

ORGANIZATIONAL EFFECTS OF CATI IN SMALL TO MEDIUM SURVEY CENTERS

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In: M. Couper, R. Baker, J. Bethlehem, C. Clark, J. Martin, W. Nicholls, & J. O'Reilly. (Eds.)
Computer Assisted Survey Information Collection. New York: Wiley., 1998

X.1 INTRODUCTION

This chapter describes the experiences of three small to medium sized survey organizations that have been conducting computer assisted telephone interview (CATI) surveys for the past decade. Since these are our organizations, we are very familiar with them and with the way that CATI has affected organizational aspects. The first organization developed its own in-house CATI software. The second organization uses the CASES software. And, the third uses Ci3. This chapter's focus on CATI technology indicates our belief that this is the dominant CASIC technique used by small to medium survey organizations, and that CATI is the motivating force behind many of the other changes in survey organizations (Brent and Anderson, 1990). Some of our discussion will be pertinent to computer assisted personal interviewing (CAPI) as well, however, this is a capability that is only rarely used by small to medium sized survey organizations (see the chapters by Groves & Tortora and Collins & Sykes for more on this point). We hope that a description of our experiences with CATI and the organizational issues we have had to confront will be useful to others engaged in similar work.

An organization is made up of people, resources, work processes, and an organizational structure. When we discuss the organizational impacts of CATI we are referring to the impacts that CATI has on all of these. The general approach taken in the paper is to outline the major organizational changes or issues that seem to arise when organizations undertake CATI surveys. The organizational issues identified are derived from a review of the CASIC literature, from the experiences of our own survey centers, and from the results of a survey of CATI organizations. The first part of the paper summarizes the most prevalent issues identified in the CASIC literature. The next section of the paper describes and compares the implementation of CATI by each of the three survey organizations, and the organizational changes that resulted. The final section of the paper summarizes the major organizational issues associated with the use of CATI and describes the results of an informal survey of CATI organizations.

X.2 LITERATURE REVIEW

While there has been relatively little research on organizational effects of CASIC technology, a number of organizational issues associated with CATI are mentioned in the literature on telephone surveys and CATI technology. We identified five major categories of organizational issues dealt with in the CASIC literature: (1) managing hardware and software; (2) human resource/staffing changes; (3) changes in designing and testing questionnaires; (4) changes in sample administration; (5) and issues in managing survey data.

Discussions about the kinds of hardware and software considerations that organizations must deal with in computer assisted interviewing are common (Carpenter, 1988; Curry, 1987; Frey, 1989; Henne, 1993; Saris, 1991). Articles generally included considerations of how to select the right hardware and software, deciding how to maintain systems and how to pay for

them, dealing with computer and software upgrades, the features of different CATI systems, how to evaluate and select appropriate software, and how to estimate the costs of establishing a small to medium sized CATI facility.

A number of authors have recognized the human resource changes involved with implementing or using CATI (Barry and O'Rourke, 1988; Curry, 1987; Martin and Manners, 1995; Weeks, 1992). Not only are new, more qualified, personnel required to manage CATI technology, but the recruitment and training of interviewing staff is affected as well. In a small survey of telephone centers conducted by Barry and O'Rourke (1988) the principal changes reported by survey respondents due to implementing CATI included: recruitment of telephone center staff; need for retraining of supervisory staff; selection and training of interviewers; and changes in salary and career patterns of telephone center staff. A review of CASIC methods (Weeks, 1992) concluded that CATI reduces interviewer supervisor time, but requires more interviewer training. Shanks and Tortora (1985) find that many survey organizations have changed their division of labor as a result of CATI and they expect this trend to continue as the technology for integration of separate tasks improves. Among organizations responding to a survey in 1979, and again in 1987 (Spaeth) the most frequent problems mentioned in converting to CATI dealt with staff and interviewer acceptance and retraining needs. Groves (1983) has noted that there is an increased need for coordination of work with CATI because the hardware and software now become the central work distribution system for the organization. He also suggests that administration of CATI may be less problematic in smaller organizations because employees can fulfill multiple roles, whereas in larger organizations, entire units are often involved in adapting to new systems and procedures.

That CATI requires more up-front time in designing and pretesting questionnaires, has been mentioned frequently in the literature (Curry, 1987; Driessen, et al., 1987; House, 1985; House and Nicholls, 1988; Saris, 1991). Designing a CATI questionnaire is a complex process, involving more precise specification of valid response values and skip logic than usually occurs with paper-and-pencil instruments. Most authors conclude that the net effect of this increased time spent on questionnaire authoring is to decrease back-end data management time (Weeks, 1992). Changes to sample administration and call-scheduling processes as a result of CATI are also mentioned frequently in the literature (Baker and Lefes, 1988; Klehn, 1993; Palit & Sharp, 1983; Weeks, 1988). CATI systems have the capability of providing substantial data about sample disposition and the status of survey samples, thereby enabling quicker control over sample allocations. Managing CATI survey data has been discussed both in terms of the types of data produced by CATI and its effects on survey operations (Carpenter, 1988; Bethlehem, 1997). Dealing with open-ended text that is in machine readable form rather than paper (Groves, 1983) is one issue that has been recognized but rarely addressed.

A variety of data management issues occur with CATI, involving primarily the creation, editing, and finalization of survey data (Baker and Lefes, 1988); the importance of managing system failures and backup of data files (Curry, 1987); and the impacts of peak staffing problems; staffing for research and development; systems design, programming, and maintenance; training; and emergency procedures (Federal Committee on Statistical Methodology, 1990). One question is to what extent manual procedures need to accompany CATI procedures, which one author (Shangraw, 1986) has suggested will be necessary because of hardware or software failures.

The relevance of these five issues is confirmed in the experiences with CATI that our own survey centers have had, and in the data obtained in an informal survey of CATI sites that we conducted. We have added three additional organizational issues, which we believe are relevant to current CATI organizations: (6) changes due to networks; (7) reporting survey results; and (8) administrative information.

X.3 EXPERIENCES WITH USING CATI IN THREE SURVEY CENTERS

This section presents a brief summary of the major organizational issues faced by each of three small to medium size survey organizations in using CATI and conducting CATI surveys. Two of the three centers initially conducted telephone interviews using paper and pencil methods, and then later made the transition to CATI. The other center was computer-based from its inception. The three organizations have different degrees of experience with CATI technology, and thus they represent a broad range of CATI experiences. The Social and Economic Sciences Research Center (SESRC) at Washington State University uses CATI at its most basic level, having developed and used its own in-house CATI system for the past sixteen years. The interviewing stations in this Center consist of standalone computers that are not networked. This organization is currently making a transition to a networked computing environment. The Social Science Research Center (SSRC) at Boise State University recently made the transition from standalone computers to a networked CATI system, and uses Ci3 CATI software. It has also automated its sample administration procedures, and many of its accounting procedures as a result. The Center for Survey Research (CSR) at Indiana University is the most highly computerized of the three. It has a networked CATI system running the CASES software on a Novell network linking a number of other users.

X.3.1 Social and Economic Sciences Research Center, Washington State University

The SESRC conducts an average of forty-five telephone and mail surveys each year and has a professional staff of fifteen to twenty people, depending on the number of active projects. It has had a 14-station telephone survey facility since 1971, and made a decision in 1982 to develop its own in-house CATI system, at a time when there were few commercial systems available for small survey centers. The initial system was developed in the Pascal language for use on Apple microcomputers, but was converted in 1988 to a DOS based system. The SESRC has continued to add interview stations and now has 36 interview stations located in three separate rooms. All stations are equipped with 386, or 486 PC's running DOS, as standalone units that are not networked. Thus, all sample administration, and call record management continues to be accomplished by paper and pencil, and collection of daily survey data files is accomplished by going to individual stations and collecting floppy diskettes. These are then merged into one master data file and uploaded to a mainframe computer for data cleaning and analysis.

CATI software

The SESRC's CATI system is maintained and upgraded by one programmer, who is assisted by other data management staff when feasible. The system is also designed for use in data entry of mail or self-administered questionnaires, as it has a double-entry verification feature. Having an in-house developed CATI system provides great flexibility in being able to make adjustments in the software when a new feature is desired. This seems to happen regularly as new problems are encountered with new survey projects, requiring new capabilities for the CATI system. However, each new version invariably has a bug, and must be thoroughly tested

before it can be used for production interviewing. The CATI system is not currently set up for use on a network, thus making it limited for sample administration and call-record management. The system is primarily used for questionnaire authoring, administration of the questionnaire on the computer screen, and recording of respondent answers into a survey database. For these reasons the SESRC is evaluating new CATI software for use with a new network that would allow it to link all 36 computers in the three separate interviewing rooms.

Key organizational issues

The most important issues that the SESRC confronts with its CATI system include: First, determining whether to purchase or lease new CATI software, or to continue to develop its in-house software, and what kind of system and network to purchase. Second, identifying a source of funds to purchase networking equipment, cables, and CATI software. Third, finding a way to make the transition without disrupting ongoing surveys. Fourth, finding the time and funds to train staff in network software and a new CATI system. Fifth, developing the procedural changes required to convert from a paper call record system to a computerized one.

X.3.2 Social Science Research Center, Boise State University

The SSRC was established in 1991 to provide survey research services to University departments and state agency clients. The SSRC has between four and ten temporary staff, some of whom are part-time and some full-time, depending on the number of active projects. Initially, telephone surveys were conducted by paper and pencil, but with several commercially available CATI systems in existence, a decision was made in 1993 to purchase ten standalone 286 microcomputers, and Ci2 CATI. At the time, the limited capabilities of the computers and the software meant that there was no archive of survey results, no ability to account for survey costs,

and no ability to administer samples. With funding from SSRC reserves and University grants the SSRC upgraded its equipment and CATI software in 1995. The SSRC now has 13 interview stations consisting of 386 and 486 microcomputers networked on a Novell system with a file server, which is also linked to the University-wide network. The network provides the SSRC with the ability to use other software (dBase, Excel, and MS Projects) for survey samples, budgeting, and planning and to have an in-house accounting system that is compatible with the requirements of the Federal Acquisition Regulation (FAR).

CATI software

The SSRC uses Ci3 CATI, and Ci3 screen writer for questionnaire authoring, administration of the interview, and collection of survey responses. In addition the system provides for proactive dialing through a modem, call scheduling, and sample management. Software for statistical analysis and variance estimation is separate from the CATI system (SPSS and SAS), as are programs used to prepare survey reports (Word Perfect and Word Perfect Presentations). The instructions for managing call scheduling are much simpler using the CATI system than they were under the previous paper and pencil method. And, since interviewer turnover is relatively high and few interviewers trained to conduct paper and pencil interviews or trained under earlier versions of the software were still with the center, there was no difficulty in training interviewers on how to use the system. The CATI system permits a number of very useful administrative reports about interviewer productivity and call disposition management. However, changes in reporting and analysis of survey results are minimal, although the CATI system has made it easy to export data files into several different formats for data analysis. While the CATI system has increased the overall efficiency of the SSRC, and the quality of

survey data that is provided to clients, it has also resulted in increased costs of hiring and retaining telephone supervisors.

Key organizational issues

The issues faced by the SSRC in making the conversion to a networked system and to an upgrade in its CATI software were substantial. One was simply the amount of time required to make the transition, with was 13 months from the initiation of planning to the first survey under the new system, and two years before all problems with the system were resolved. A second problem was finding that some hardware was incompatible with the network software. A third problem was the difficulty of having to conduct surveys while the new CATI software was still being installed and debugged. A fourth was the need for new staff with the technological ability to maintain the network and CATI system. The fifth challenge is to find sufficient paying survey projects to fund the cost of maintaining and upgrading the CATI facility.

One of the main changes that occurred as a result of the networked CATI system was in the role of telephone supervisors, who now assume explicit responsibilities for programming and computer maintenance. This required increasing their salaries, and providing training in use of CATI and screen writing software. New telephone supervisors with more advanced computer skills were recruited and hired as needed for funded projects. To compensate for the increased time that supervisors had to spend on programming and managing the computer system, their responsibilities for hiring interviewers were transferred to other staff. With the sample management features of a networked CATI system, telephone supervisors could also spend more time monitoring the progress of a survey rather than dealing with sample management issues.

X.3.3 Center for Survey Research, Indiana University

The CSR at Indiana University was established in 1981 as part of the Institute of Social Research (ISR) which is the research home for the Department of Sociology. The CSR from its inception has nearly all of its survey, training, cost accounting, and management procedures computerized, and shares computing resources including hardware, software, and support staff, with the ISR and Sociology. This arrangement allows all three organizations (CSR, ISR, Sociology) to acquire and support a higher level of technology than any of the three could do alone. The CSR conducts all of its telephone surveys by CATI. The survey facility initially consisted of eight interviewing stations connected by serial cable to a PDP-11 minicomputer running Unix, which also served faculty, staff, and students in ISR and the Department of Sociology.

CATI software

The first CATI system used by CSR was version one of CASES which was used principally for interview administration and sample management. In 1988 the CSR upgraded its CATI system to a Novell network and the then current version of CASES (3.3). There were substantial differences between the earlier and this later version, which required many changes to CSR survey and management procedures as well. The current CATI system consists of CASES 4.1, which runs on a file server microcomputer, running Novell 4.1 as its operating system. There are approximately 200 users on the network, and approximately 150 computers connected to the network; only about one fifth are CSR staff. The LAN has a tape backup system that provides daily backups and weekly archives. Each week, one-full backup tape is stored off-site. All interviewing stations use 486 microcomputers, and the network supports video monitoring of production interviewing. The Center has already decided that in the near future it will change its

operating system once again, in order to take advantage of the improvements that are occurring in microcomputer software and hardware.

Key organizational issues

The main issues confronted by CSR as it has made the transition from earlier systems to later CATI systems include the following: Like the experience of the SSRC, a first challenge was the amount of time required to upgrade to a new CATI system, which averaged about two years. A second issue was that upgrades tended to involve learning a new network system, learning a new CASES upgrade, and learning new computerized survey functions, all at the same time. A third problem was having to put survey operations on hold for ten weeks while the new network and CATI software were being installed and tested. A fourth challenge was realizing that additional support staff would be needed to maintain the network, to track and solve hardware and network problems, manage backups, manage software changes, and set up new computers. A fifth issue is the continuing concern over how to fund maintenance upgrades of the network, computer equipment, and CATI software.

X.4 ORGANIZATIONAL ISSUES IN MANAGING CATI PROCESSES

Our three survey organizations have encountered and dealt with many organizational issues associated with using CATI during the past decade. A number of these issues are very likely also confronted by large survey organizations as well. However, smaller organizations may have an advantage in dealing with these issues because employees are more likely to perform multiple functions (Groves, 1983), and because the administrative process for changing survey procedures may be more flexible (Dillman, 1994). This seems to be true for our organizations, as job descriptions for our employees keep changing, depending on the current

critical needs for providing assistance in programming CATI questionnaires, managing CATI data, dealing with upgrades and maintenance of software and hardware, and testing and debugging CATI questionnaires. We have often found that better results are achieved when interviewing staff are involved in multiple other responsibilities associated with the CATI system. We were interested in knowing whether our experiences with CATI were true of other similar sized survey organizations as well.

X.4.1 Results of a Survey of Small Survey Organizations

To identify some of the organizational issues faced by CATI survey centers we designed an informal survey consisting of a cover letter from the authors, a mail questionnaire with postage paid reply envelope, and a telephone followup contact. We included in the mailing, all survey organizations listed in the 1996-97 AAPOR/WAPOR Blue Book, including those with international addresses. Membership in the American Association for Public Opinion Research (AAPOR) and the World Association for Public Opinion Research (WAPOR) includes survey representatives from academic institutions, commercial organizations, government agencies, and non-profit organizations. Questions for the survey were based on the five issues identified in the literature review, and the three additional issues based on our own experiences with CATI.

The questionnaire was mailed to all 204 organizations listed in the Blue Book, including 148 U.S. and 56 international organizations. After followup telephone calls, we obtained a 64% response rate, including 7 refusals (3%), and 66 nonresponses (33%). Twenty-four organizations (12%) identified themselves as large, and 63 (31%) did not conduct surveys or did not have a CATI capability. This left 44 (21%) who identified themselves as small or medium survey centers with CATI facilities. In the next section we present the results of this survey in the

context of the eight organizational issues already presented. The order in which issues are discussed corresponds somewhat to their significance as revealed in the number of times issues surfaced in the literature review.

X.4.2 Managing Hardware/Software

A fundamental organizational change with CATI is having to spend staff time and organizational funds on computer hardware and software, and on maintaining equipment and software upgrades. In the early days of microcomputers, making decisions about the kind of system to get, whether to purchase or lease a system, and how to maintain it could involve substantial effort and anxiety, because of the rapid pace of technological change. A common recommendation then was that CATI software should be selected first and hardware should be matched to the requirements of the software (Saris, 1991), otherwise incompatibility problems could surface. However, recent advances in standardization of operating systems, hardware configurations, and software, make this issue less important than others.

Cost

The substantial cost of CATI hardware/software is one of the first issues faced by an organization. Initial costs of establishing a CATI facility can be substantial (Frey, 1989). Because of this, our own organizations have adopted an incremental approach to purchasing, starting out often with fewer than ten interview stations, and then adding or upgrading equipment as funds become available. The funds to pay for CATI systems comes from a variety of sources, but the two main sources identified in our survey of organizations are accumulated cash reserves (59%) and fees charged to survey projects (51%). **These sources correspond to the way**

our own centers are funding CATI.

Type of software

A number of different CATI systems are on the market (Carpenter, 1988) and deciding which software to purchase can be a major undertaking for survey staff. For our own survey organizations this decision was based mainly on cost, ease of use, whether the software would work within the existing computer environment, and what features the system had. Once a decision is made about a system, it becomes difficult to change to another CATI system because of the amount of time and resources that is spent in learning a particular CATI system. Our own organizations demonstrate this principle, since all of us have remained with the initial CATI system we either purchased or developed. In our survey, forty-six percent of survey organizations responded that CATI features was the most important factor in selecting their particular CATI software, compared with 18% reporting cost, and 15% ease of use as the most important factor.

Type of Hardware

Deciding on hardware is often a matter of cost and match with existing equipment. The main factor identified by the survey was cost, with 28% of organizations selecting equipment on the basis of this factor. Another 23% reported that the main factor was the match with their organization's existing computer hardware. Only 18% of organizations considered CATI features as the most important reason for selecting the specific equipment.

Maintenance

Maintaining hardware is an ongoing issue because computer equipment has to be set up, installed, made-ready for users, tested, and repaired if

things break down. Some organizations have dedicated staff for these kinds of tasks, others have people in the organization who are identified as the technology experts, but who normally have other job responsibilities. The SESRC for instance has one supervisor, and one data manager, both of whom are also very knowledgeable about computers, and who are therefore called on to assist in solving technological problems. In our survey, 87 percent of organizations reported that they have in-house technical programming staff who maintain their CATI hardware and software. Fifty-six percent of organizations indicated that other in-house survey staff also deal with these issues. A related issue has to do with equipment replacement and how to fund new equipment. Our own organizations charge survey projects a computer use fee, which pays for new or replacement computers each year. About 50% of the respondents to our survey indicated that they charged a similar fee for CATI surveys, which was used to pay for software upgrades and hardware maintenance.

Upgrades

Upgrading and maintaining software for CATI is also an issue for both in-house and purchased or leased CATI systems. Even new programs may have “bugs” that are not encountered until production interviewing has begun. Software upgrades or fixes must then be made to a network or to individual interview stations. All three of our organizations have upgraded our CATI software several times. The SESRC has upgraded its programs at least once a year over the last fifteen years; having a system that was developed in-house made it easier to upgrade frequently. What we have learned through these frequent upgrades is that many problems are created when different

versions of CATI software are operating at the same time. Failing to upgrade all interview stations and computers can lead to further problems later with datasets having data in different formats. This can be a data management nightmare and reinforces the idea that upgrades and fixes should happen between surveys rather than during a survey, if possible.

Upgrades to commercial CATI systems can also occur fairly often. In our survey only 15% of organizations indicated that they have not experienced any upgrades to their CATI software. On the other hand, over 38% reported having had more than two upgrades to their systems.

An additional advantage of microcomputers is that with the increasing variety of software that is available for them, they become valuable for purposes other than telephone interviewing, when production interviewing is not in progress. Most organizations use their computers for other CASIC applications, including computer assisted data entry (CADE), computer assisted self-administered questionnaires (CASAQ), computer assisted instruction (CAI), word processing, and data management/analysis. Of the organizations responding to the survey, 85% use their CATI system for other survey related purposes. About 25% indicated using CATI computers for instructional purposes, 25% reported using it for self-administered questionnaires, and 50% reported using it for data management and statistical analysis. The dominant secondary use of CATI systems was for data entry purposes, reported by approximately 75% of respondents. Because of the many mail surveys undertaken by the SESRC, its CATI system was specifically programmed for double entry verification of self-administered questionnaires. A side benefit of using a CATI system for data

entry work, is that it can also be a good way to train telephone interviewers on the basics of interacting with a CATI system, which is what frequently happens at the SESRC.

X.4.2 Human Resource Changes

Managing computer equipment, knowing how to maintain a network, dealing with software problems, and knowing how to install and repair computers become major administrative issues for organizations with CATI systems (see the chapter by Clark, Martin, & Bates for the large organization view of this issue). A variety of ways have evolved to deal with these kinds of administrative issues, with the more technologically oriented centers hiring dedicated computer experts, and the less computerized environments emphasizing training of existing staff. Among our own organizations, the CSR is the most computerized, and it hires dedicated programmers to maintain its CATI system. In comparison, the SESRC trains existing staff to maintain its system. The SSRC also trains its own staff, but has also had to hire more experienced people to manage its CATI system. Our survey indicated that 87% of survey centers rely on their own in-house technical programming staff for maintenance of CATI software and hardware, and 57% also use other survey staff for this purpose. Twenty-eight percent report contracting for these services, and 36% indicate that CATI vendors provide maintenance services.

Interviewers

Interviewing skills are somewhat more demanding with CATI. The basic skills required of interviewers include how to log onto the CATI system, how to interact with the computer through a keyboard and/or mouse, and sufficient typing ability to enter respondent comments and other text into a

computer. All of these skills are trainable, although it is generally easier to find people who already have typing skills than to train people in this skill. Some organizations recruit and hire only interviewers with computer skills. This is not too difficult in University environments where students have become accustomed to working with computers. Interviewers are on the whole positive about using computers to conduct interviews (Couper & Burt, 1994), and we have encountered no reports of negative experiences, except for initial fears of dealing with computers. Our own observations are that once they are taught how to use the computer, and overcome their initial fear that they will “break” something, interviewers prefer CATI to paper and pencil surveys. Two-thirds of the respondents to our survey reported that the recruitment and training of telephone interviewers changed when CATI surveys were started. Twenty-six percent of centers now require their interviewers to have typing skills when they hire them. Another 56% say this is a desired skill but not required (19% say that typing skills are not needed at all). Some additional time is needed to train interviewers in the use of CATI systems, however, average training time reported in the survey was four hours or less for 56% of centers. Only 15% of organizations reported eight or more hours of CATI training for interviewers.

Computerizing the interviewer training process can have advantages as the CSR has learned. The CSR has a computerized self-paced training program for training new telephone interviewers and data entry clerks, using CASES and Powerpoint software. In the past training was done by a lecturer in a classroom and with close supervision by shift supervisors in

interviewing carrels. Now, they present information on computers, using graphics and color. The trainee controls the pace that she or he moves through each training module. At the end of each module, a CASES instrument is used to test the concepts taught in the module. If the new interviewer does not pass the test, she or he repeats the module. This new training allows more flexibility so that interview carrels are not lost during prime interviewing time, because new interviewers can complete their training at any time of the day. This new training also significantly reduces training costs because there is less need for management staff to be involved.

Programmers

Programming responsibilities may be distributed among several organization staff, or consolidated in one or more individuals dedicated to CATI functions, depending on the size and complexity of the system. In small to medium sized organizations where the same people often do multiple tasks, the CATI software is usually learned by other non-interview staff. Thirty-six percent of respondents to the survey reported that all or most of their professional staff are trained in how to program CATI questionnaires. Among the three survey organizations represented in this paper, authoring of CATI questionnaires is typically accomplished by project managers, and sometimes by principal investigators. However for longer and more complex questionnaires programming staff are more likely to assume responsibility for the authoring process.

X.4.3 Designing/Testing Questionnaires

CATI allows for complex questionnaire design but then requires substantial testing to be certain that the questionnaire works as intended. There seems to be general agreement that CATI questionnaires require more careful design and planning than conventional questionnaires (Nicholls & Groves, 1986). CATI questionnaires require more careful planning because all aspects of the questionnaire, including display of questions, branching patterns, valid response categories, edit checks, all must be specified before the questionnaire can be properly installed on the computer. Inadequately tested CATI questionnaires can lead to some questions being skipped inappropriately, or to not being asked at all in the main survey. When this happens respondents may need to be recontacted and asked the skipped questions, thereby increasing survey costs and item-nonresponse rates.

To minimize these kinds of errors, a critical part of programming CATI questionnaires at the CSR is maintaining CSR programming standards. All questionnaires are reviewed by the field director or center director to ensure that programming standards are maintained. These standards allow any CSR management person to understand quickly any programming that was done by another staff member. For archival purposes, the standardized programming allows current staff to find programming and questions used in previous studies and reuse them for new surveys if appropriate. Standardization has saved significant amounts of programming and review time. At the SESRC, CATI questionnaires are archived on floppy diskettes contained in the codebooks created for each project so that they can be readily retrieved and used in developing new surveys.

Despite this kind of standardization, pretesting questionnaires continues to be one of the major unsolved problems with CATI surveys. A typical CATI questionnaire has so many aspects

that must be checked for accuracy, including question text, response values, fills, computed values, branching and skip logic, and missing value codes, that it becomes very difficult to identify all errors in advance. A related problem is the potential for new errors, whenever one version of a CATI questionnaire has been changed. Consequently, most survey organizations (62% in the survey) have had to recontact survey respondents, because of errors found in CATI questionnaires. When asked if they had written procedures for testing and debugging CATI questionnaires, only 56% of organizations in the survey reported having them. Some organizations (13%) prefer to pretest a paper and pencil version of the questionnaire, instead of the CATI version, because of difficulties in making modifications or corrections to a CATI questionnaire. Most respondents in our survey (87%) indicated that they usually use the CATI version of the questionnaire when conducting pretests.

Some CATI systems can accept a word processing version of the questionnaire file, or an ASCII file created from the word processor, and use this to create the CATI version of the questionnaire. This capability seems critical because there is always the issue of the correspondence between the paper version of a questionnaire, seen by the client, and the one actually used in CATI interviews. The likelihood of differences between the two versions of the questionnaire are always greater if the same files cannot be used for both the word processing version and the CATI system version. This ability to use word processing files for CATI also makes it more likely that non-programming staff can develop final versions of the questionnaire that are used in the CATI system. Eighty-four percent of our survey respondents indicated that their CATI system can import questionnaires created by word processing software.

X.4.4 Sample Administration

Besides questionnaire control, the biggest benefit of CATI is the ease of case and sample management offered by networked CATI systems. The immediate access to status reports on the progress of the study is critical for effective survey management. The ability to track the progress of a study permits shift supervisors to assign interviewing staff efficiently which is critical when there are multiple studies in the field. Computerized case and sample management reduces the need to process paper forms and questionnaires which can get lost or misplaced. Automated call scheduling is another advantage of CATI systems. The ability to automatically assign cases to interviewers based on standards set by the study manager permits efficient calling.

Most CATI organizations rely on these features to manage their samples, as 82% of our survey respondents said that they regularly use the sample management and call scheduling features of their CATI systems. The remaining 18% of organizations that do not use or do not have these features presumably still rely on paper call records and other ways of managing sample databases.

Organizations that don't have a network must deal separately with sample administration and call-scheduling. The SESRC for instance has two approaches for sample administration. The first is entirely dependent on paper call records which are prepared for every telephone number in the sample. These are released to interviewers who use them to initiate telephone contacts with respondents, and then to record information about call-backs and result codes. Following each interview shift, call records are sorted according to result code and a summary disposition table is prepared. The second approach accomplishes the same thing by computer. This involves creating floppy diskettes containing sample telephone numbers which are released to interviewers. The CATI system reads the information from the floppy diskettes to initiate

interviews. Result codes and interview data are returned to the floppy diskettes, which are then collected by supervisors for merging into a daily master database. Summary statistics and dispositions are then run on the daily databases. Both of these approaches are significantly more labor intensive without the call scheduling advantages of a networked CATI system.

X.4.5 Managing Survey Data

About half of the organizations surveyed (51%) reported that their CATI system creates final survey datasets for them. The remainder reported that final survey datasets are created by a separate data management process. In many respects data management with CATI is not much different than with paper and pencil interviews since at some point data must be in electronic form under both conditions. However, one major difference between paper and CATI interviews is the final form of the “raw” data from the interview. For paper and pencil interviews, this is the completed paper questionnaire. For a CATI interview, this is an electronic file that resides on some magnetic medium such as a floppy diskette, a hard drive, or a tape backup system.

One of the most imperative requirements for any CATI system is having a procedure for backing up survey data to protect against the inadvertent loss of data. Conventional paper and pencil surveys do not usually worry about losing data because the paper questionnaire is physically visible and serves as a backup after the data have been entered into a computer database. Should something happen to damage or lose the computer database, it would always be possible to recover the data by reentering the questionnaire responses into a computer database again. CATI surveys, however, have no paper questionnaires. The data from CATI surveys are generally stored on floppy diskettes or as files on a hard drive or a file

server computer. If a floppy diskette is damaged or if a hard drive "crashes," then survey data may be irretrievably lost. Without an appropriate backup system, lost data could cost an organization not only thousands of dollars of lost interviews, but also its credibility as a survey research facility. Adequate protection from data loss can be had by some very basic procedures such as, copying hard drive files to floppy diskettes, backing up floppy diskettes to tape or to other backup devices. One copy of such backups should be stored "off-site" to protect against theft, vandalism, or fire. In our experience these backup files are rarely needed. The small investment in data storage, however, is worth the peace of mind, and insurance that is provided against data loss. In our survey, 53% of organizations reported that they had lost interview data collected by CATI because of a hardware or software failure. Most organizations (90%) reported having specific procedures for backing up interview data collected by CATI.

X.4.6 Networks

Connecting interviewing computers to a local area network (LAN) is a desirable feature of a CATI system, because networks allow computers to share files and resources, which offers tremendous advantages to survey tasks such as call scheduling, sample administration, and data management. Two of the three survey organizations (SSRC and CSR) represented in this paper have advanced networks for their CATI systems (Novell). The third organization (SESRC) has been using stand alone computers, and is currently installing a network. Most survey organizations are using networked CATI systems. More than 87% of the organizations responding to our survey indicated that their interviewing stations are networked.

For survey organizations, probably the biggest advantage of having a networked system is that this allows sample management and call scheduling to be conducted by the CATI system rather than by manual means. It is not surprising then that 82% of organizations in the survey responded that they use their CATI system's sample management features, and that 80% responded that they use call scheduling features. When accomplished manually, sample management and call scheduling are very labor intensive involving primarily interviewing staff. CATI systems reduce the labor involved, but require more skilled staff to prepare the sample for input to the program. Consolidation of questionnaire data files and creation of survey datasets can also be facilitated by networked systems. However, only 51% of survey respondents indicated that their CATI software creates final survey datasets. For the remainder, these are created by separate data management processes.

The organizational issue posed by networks is that this changes how samples are administered, how data is collected, and who in the organization is responsible for overseeing these tasks. For the SSRC this has meant having to hire more experienced supervisors with skills in working with networked systems. For the CSR, this has meant hiring a dedicated LAN administrator to maintain the system. The CSR, like many organizations, is now totally dependent on a networked interactive computing environment that generates and records substantial amounts of shared information. Without the network, many survey functions would not be possible, or would be drastically altered.

X.4.7 Reporting Survey Results

CATI facilitates the production of preliminary survey datasets, and survey codebooks. Survey clients appreciate this since they often request survey results to assess the progress of a

survey. Some CATI software provides the capability to generate a codebook that describes the variables in the survey database. Approximately 80% of survey respondents indicated that their CATI system creates a codebook of survey variables. However, only 41% of respondents indicated that their CATI software had the capability to conduct basic statistical analyses. Most organizations reported using other software for statistical analyses of survey data.

At the CSR, SESRC, and SSRC, simple standardized procedures have been developed at each center to generate preliminary data as needed from active studies. Frequency distributions are analyzed during the survey field period to check skip patterns, to provide preliminary data to clients, and to provide feedback to staff on survey questions that might be troublesome. At CSR, the CASES program used for CATI interviewing has a companion program, Conversational Survey Analysis (CSA) that is used for reporting survey results. CSA is a set of programs that generates simple statistics and frequency distributions. CSA uses the CASES questionnaire to create a file that contains all the question text, precodes, and some questionnaire flow information. When this file is merged with the raw survey data, using another CSA program, a codebook of frequency distributions is created. This codebook is generally sent to clients along with their survey data. Other CSA programs use the questionnaire text to generate SPSS and SAS program files that can read the data in these formats.

X.4.8 Administrative Information

Some CATI systems provide a wealth of additional information about the interviewing process, including: data about length of interviews (or parts), completion rate statistics for each interviewer, complete keystroke sequences (for editing), etc. Some of this information is quite useful, particularly for budgeting and tracking of survey expenses, and to support payroll, billing,

and accounting systems. Eighty-seven percent of respondents to our survey reported that their CATI system routinely provides this kind of information.

All hourly employees at the CSR have the number of hours and minutes they work automatically recorded in a computerized database. After they log in to the network, employees respond to a few simple questions programmed in a CASES questionnaire. At the end of each shift or workday another CASES questionnaire provides employees with the number of hours worked and asks them to account for their time by charging it to tasks and projects. The CASES questionnaire is programmed to ensure that all time worked is charged to a project and task. This information is linked to a payroll and wage database to generate project expenses and payroll reports. This accounting information is also linked to other information produced by CASES, such as the interview data file. By linking this information it is possible to track productivity differences in studies and interviewers. This provides information for future cost estimates and is useful for evaluation of interviewers. It also becomes possible to link daily attendance reports, tallies from interviewers monitoring sheets, and other information stored in center databases. The SESRC's CATI system is used for data entry of mail or self-administered questionnaires, which are keyed in twice to ensure accurate data entry. The CATI system records information about the source of errors when they are encountered during data entry, providing information about interviewer performance, question difficulty, and rates of data entry errors for different kinds of surveys.

X.5 CONCLUSION

This chapter has presented eight organizational issues faced by small or medium survey centers when implementing or using CATI. It is possible that these same issues confront larger

survey organizations as well, but to a greater extent, or in a qualitatively different manner. Since we did not collect data on large organizations, we cannot be sure. However, for small and medium organizations several themes emerge from our data.

One theme concerns the effects of introducing new technology and work processes into a stable organization. Making the transition from paper-and-pencil interviews to CATI interviewing presents numerous problems to organizations. Staff may have little experience with computers and relatively little knowledge of CATI systems and requirements. Problems with incompatible hardware, software bugs, and working out network details can cause delays in getting a CATI system functioning. Installing a new CATI system can also disrupt ongoing surveys, and will cause changes in survey procedures causing frustration and additional work for staff. The more complex the CATI software and the network, the longer the period required for installation and training of staff.

Both the survey data and the experiences of our own survey centers suggests that maintenance and upgrade issues become a major ongoing concern after CATI implementation. All three of the organizations represented in this paper have had negative experiences with trying to upgrade hardware and/or software during production interviewing. The conclusion seems to be to upgrade in stages and to test all elements of an upgrade completely before attempting to conduct field interviews with a new CATI system. Hardware upgrades can be costly if all interview stations must be upgraded at the same time. Software upgrades are relatively frequent as the survey data indicate. And, in addition they are disruptive and take staff time to accomplish because someone in the organization must take responsibility for upgrading interviewing stations and training staff in software changes.

Another major theme is the effect of CATI on survey staff. CATI processes require continual training and upgrading of staff skills. In smaller survey organizations where most staff have multiple responsibilities, usually everyone from interviewers to management must learn aspects of the CATI system. Rapid advances in computer technology and improvements in CATI software require continual re-training and learning of new systems. There is some evidence that survey staff must be more skilled in computer technology and that interviewers with typing or computing skills are preferred over others.

The research literature indicates that CATI can improve the quality and volume of survey data collected (Nicholls, Baker, and Martin, 1997). However, there is no evidence that it lowers survey costs (see the Groves & Tortora chapter for a discussion of fixed and variable costs). CATI incurs new costs for an organization because of maintenance and training costs that would not be there but for the CATI system. In addition, costs are shifted among various survey tasks, so that for instance, data entry costs are virtually eliminated, but questionnaire development and testing costs are increased. Organizations will still find investment in CATI systems to be worthwhile, since the quality of data collected can improve, and the time it takes for data collection can decrease.

Our findings indicate that most CATI facilities are networked, and that most are making extensive use of the network's capabilities for sample administration and call-scheduling. Networks offer substantial advantages for sharing daily useful information among survey staff. The rapid developments in computer technology now make it possible for even the very small survey organizations to invest in a network for its interviewing stations. A network is essential to be able to take advantage of the sample administration, call-scheduling features of CATI

systems, which is also where much of the cost savings can be realized with CATI systems. A network also makes it possible for survey staff to share files, to communicate with one another by E-mail, and to collect administrative data useful for payroll and budgeting applications..

Small to medium sized organizations can take advantage of their CATI system by using the computers for other purposes than simply telephone interviewing. The hardware and software can also be used for computer assisted data entry, computer assisted self-administered questionnaires, project accounting, billing and payroll, preparation of reports and presentations, budgeting and forecasting, instruction and training, and email and communications. This spreads out the cost of investing in CATI technology among a number of organizational functions.

Future developments in CASIC technology will most likely change the relative significance of some of these organizational issues (see the Baker chapter). Baker (1994) and others (Shanks & Tortora, 1985; Dillman & Tarnai, 1988) argue that increasing use of mixed mode surveys, and integration of different survey functions is more likely in the near future which has organizational effects that are unanticipated as yet. Small to medium survey centers have an advantage here over larger organizations, which are generally slower to change and adapt to new ideas and technology (Dillman, 1997). It seems clear that computers and technology are changing our organizations and how we conduct surveys, and this trend will most likely accelerate into the next century (Van der Spiegel, 1995).

ACKNOWLEDGMENT

The authors would like to thank the administrative, research, and interviewing staffs of their respective organizations for their assistance in identifying, and in some instances, creating these organizational issues.

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