

A MICROCOMPUTER BASED COMPUTER
ASSISTED INTERVIEWING SYSTEM

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Introduction

Computer Assisted Telephone Interviewing (CATI) adds a third party, the computer, to the traditional interviewer-respondent relationship in survey research. When using CATI, the interviewer reads questions as they appear on a screen, similar to a television screen, and records the answers by using a keyboard connected to a computer. The text which appears on the screen is put there by the computer.

The advantages of a CATI system over a paper interview schedule with answers recorded by pencil or pen are substantial.

The disadvantages of CATI appear to be related to the practical problems of producing a functional system. That is, the theory of CATI surveying seems sound; the application of available computer hardware (the machines themselves), and the development of software (programs which tell the machines what to do) can involve considerable expenditures in time and money--expenditures which do not always result in efficient operations.

Three approaches to Computer Assisted Telephone Interviewing are now used. One system employs a central main frame computer which feeds information to and from "terminals" located at interviewer stations. All the information each interviewer needs to conduct an interview is sent from the central computer; all the information each interviewer collects from the respondent is sent back to the central computer.

A second type of CATI system uses only microcomputers, one for each interviewer. All information about the interview originates from, and is returned to, the microcomputer. Data from completed interviews are then aggregated (or batched) in a separate operation.

The third type of CATI system employs an interactive procedure involving a central computer and microcomputers at each individual interviewer station. It is the third approach to CATI which is described in this report.

Hardware

The Wisconsin Survey Research Laboratory uses a CATI system which consists of eight microcomputers linked to a digital equipment VAX 11/70 using a concentrator, appropriate modems, and a single voice grade telephone line. The concentrator operates at 1200 baud.

The VAX controls the administration of the sample. Control of the actual interview is through microcomputers at the individual interviewer stations.

A comparatively inexpensive personal computer--CompuColor II--is the central component of the CATI system. This model has a cathode ray tube (CRT) equivalent to the CRT or TV tube on a standard 13-inch television set.

The microcomputer CompuColor II has 32 K of user random access memory and up to 32 K of Read Only Memory with a 5½ inch floppy disk on the side. The floppy disk, which provides 51 K of additional storage, stores most of the interview

schedule or questionnaire. This machine has an excellent detached keyboard with color entry keys and a 10-key number pad. The keyboard, the CompuColor II's color capability, and its large screen containing up to 32 lines of 64 characters (2048 total characters) were important considerations leading to its selection.

The unique feature of a microcomputer based CATI system is that a substantial amount of computing power and memory is located at the interviewing station. The interviewing station is called "intelligent." The implication of this property for survey operations has not yet been fully explored.

We have used the intelligence of the microcomputer interviewing station to: 1) simplify the sign on or start up procedures for the interviewing station with the larger computer; 2) provide temporary back up storage for an interview in the event that the connection to the main frame computer fails or the central computer itself malfunctions; and 3) of greatest importance, store the interview schedule text and administration logic, i.e., skip patterns, etc.

Using the microcomputer as an interview schedule source relieves the central, or host, computer of much of the processing load normally associated with CATI system. This is significant because a major share of any CATI system's processing is allocated to the transfer of text from the computer to the screen. Normally this requires hi-speed transmission lines. High speed transmission lines are not required between a micro-interviewing station and the central computer: normal 300 baud transmission, i.e., 30 characters per second lines are adequate. The WSRL system can use 30 characters per second lines or anything faster. An important advantage of using the microcomputer as the interviewing station instead of a "dumb" terminal is that the load on the central computer for text transmission is reduced by a factor on the order of 1/30.

Currently, the central computer is a VAX 11/70. This computer is shared with many other users. No special priorities are given to the CATI system, and none have been needed. No response time difficulties have been experienced.

All CATI operations require a virtually immediate response from the computer when the interviewer calls for the next question. The interview is endangered if the interviewer and the respondent are both waiting to see what will be asked next. To achieve this, CATI operations using dumb terminals often require a dedicated, or almost dedicated, computer.

Software

The current software package for the Wisconsin Survey Research Laboratory's CATI system has four basic components:

(1) The sample administration package controls the flow of sampled telephone numbers to the interviewer stations. The original sample (be it a Random Digit Dialing sample or any other kind of

design implemented by telephone) is stored in the central computer and called to an individual station by the interviewer using the microcomputer.

The sample administration program allows the interviewer to record a full description--with text, if necessary--of the result of every contact at every designated sample point. The interviewer making the next contact can then recover the entire chronological history of the efforts to gain a completed interview at this point.

It is mostly on the central machine but has links to the Questionnaire Driver.

(2) The second component of WSRL's CATI software package allows the interview schedule or questionnaire and associated skip logic to be entered in the microcomputer by personnel other than computer programmers. This program permits the direct entry of the questions which form the interview schedule. The microcomputer then converts the set of questions into a form for rapid presentation on the screen during the interview process. Both the entry and/or the converted source can be modified directly at a later stage in the survey, if necessary.

The microcomputer operates on a stand-alone basis when the interview schedule or questionnaire is entered (i.e., it is not connected to another computer). Thus, entry of the schedule can be done anywhere at the operator's convenience. The time required to prepare an interview schedule for the microcomputer is only slightly longer than that required to type the schedule for standard paper duplication.

The set of questions is stored on a Compu-color II 5½ inch floppy disk. WSRL's experience has shown that one side of Compu-color's small disks can easily hold a 35-minute interview.

(3) The third software component--a "driver" program--actually administers the interview. It presents the interview schedule text on the screen; accepts and stores the responses from the keyboard; enables the immediate transmission of these responses to the central computer for permanent storage; and, retains most of the text of the respondent's answers on a temporary basis in the event that some other part of the system should fail.

The driver package permits immediate exit from the main body of the interview at any time and re-entry to the interview at any selected question. Interviewers may, at their option, edit responses to open-end questions after an interview is completed.

At this time the system does not provide an on-line monitoring capability.

Provision for the entry of special question formatting is placed in the driver program.

Special "hooks" are provided at this point in WSRL's software which permits the addition of these kinds of question and answer sequences to the interview schedule. Programming for these hooks, however, require a knowledge of BASIC--a simple but powerful programming language which is comparatively easy to learn. (Currently, BASIC is the standard higher level language for microcomputers.)

(4) A processing package--the fourth CATI soft-

ware component--is used to code the verbatim responses to open-end questions, to code closed-end questions which have been commented on by the interviewer, etc.

The CATI processing program is also used to construct a printed codebook with percentaged and absolute N frequency distributions of the answers to every question asked during the interview. The codebook is used as documentation for a clean rectangular data file. Programs for this package are currently written in FORTRAN and BASIC. The microcomputer programs are all in BASIC.

Interviewer Consideration

Computer Assisted Telephone Interviewing in no way diminishes the significance of the interviewer as the keystone of the entire survey research process. Rather when properly implemented, CATI allows the interviewer to devote more effort to the difficult task of obtaining accurate responses, and correspondingly less effort to the often frustrating task of interpreting the interview schedule.

One feature of the Wisconsin Survey Research Laboratory's CATI system is the use of color in communicating the text and intent of the interview schedule to the interviewer. Eight available colors can themselves be used as signals to the interviewer, in combination with the size of the letters shown on the CRT (large and small letters are possible).

We believe that the use of color reduces the boredom associated with long interviewing shifts; that the large letters and detached keyboard allows the interviewers a wider than normal range of position and movement during their work periods. This in turn should help to reduce interviewer fatigue during the work shift.

In our experience the main concern interviewers have when first introduced to CATI is a fear of damaging (or "hurting") the computer. When they discover that there is literally no way they can cause any real damage, and that they themselves have the capacity to correct any operational mistakes of theirs--including the mistakes of simply entering the wrong response to a check-off question--they quickly accept CATI for what it is meant to be: a system which will assist them in producing a high quality interview.

Some Special Advantages of An Interactive Microcomputer-Central Computer CATI System

- (1) The time between an interviewer entering a respondent's answer to a question and the appearance on the CRT of the next appropriate question is minimal with the CATI microcomputer system described here. Currently, response time is almost never longer than two seconds, and almost always is significantly less than one second. Moreover, this time is not subject to degradation as more interviewing stations become operable in the system. Response time on CATI systems using only a single main frame computer can have a severe negative effect on the flow of an interview due to system overload. A single multi-interviewing CATI system can experience response time de-

lays of unacceptable length at any point during an interview. Main frame system over-load of this type is almost impossible in a microsystem.

- (2) With a microcomputer CATI system, remote interviewing stations are connected to a host computer by inexpensive telephone lines. (As indicated at the start of this paper, interviewing can be done with stand-alone machines which are completely independent of a host computer.)
- (3) Microcomputer CATI does not require dedicated central host computers.
- (4) Failure of the computer in a main frame system disables all interviewer terminals at once. In the micro-CATI system, the failure of one microcomputer does not affect the operation of the remaining terminals, and if the central or host computer fails, interviews can still be completed by the microcomputers without interruption.
- (5) The development of a modest microcomputer CATI system will involve a considerably smaller capital expenditure than a main frame CATI system of comparable size. WSRL's eight stations cost \$21,000 (about \$2,600 per station)

plus \$4,500 for hardware permitting standard telephone connections with a central host computer. The total hardware costs specifically for CATI, therefore, were less than \$30,000. Time-sharing costs for the use of a host computer will vary greatly between organizations. WSRL's system incurs a daily central computer charge for the operation of one microcomputer terminal of: 12 hours for connect time (about \$3.00); and three minutes for machine computing time (about \$2.00). However, if a microcomputer with hard disk is used as the central or controlling computer, then telephone hook-up hardware, and time sharing cost is replaced by a \$10,000 to \$15,000 one time charge bringing the total cost to somewhere between \$40,000 and \$45,000.

ACKNOWLEDGEMENTS

Finally, the authors wish to express their thanks to Robert Groves at the University of Michigan, to Owen Thornberry of the National Center for Health Statistics for their help and support, and to the National Center for Health Statistics who provided the opportunity for us to see and learn about other CATI systems.