Implementation of CARI Technology to Improve Data Quality

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Introduction

- Prevalent use of surveys has adversely affected response rates and potential respondents’ (Rs) impressions about surveys.

- The widespread adoption of technology, especially the use of computers for surveys, pushes many aspects of survey data collection in positive directions.

- Digital audio recording is one promising component with great potential for improving survey quality and reducing the burden on fatigued respondents.
CARI is a technology that allows the computer to act as a sound recorder while the interviewer (IWR) administers a computerized survey questionnaire.

CARI records the verbal exchange between IWR and R.

The recording can be switched on or off by the computer for all interviews, for portions of interviews, or for randomly selected interviews.

This paper reviews how CARI technology can be used for many aspects of surveys in order to improve data quality.
The Cycle of CARI

Figure 1. Cycle of survey data collection
The Cycle of CARI: Step 0. Startup Activities

- Several startup activities must take place prior to the beginning of data collection including:
  - system developers create or configure infrastructure to support data collection;
  - survey specialists design and pre-test the questionnaire;
  - and statisticians select the sample.

- It should be noted that the decision on whether to use CARI technology will affect these startup activities.
The Cycle of CARI: Step 0. Startup Activities – Cont’d

Examples:

1) Adequate time should be allocated at the questionnaire development stage because CARI implementation requires additional time for developing and testing the programmed questionnaire (instrument).

2) When CARI is to be implemented, the configuration files should be modified so that it can activate and de-activate the microphone at specific items or times.

3) The instrument may also initiate and terminate calendar entries, global positioning system data capture, video recordings, or screenshots.
The Cycle of CARI: Step 1. Interviewing and Transfer

Figure 2. Example of a simple questionnaire item programmed with Blaise
The Cycle of CARI:
Step 1. Interviewing and Transfer – Cont’d

Figure 3.
Data flow and systems that support CARI data collection, storage, and review
The Cycle of CARI:
Step 2. Data Storage

- Data storage requirements depend on characteristics of the survey:
  - instrumentation software,
  - system(s) employed for review,
  - size of the survey’s respondent pool, and
  - size of the response dataset.

- The chosen method typically meshes with the data transfer system for receipt and storage on a flow basis, allowing quick turnaround of review and feedback.
The Cycle of CARI:  
Step 3. Quality & Operational Review

- Data stored at the central site are made available to quality review staff, supervisors, and others through some type of CARI review system, which may be
  - as simple as audio playback software with a mechanism for keeping notes.
  - as complex as a large commercial relational database with a role-based web application for playback, coding, and tracking of the cases and their audio segments, along with functionality for management of the review operation itself, as is found at the US Census Bureau.
  - It may fall in between, as does the one at RTI International, with a single coding interface and versatile scoring.
The Cycle of CARI:
Step 3. Quality & Operational Review – Cont’d

- Review may include all/a subset of response files, audio recordings, screen capture, video recording, GPS coordinates, calendar entries, document scans, assessment scores, or any other information collected during the interview.

- Review results pass to supervisors who recognize accomplishments or address concerns raised from review of recordings combined with other information.
To categorize the voice characteristics of the answerer, you can choose from the following options:

- Authenticity
- Reading
- Interview administration
- Probing
- Conduct
- Other

For example, my gender is

(INTERVIEWER: SELECT THE APPROPRIATE)

- GENDER_INTERVIEWER
- GENDER_CLIENT
- AGE
- AGE_CLIENT
- PITCH_INTERVIEWER
- PITCH_CLIENT
- BIRTH_COUNTRY
- BIRTH_COUNTRY_INT
- LANGUAGE
- LOUDNESS
- SPEED

Codes: S4 L3 P4
Notes:

Add Coding Entry

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CARI to Improve Data Quality

- Proven capabilities including:
  - monitoring field interview staff,
  - confirming interview authenticity & detecting curb-stoning,
  - diagnosing questionnaire problems,
  - offering an intimate view of in-person interviews & performance information
  - improving survey data quality by replacing/supplementing field verbatim transcription of responses.

- CARI might offer a remedy to resolve declining response rate issues through the analysis of conversation between interviewer and respondent.
1. Reducing IWR related survey errors
2. Reducing R related survey errors
3. Reducing other survey errors
Survey Errors Related to Interviewers: Role Dependent Errors

- **Role-independent** refers to cases where respondents’ answers are affected by interviewer presence or their demographic characteristics.
  - i.e. Rs’ answer to the race related questions vary depending on the interviewer race.

- This type of error is known to appear for certain topics of surveys, so deliberate interviewer-respondent match, in terms of demographics or, for example, appropriate interviewers’ attire for the sampled neighborhood, can resolve most of these role-independent interviewer effects.
Survey Errors Related to Interviewers: Role Dependent Errors – Cont’d

- **Role-dependent error** is caused by interviewers who break the rules of the standardized interview.
- This happens regardless of the topic despite researchers’ effort via intensive interviewer training.
  - Novice interviewers may commit this error in ignorance of the basic rules of standardized interviews while veteran interviewers through bad habits matured along their career as a survey interviewer.
- CARI’s unobtrusive characteristics of data recording enable us to access this information while decreasing the costs associated with field observation.
Survey Errors Related to Interviewers: Short-cutting & Data Fabrication

- Confronted by the historically lowest response rates, Interviewers may be tempted to fabricate the interview.
  - Fictitious interview
  - Curb-stoning. i.e., skipping lengthy sections by falsifying the response to gateway questions that lead to a subsequent series of more detailed questions.

- CARI reviewer can confirm validity by noting the behaviors on key questions, listening for two distinct voices, and confirming reasonable response patterns.

- Specific circumstances that are suspicious can be flagged for more intensive review.
Survey Errors Related to Interviewers: Interviewing Performance Monitoring

- A great management and training tool for field managers since each recorded segment., provides direct evidence of performance and data quality.
- Survey managers configure scoring algorithms based on the codes that are defined for the specific survey.
- By using this system, survey managers can easily identify interviewers who need further training and obtain knowledge about the areas needing improvement for each interviewer.
### Staff Workload

Enter search values and click the Filter button.

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- **Current Coder:** -- All --
- **Intv Site:** -- All --
- **Intv Date From:**
- **Intv Mode:** -- All --
- **Intv ID:** -- All --
- **Intv Date To:**
- **Language:** -- All --
- **Control Num:** -- All --
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- **FS:** -- All --

![Filter and Reset buttons]

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1. Reducing IWR related survey errors
2. Reducing R related survey errors
3. Reducing other survey errors
Rs make errors intentionally or unconsciously and the level of errors can be decreased or increased with the presence of interviewers.

The errors initiated from Rs occur along the cognitive process consist of comprehension, information retrieval, formulating an answer, and formatting and editing responses (Bradburn 2004)
# Survey Errors Related to Respondents: Comprehension

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<thead>
<tr>
<th>Cognitive Process</th>
<th>Definition and Examples</th>
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| Comprehension     | The goal for the researcher is for Rs to understand the question in the same way that the researcher does.  
  i.e., *misunderstanding in questions using common terms such as “weekday”, “children,” and “regularly.”* (Belson 1981) |
## Survey Errors Related to Respondents: Information Retrieval

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<td>Information Retrieval</td>
<td>It is process by which the memory storehouse is searched to retrieve a particular item sought. It is facilitated by cues in the question that activate the pathways of association leading to the desired information. i.e., Telescoping</td>
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<td>Formulating an Answer</td>
<td>Rs must formulate an answer to the question. If the questions are about behavior that is not well remembered or about attitudes that have not been well discussed, Rs construct answers on the spot using all the information from available sources in working memory.</td>
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<td><em>i.e. Assimilation, Contrast</em></td>
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### Cognitive process

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<td>Formatting and Editing Responses</td>
<td>Rs must find their answers among the response options that IWR offers. Even after a response option has been chosen in Rs’ mind, they may still edit the response out of their concerns with self-presentation.</td>
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i.e., Primacy, Recency, Social Desirability,
How CARI Detect Respondent Related Errors

- The audio recordings help researchers detect many of the respondent originating errors and shed light on how to revise questionnaires to reduce such errors.
- When a situation conducive to error is suspected, the questionnaire may be modified or interviewers can be trained to provide better guidance.
How CARI Detect Respondent Related Errors – Cont’d

- **Examples:**
  - Identify problematic terms by detecting accidental errors that occur when R comprehends the question incorrectly.
  - Identify problematic words as IWR may stumble or R may ask to read or hear the question again.
  - Identify too lengthy question text or list of response options as IWR may paraphrase, or R may volunteer to answer the question before listening to all response options.
  - Identify problematic wording by watching Rs’ uncomfortable reactions when a sensitive question is asked or perceiving the nuances associated with the selection of certain response options.
1. Reducing IWR related survey errors
2. Reducing R related survey errors
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Reducing Other Survey Error

- IWRs’ code answers on the spot using the pre-existing categories; however, it can be improved (i.e. I/O coding)
- Audio-recordings resolve this issue by bringing the appropriate context associated with respondent open-ended answers to the appropriate coding experts.
- Correction of errors in the data entry step for a discrepancy between the entered response and the respondent’s reporting of the same survey question.
Conclusion

- The use of CARI digital audio recording technology puts greater knowledge and power into the hands of data collection managers.
- Though implementation may vary, each operation can benefit from the cycle of data collection, review, and feedback.
- The potential of CARI technology in survey research remains very promising and worthy of further investigation.
More Information

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