen allows the coder to play the recording, the bottom left shows the Blaise screen shot (may be enlarged if necessary) and the bottom right contains the questions for the coder to answer.
The coder codes all recordings for a given case using this format, and then summarizes the recorded data for the case using the following screen:
One benefit of a distributed system is the ability to direct users who are best positioned for specific tasks to that work. CARICode is role-based, meaning that user tables are configured so that individual users may be a coder for one function, a verifier or adjudicator for another function, and have no role at all on a third function. Other configuration tables allow individual projects to designate specific CARI items and associate them with individual functions.

VI. Implementation Overview

An overview of the CARI implementation on a specific project is:

- During the questionnaire design and specification stage, items are targeted for recording by function or purpose of recording, along with the probability of recording. For instance, a set of questions will be recorded and used for interviewer validation, another set for interviewer performance, and some for multiple purposes such as interviewer performance and question assessment. A pretest may place particular emphasis on question assessment, while another project may not use that function at all.
- These items and functions are tested during instrument development.
- Systems integration testing – i.e., testing that the instruments, field management system, and all data communication components work together – includes CARI sound files.
- CARICode items and coding/verification rates defined.
- Supporting data are defined and specified and loaded into the CARICode system. Paradata are at the heart of this specification, and may include:
- Timings data – either the whole interview, or modules/sections within the interview
- Interview date and start time
- Previous result codes for the case, such as an pre-close out refusal
- GPS coordinates

- Coding items and response schemes are configured for each coding function in CARICode.
- CARICode usernames, passwords, and access rights are defined and implemented for this project.
- Case data and sound files are loaded from the data collection environment into CARICode and tested, and coding begins.
- Coded data are extracted into various reports, including those designed to monitor and manage the coding effort, and more analytical reports geared toward data quality assessment and outcomes.

**VII. Conclusion**

Advances in CARI capabilities have expanded the utility of the recording data, making it easier to create the recordings and to subsequently process the recordings for many different purposes. CARI data and the improved coding capabilities significantly enhance the usefulness of the recorded data in terms of improving survey data quality, interviewer performance, and even reducing total data collection costs with the reduced need for direct field observations and validation reinterviews.