EMBEDDED CAPI TRAINING

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THE CLASIC SOFTWARE CONCEPT

Size and Complexity in NCHS Health Surveys

There are several software systems which have been successfully used for Computer-Assisted Personal Interviewing (CAPI). Most were originally designed for Computer-Assisted Telephone Interviewing (CATI). The software architectures of these systems were originally designed for use on mainframes or minicomputers, rather than microcomputers. Because CAPI surveys have to be carried into the field, they have to run on microcomputers, preferably laptop size or smaller.

With some adaptation and within some limits, CATI systems can be downloaded for use on microcomputers. The better systems are able to handle fairly large surveys with multiple rosters and complex edit rules even on these small machines. All CATI-based systems, however, have software architectures which limit them on small computers.

Software systems designed expressly for CAPI typically break up the survey into a series of tasks, each of which can run well on a small machine. Where CAPI technology can be applied, it, like other forms of Computer-Assisted Survey Information Collection (CASIC), promises improvements in quality, timeliness, and flexibility over paper and pencil methods.[1] Anticipating such benefits, NCHS began investigations in 1987 to automate its most complex personal interview surveys.[2] The results were highly encouraging, but fell short of the full capability required.

As we later learned, the following requirements were exceptionally difficult to fulfill using conventional CATI software architectures:

Ability to adjust interview size dynamically during the interview itself. National Health Interview Survey (NHIS) interviews run from 1½ to 3½ hours with one to about thirty persons for whom extensive health data must be collected.

Ability to let the interviewer control the order in which the interview is conducted, based on each respondent's availability.

Ability for the interviewer to track what survey parts are: not required, required, or completed for each person, dynamically throughout the interview.

Ability to back up, change or add responses, and proceed forward on the appropriate paths dictated by the new response set - without losing previous still-valid answers.

Ability to re-start an interrupted interview at the point of interrupt, even if a child or pet accidently dislodges the computer power plug.

A Design for No Limits

In 1990, we decided the best, if not the only, way to meet these requirements was to develop survey software from scratch. Accordingly, we prepared full software requirements specifications and the preliminary design.[3] We adapted the CASIC acronym to focus on small computers, hence, the Computer/Laptop Assisted Survey Information Collection (CLASIC) system.

The new CLASIC software is insensitive both to interview size and complexity. It is (largely) generic in the sense that one set of computer programs can run almost any NCHS health interview survey. All survey-specific text AND LOGIC are placed in "survey definition" files. Survey responses are initially held in CLASIC working files. After the interview, they are translate to a generic format for later processing and analysis by any computer and any statistical software.

NCHS does not collect its own data; rather, the Bureau of the Census and various contract survey organizations do the actual field work. That means CLASIC does not have to solve the case management problem, but it does have to interface with any existing or future case management system.

Interesting training issues arise from the design objectives. If you give field interviewers a computer system designed for unlimited size and complexity, how can you expect them to learn to use it? If the individual surveys vary considerably in size and complexity, how many survey training programs does it take to teach the use of one generic survey software system?

INSTRUCTIONAL SYSTEM DESIGN (ISD) FOR CLASIC

The Process

During and after World War II, the increasing complexity of military, civilian aerospace, and some industrial operations led to a focus on just this sort of training problem. How can human beings be trained to deal intelligently and competently with extremely complex systems? According to Briggs,[4] "instructional systems design" is a special application of "general systems theory." It typically includes the steps: Analysis, Design, Development, Implementation, and Evaluation. It is not always linear, but iterates among these steps as suited to the problem at hand.

It is a process which focuses on the objectives (for example, task performance needed for safe and efficient operation of an airliner or refinery) and the initial conditions (what knowledge and skills operators bring to their tasks prior to training.) It then seeks to use available information about the capabilities and limitations of various training methods and devices to fill the gaps in an effective and efficient manner.

ISD professionals are specialists with expert knowledge of training: psychology, technology, and management/logistics. They are often called "instructional technologists." The federal Office of Personnel Management, Training Division, maintains contracts with several firms specializing in this area as a service to all federal agencies. They assigned development of NCHS' CLASIC training subsystem (CLASIC-TS) to Universal Systems, Inc. (USI) At our request, it is a "computer-based instructional" (CBI) system.

Front End Analysis (FEA)

The FEA is that analysis which must be completed in order to allow a suitable initial design. It covers the trainees' characteristics, the job performance requirements, and the expected learning environment in order to define performance-based learning objectives.

Using data from the Bureau of the Census and NCHS, as well as personal observation of NHIS interviewers at work, USI reached the following conclusions about the trainees:

NHIS interviewers are mostly middle-aged females with at least a high school education, whose primary skills include social and conversational adeptness combined with planning and organization ability. They have little or no experience with typewriter keyboards, computers, or computer-based training, but are experienced with self-study materials. A typical NHIS interviewer has at least a sixth to eighth grade reading level, is physically vigorous and willing to travel, is fairly isolated from interaction with other interviewers, and typically has more than two years experience with the NHIS. S/he prefers self-paced training with immediate feedback, but feels a need for some instructor-led training. S/he wants CLASIC training to give her/him confidence and speed. Of course, individuals do deviate from the typical profile. Some are highly computer literate; some are novice interviewers.

The job requirements are partially the same, partly different for CAPI versus paper- and-pencil interviewing (PAPI). In either case, s/he must ask the questions in a precise manner and sequence so as not to influence the answers. In CAPI, the interviewer does not have problems of resolving complex question wording variations on

the fly; the computer does most of that. S/he does not have to analyze very complex skip patterns. The interviewer does have to operate a typewriter-type keyboard. In less complex interviews, s/he need only follow a repetitive linear pattern of, say 10 to 20 different keyboard functions, from start to finish. In the NHIS, s/he must understand all of the normal functions and a variety of situations which call for her/him to interrupt the normal flow and take manual control of some interview sequencing. S/he must also recognize several "special situations" and recall and apply the correct special procedure for dealing with each of them. Finally, s/he must understand the system functionality well enough to solve any unanticipated "special situation."

The learning environment is based entirely on self-guided and self-paced instruction. The trainee will have access to an instructor at some point between first encountering the training material and first using it in actual interviews. It is most likely, however, that the trainee will be asked to master as much of the material as possible in isolation and have access to instructor-led training mainly to answer unresolved questions.

Development and Implementation

Each screen of the CBI course is first laid out on paper as a "storyboard." The control keys governing the training are also defined. (The computer "function keys" are not available for this purpose as they are utilized by the survey software itself.)

The storyboards and drafts of the User Guide must be reviewed and approved before they are finalized. As the computer-based training course evolves into a working prototype (and ultimately a final training system), the training material is carefully tested both by USI and by the government.

Finally, "job aids" are prepared to serve as convenient bridges between the training/ manual and the survey software. Specifically, these include a function key template for the top of the computer keyboard and a single page "Quick Reference Guide" which may be kept handy during the interview itself. (These materials supplement "Help" - online documentation - within the survey software itself.)

Embedded Generic Training

The CLASIC-TS software is a separate executable program, designed to be "embedded" (built into)[5] the actual interview program. This will allow a single CBI training program to support any number of specific surveys with minimal adaptation. This concept presupposes a focus on the structure of each individual interview and on the mechanics of CLASIC software operation.

It is entirely feasible to expand the training to deal with the concepts and

definitions of each individual survey. That will, however, require the survey designers to create specific training materials above and beyond what they would normally provide for on-screen instructions and context-sensitive help. The CLASIC-TS system is designed to be able to provide training in the interview mechanics at least, with minimal demands on the survey designers.

The User Guide contains an orientation to the training system (the CBI course plus the Guide). It also contains a glossary of computer terms and a cross index referencing specific topics in both the Guide and the CBI course. The NHIS CBI course covers: (1) Elementary screen reading and data entry, (2) Normal question flow and simple interviews, and (3) Manual navigation, special edits, and special situations. For simpler surveys than the NHIS, the last part might be unnecessary. Each lesson contains a tutorial, a practice exercise, and a quick review.

Each training screen is based on a screen in the CLASIC survey software itself. A "header line" identifies the current survey topic and the current state of the computer. (For example, "ASK" means the computer is waiting for the interviewer to process a question; "WAIT" means the computer is processing data; "ERROR" requires resolving a problem before proceeding.)

The training screens add specific data about the training itself in the header line. The training material is contained in a "TRAINING WINDOW" which overlays about one-third of the actual survey software screen - either at the top or the bottom. In cases where the training window necessarily obscures important material in the underlying screen, the trainee can reposition the training window (to the top or bottom) with a toggle command. In cases where the training information or exercises take up too much space, material can be scrolled within the training window.

The system allows the interviewers to select the topics they most want to study. If they are not sure whether they need the actual tutorial on a topic, they can page through the "quick review" to get a feel for the key points covered. Either before or after taking a lesson tutorial, they can take a quiz on the material covered - usually about 10 multiple choice questions.

Finally, for the NHIS, the interviewers also have available scripted practice interviews prepared by the Bureau of the Census field training branch for hands-on experience with the actual survey software - apart from the embedded training. The scripted interviews provide "embedded practice."

Test and Revision

Like most major surveys, the NHIS is pretested on a small sample of respondents first.

Any problems with question wording, question order, or other aspects of survey design can then be fixed before real data collection begins. The pretest for the 1993 NHIS was held in September, 1992. That pretest was a de facto field test of both the interviewing software and the training software. Lessons learned in preparing interviewers for the pretest will be applied to revise and improve the instruction prior to conducting training for fielding the final survey.

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