

## **Enhancing Data Quality Through the Use of Mixed Mode Collection**

**GEORGE S. WERKING and RICHARD L. CLAYTON<sup>1</sup>**

### **ABSTRACT**

A chronic problem in the preparation of time critical estimates is the significant limitations inherent in data collection by mail. To address this issue, the U.S. Bureau of Labor Statistics has conducted an extensive 7 year research effort into the use of computer assisted telephone interviewing (CATI) and the computer assisted self interviewing (CASI) methods of touchtone and voice recognition self-response. This paper will summarize some of the significant results of this research covering both performance and cost data. The paper will conclude with a discussion of a large scale implementation program of these techniques for a monthly sample of 350,000 establishments.

**KEY WORDS:** Employment statistics; Revisions; CATI; Touchtone collection; Voice collection; Cost analysis.

### **1. INTRODUCTION**

#### **1.1 Employment Statistics in the United States**

On the first Friday of each month, the U.S. Bureau of Labor Statistics releases data on the United States' employment situation for the previous month. On release day, the Commissioner of Labor Statistics appears before the Joint Economic Committee of Congress and provides a detailed analysis of the current month's data and trends; at the same time, the data are made available to the news media and the financial and business communities. This closely watched set of statistics is the earliest indicator available on the previous month's economic activity and is used as a major gauge of the health of the U.S. economy. The data in the release cover employment, hours and earnings by detailed industry which are derived from the Bureau's 350,000 unit monthly establishment survey – the Current Employment Statistics (CES) survey – along with labor force and unemployment data which are derived from the Bureau's 60,000 unit household survey – the Current Population Survey (CPS).

The establishment survey data have many important economic uses. Due to the CES survey's size and timeliness in conjunction with the importance of the basic payroll statistics which it collects, the CES monthly estimates are not only used as principal economic indicators by themselves but they are also included in the development of many of the Nation's other major economic indicators including: Personal Income for the Gross National Product, the Index of Leading Economic Indicators, the Index of Coincident Indicators, the Industrial Production Index, Real Earnings measures and Productivity measures. While the timeliness and accuracy of the CES statistics are essential in analyzing the current economic conditions in the United States, the CES survey has had to rely on a mail data collection process since its inception in the early 1900s. This collection process results initially in the publication of "preliminary" estimates for higher level aggregates using only the sample returns received to date followed by "final" estimates two months later which use the full sample. The process of producing both preliminary and final estimates for a given month periodically yields a

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<sup>1</sup> G. Werking and R. Clayton, Monthly Industry Employment Statistics Division, Bureau of Labor Statistics, Room 2089, 441 G Street, N.W., Washington, D.C., USA, 20212.

substantial revision to the initial estimates. These revisions not only affect the basic CES statistics but also the other statistics which make use of CES estimates as input. To address this issue, the Bureau initiated a research program into automated telephone data collection approaches with the objective of substantially reducing the size and frequency of large revisions in the preliminary estimates.

This paper provides an overview of the Bureau's 7 year research program into automated telephone collection techniques and summarizes some of the most significant results. The following sections describe the CES survey process; discuss the research program evaluating Computer Assisted Telephone Interviewing (CATI), Touchtone Data Entry (TDE) and Voice Recognition (VR) data collection methods; detail some of the significant research results covering both performance and cost data; and conclude with a discussion of the large scale implementation program of these methods in the CES survey.

## **1.2 Current Employment Statistics Survey**

The CES survey, with 350,000 units, is the largest monthly sample survey in the United States. It is conducted by the Bureau as a Federal-State cooperative program under which the Bureau specifies the survey's sample design and operational procedures while each State conducts all data collection and edit reconciliation activities. The Bureau produces and publishes extensive monthly industry detail at the 2, 3 and 4 digit industry levels for the Nation as a whole while each State produces monthly State and area (270 Metropolitan Statistical Areas) estimates.

The CES estimates are widely regarded as highly accurate economic statistics. Once each year, complete (or universe) employment counts for the previous year become available from the Unemployment Insurance tax records; these counts are used to annually benchmark (realign) the CES sample estimates to these universe counts. The annual benchmark process yields more accurate current monthly estimates along with providing an annual estimate of overall survey error. The average difference in the CES final sample estimate versus the complete universe count over the past 5 years is under 0.2% with 4 years in the 1980s when the difference was approximately zero. While the CES final monthly estimates are regarded as highly accurate relative to the universe counts; the preliminary monthly estimates, which are based on approximately 50% of the mail sample returns, have been periodically subject to large revisions when compared to the final estimate that is available 2 months later. Over the years, some improvement in reducing the size of the monthly revisions has been made; however, periodic large revisions have been viewed as a byproduct of conducting a large decentralized mail data collection process.

The decade of the 1980s brought about a number of changes for the CES program which would significantly alter the urgency and options for resolving the monthly revision issue. The 1980s created a far more quality conscious user constituency and while the CES products had not necessarily deteriorated, the CES users' expectations on quality and "fitness for use" had greatly increased. Much of this new way of thinking is directly attributable to the efforts of Deming, Juran and others on the subject of quality management. The 1980s also saw a much greater focus on the uses and the importance of the CES payroll statistics in assessing the current health of the U.S. economy, but with the rise in the use and the visibility of the CES statistics came a corresponding user frustration with monthly revisions. The 1980s also ushered in some dramatic new technological breakthroughs, most notably in microcomputers. This new technology offered survey agencies many new opportunities for improving data collection control and quality that included: Computer Assisted Telephone Interviewing, Touchtone Data Entry, Voice Recognition, Computer Assisted Personal Interviewing and FAX. Several of these methods would ultimately offer options to significantly improve timeliness and quality at an equivalent or reduced ongoing program cost.

The 1980s saw the Bureau shift from experimental research in the CES survey to full production testing of some of the most advanced state-of-the-art automated collection techniques then available, with major implementation of these techniques scheduled for 1991.

## 2. CES RESEARCH PROGRAM

### 2.1 Research Goals

In the early 1980s, the Bureau began an extensive 7 year research effort into the causes of late response and alternative collection methods which could significantly increase response rates for the preliminary estimates. The focus of the survey research centered around obtaining answers to three basic questions:

- Are data available at the establishment in time to respond by the publication deadline for the preliminary estimates?
- Are there data collection methods which can ensure an 80-90% response rate under these tight time constraints?
- Can the cost of these data collection methods be controlled at about the same level as the current mail collection costs?

At the conclusion of the research program, a mixed mode CATI/TDE collection approach emerged which satisfied the response rate and cost constraints for the survey. The following sections provide a brief description of these personal computer (PC) based data collection methods, the research tests, the response rate results and the cost analysis. Further details on these tests are documented in the research papers listed in the references. Additionally, recent results on measurement error for Touchtone collection are presented in a paper by Phipps and Tupek, this issue.

### 2.2 Data Collection Methods

The CES survey has a very limited data collection time period available to meet the preliminary estimates publication deadline. The CES survey's reference date is the payroll period containing the 12th of the month; thus, there are only 2 1/2 weeks available to collect, keypunch, edit, tabulate, validate and publish the data. In order to meet these tight time constraints, a collection method must be able to obtain the required data as soon as they become available within the establishment. The four data collection methods studied are described in turn below.

**Mail** – The CES questionnaire is a single page mail-shuttle form which provides space for the employer to record 12 months of data. The employer receives the questionnaire in the mail each month on or about the 12th of the month (*i.e.*, the survey reference date) and subsequently fills in the row of data items corresponding to the current month. There are five basic data items collected: all employees, women worker employment and production (or nonsupervisory) worker employment, hours and earnings. Once completed, the employer mails the form back to the State agency where it is keypunched and edited. The form is then filed so that it can be mailed back to the employer for the collection of the next month's report. As indicated earlier, this process currently yields a 50% response rate in the 2 1/2 weeks available for the preliminary estimates.

**Computer Assisted Telephone Interviewing** – Under CATI collection, the employer is mailed the CES questionnaire once at the beginning of the year and retains it for recording each month's data throughout the year. Each month as the payroll data become available, the employer fills

in the data items for that month and waits for the prearranged CATI call from the State agency. When the State agency calls, the data are collected under CATI, edited and a time for the next month's collection call is arranged.

**Touchtone Date Entry** – Under TDE reporting, the employer does the same activities as under CATI except instead of waiting for the State agency's CATI call, the employer now calls an 800 telephone number connected to the touchtone PC located at the State agency. The employer then touchtone enters the data items following the prompts in the automated CES interview. As each data item is entered by the employer, it is read back for respondent verification.

**Voice Recognition** – VR data reporting is identical to touchtone collection except the employer no longer needs to have a touchtone phone. The employer now reads the data as they appear on the form and the voice PC translates and reads back the data to the employer for verification. The VR system is speaker independent and accepts continuous speech; it recognizes the digits 0 through 9 and "yes" and "no".

### 2.3 Research Tests

The Bureau began developing a PC-based CATI system in 1983 for use in a two State test that began in 1984 (Figure 1). The CATI system developed by the University of California at Berkeley was selected for the test and was subsequently used throughout the research effort. A small random sample of 200 units was selected in each State and collection procedures and systems were refined over the next 7 years. The initial research tests were highly successful in the response rates they achieved and the tests were expanded to 9 States in 1986 and then to a total of 14 States in 1988. The composition of the test sample was also changed in 1986. Instead of selecting random samples of the full CES sample, the subsequent research tests focused only on random samples of habitually late CES respondents (*i.e.*, those units which had a response rate of under 20% for the preliminary estimates publication deadline). Thus, the success of the new collection methods of CATI and TDE was measured in terms of their ability to move samples of reporting units with a 0-20% preliminary estimates response rate to a stable ongoing 80-90% response rate. By the end of the CATI research phase in 1990, the Bureau was collecting over 5,000 units monthly under CATI and had conducted well over a quarter of a million CATI interviews.

While CATI was proving to be highly successful in improving response rates, it also became clear by 1985 that ongoing CATI collection would be more expensive than the existing mail collection. At this time, a separate path of research was begun on how to reduce the cost of CATI, while still maintaining the high monthly response rates which it was achieving. While improvements were made in reducing the length of time required for a CATI interview, it was a new alternative PC-based telephone reporting method which would offer dramatic reductions in the collection costs of CATI.

By 1985, many U.S. banks were operating a version of touchtone entry verification for check cashing at drive-in windows. The Bureau identified a PC-based touchtone reporting system suitable for survey research testing and by 1986 was conducting a small two State test of this technique for collecting data. TDE was not viewed as a direct replacement for mail nor as a competitive method to be tested against CATI. CATI's role was to take habitually late responders and turn them into timely responders through personal contact and an educational process, while TDE's role was to take these timely CATI responders and maintain their response rates at the same high level, but at a greatly reduced unit cost. Over the 5 years of data collection, TDE has also proven to be a very successful and reliable method of telephone data collection. The research phase for TDE is now also being concluded with over 5,000 units continuing to report monthly under TDE across 14 States; in total the Bureau has collected over 100,000 schedules using this new automated reporting method.

As a natural follow-up to TDE, the Bureau is currently conducting several small research tests of a new Voice Recognition reporting system. Preliminary results for VR reporting have replicated the same high monthly response rates achieved under TDE, but with the important advantage that respondents find VR reporting more natural and generally prefer it over TDE. At this time, the cost of the VR hardware is approximately 15 times that of TDE; however, within several years as the initial costs of VR drop, this collection method should become a viable replacement for TDE.

## 2.4 Research Results

Over the past 7 years, the Bureau has been able to establish that payroll data is available in most firms prior to the publication deadline for the preliminary estimates and that CATI collection has the ability to take traditionally late mail responders (*i.e.*, 0-20% response rate for preliminary estimates) and within 6 months turn them into timely responders with response rates of 82-84% (Figure 1). These response rates have been remarkably stable over the years as the CATI sample has been expanded from 400 units to 5,000 units and the number of participating States increased from 2 States to 14 States. The research results indicate that the data do exist at most establishments in time to meet the publication deadline and that CATI collection can raise mail response rates by 60-80% for these late responders and this rate can be maintained in the targeted range of 80-90% over long periods of time. The principal limiting factor in a respondent's ability to make the publication deadline was found to be the length of the firm's pay period (Figure 3). Employer pay periods are generally weekly, biweekly, semi-monthly or monthly. Weekly and semi-monthly payrolls can almost always be collected in time for publication with biweekly pay periods available most of the time; however, most monthly payroll systems close out well after the publication deadline. Monthly payrolls have been one of the largest factors in limiting the CATI response rates to the 82-84% range.

Several other important results have come out of the CATI research. Under CATI, approximately 60% of the respondents will have their data available on the prearranged date for the first call with the remaining 40% using the first call as a prompt call (Figure 1). This rate has varied little across States or over the years of testing. A small test is scheduled to be conducted to see if an advance postcard notice to the respondent shortly before the prearranged CATI contact date will significantly limit the number of callbacks required.

		1984	1985	1986	1987	1988	1989	1990
Mail	Resp. Rates	47%	47%	48%	49%	49%	51%	52%
CATI	Units	400	400	2000	3000	5000	5000	5000
	Resp. Rates	83%	84%	82%	84%	83%	84%	82%
	% Call Back	44%	42%	40%	41%	42%	41%	41%
	Av. Minutes	5.6	5.6	5.0	4.8	4.4	3.5	3.8
TDE & Voice	Units				400	600	2000	5000
	Resp. Rates				78%	80%	84%	82%
	% Call Back				45%	45%	43%	40%
	Av. Minutes				1.8	1.8	1.7	1.7

Figure 1. Research Summary

The average time for a CATI interview depends on the number of items to be collected, the time efficiency of the interview instrument, and the experience of the data collector. The average time for a CATI call (Figure 1) was reduced by one-third as the CATI instrument was streamlined and interviewers became more experienced. Another very important concern in the testing was the effect of CATI on sample attrition. There was some concern that employers would not want to be constantly bothered by telephone contacts and would drop out of the program. However, the sample attrition rate for CATI was about one-third of that for mail with almost no loss of large reporters under CATI. In summary, CATI appears to have come close to maximizing the achievable response rate for the preliminary estimates while also enjoying broad support from the respondents.

Due to the increased cost associated with CATI collection, the Bureau initiated research into touchtone collection. During the 4 years of testing, TDE has demonstrated the ability to take timely CATI reporters having 82-84% response rates and maintain these high rates under completely automated TDE reporting (Figure 1). The importance of this result lies in the cost savings under TDE collection versus CATI collection. One of the major concerns for TDE collection was that, unlike CATI where respondent contacts are scheduled throughout the day, TDE respondents might tend to call during the same time period thus generating busy signals and require an excessive number of touchtone PCs to handle peak load reporting. Fortunately, this was not the case, and while the touchtone PCs are on-line 24 hours a day, most calls are relatively uniformly distributed between 8am and 5pm (Figure 4). TDE respondents tend to require the same proportion of prompt calls as CATI respondents – approximately 40%. Methods are currently also being tested to reduce the TDE prompting workload. One major advantage for the respondent is that TDE collection requires only one-half of the time of a CATI interview with the average TDE interview lasting only 1 minute and 45 seconds. Additionally, touchtone phones are widely available at most establishments; current estimates indicate that over 80% of employers could report under touchtone data collection. While TDE reporting offers many advantages to the survey agency, its strongest feature is respondent acceptance; respondent reaction to touchtone reporting has been very positive due to its speed and convenience for the respondent.

One general observation concerning the development of a CATI research program is that it is not critical which CATI hardware or software system is used during the research phase as long as it is reasonably flexible for change. The final results from testing may suggest very different CATI requirements for production implementation than those originally required for the research program. The most important and time consuming activity is the development and refinement of the methods and procedures for respondent contact. Once effective methods and procedures are developed, the requirements for the “right” system become more obvious.

## 2.5 Cost Analysis

With the performance testing and respondent acceptance for CATI and TDE proving to be highly successful, the final phase of research shifted to analyzing the transitional costs of CATI and the ongoing costs of TDE collection.

The major “labor” and “non-labor” cost categories were studied for mail, CATI, and TDE collection (Figure 2). The study looked not only at estimates of current cost, but also at projected costs over the next 10 years using the current rate of increase for the major cost items. Since CATI was to play only a 6 month transitional role (*i.e.*, moving late responding mail units to on-time responding CATI units) prior to conversion to ongoing TDE, the major focus of the cost analysis was on the cost tradeoffs between ongoing mail versus ongoing TDE data collection.

Cost Category	Mail	CATI	Self-response (TDE & VR)
<b>LABOR</b>			
mail out	↗		
mail return	↗		
data entry	↗	↗	
edit and edit reconciliation	↗	↗	↗
nonresponse followup			↗
<b>NON-LABOR</b>			
postage	↗		↗
telephones		↘	↘
microcomputers		↘	↘

#### Recent Annual Price Change Factors

Labor	+5.7%	ECL, State and Local Government
Postage	+5.0%	U.S. Postal Service
Telephone	-1.7%	CPI-U, Intrastate toll calls
Microcomputers	-19.5%	PPI Experimental Price Indexes (16 bit computer)

**Figure 2.** Data Collection Costs (arrows show direction of recent price change)

For the labor categories, the monthly mailout, mailback, check-in and forms control operations of mail were replaced by a single annual mailout-only operation under TDE, thus eliminating a large monthly clerical operation in the States. The batch keypunching, keypunch validation, and forms control operations under mail were completely eliminated under TDE, where the respondent touchtone enters the individual firm's data and validates each entry. Another major quality and cost-efficiency advantage of TDE was that procedures for telephone nonresponse follow-up became far more feasible under TDE than mail. Under TDE, an accurate up-to-date list can be generated of respondents who have not yet called in their data, this list can then be used to conduct brief telephone prompting calls. Under mail, telephone follow-up activities of "apparent" nonrespondents were awkward since the State staff did not know whether the respondent's form was not yet completed, currently in the mail, in the State check-in process or at keypunch; in addition, respondents who had recently sent their form tended to resent the additional reminder for an activity that they perceived as completed. Due to the voluntary nature of the program and the uncertainty of a respondent's response status, telephone prompting under mail was only used for critical (large employers) units.

There were no significant cost savings made for edit reconciliation as the number of edit failures under TDE remained at about the same level as under mail. This was also true for postcard reminders where the number of postcards used under mail collection for late respondents was approximately the same as the number used under TDE, where respondents received an "advance" postcard notice to touchtone their data by the due date.

In the non-labor categories, the cost of postage under mail (currently 58 cents per unit) is replaced by the cost of a telephone call and the amortized cost of the TDE machine (together currently 46 cents per unit). Postage is a continually increasing cost with an annual price increase of approximately 5% (Figure 2). The rising cost of postage is driven by annual labor cost increases (+ 5.7%) and by fuel costs (also generally increasing) with labor accounting for over 80% of total postage costs. In contrast, under TDE the cost of telephone calls has been decreasing in recent years (- 1.7%), along with the cost of microcomputers (- 19.5%).

Excluding the additional new requirement of full telephone nonresponse prompting for TDE, there are demonstrable cost savings in shifting from mail to TDE. Perhaps more importantly, under a 10 year projection of future costs of these two collection methods (Figure 5), these savings grow substantially. Attempts will be made to redirect future cost savings from TDE to help offset the full nonresponse prompting activities.

There are several major conclusions concerning TDE reporting which have emerged from the performance and cost analysis review. (1) The traditional view that mail is the least expensive collection option available to statistical agencies is no longer true. The major technological breakthroughs of the 1980s in automated telephone collection can not only reduce the collection cost below that of mail but can also improve timeliness and control over the collection process. Additionally, over the next 5-10 years, the cost of mail will become even less cost competitive with these high-technology/low-labor collection approaches due to the increasing labor and postage costs associated with mail. (2) The transition of respondents from mail to TDE appears to cause very little disruption to monthly reporting. In the Bureau's follow-up interviews with respondents who were converted to TDE, results have shown that respondents have very little trouble adapting to this new method of reporting. Virtually all respondents completed their first month TDE report accurately and without assistance, with many respondents commenting on the ease of reporting under TDE. (3) TDE can be viewed as a reliable replacement method for survey data collection; over the past 4 years of collection there have been no major equipment failure problems or disruptions of the collection process. Minor equipment problems have been easily resolved using a back-up PC when required. In addition, future back-up protection for the State TDE collection process will involve the use of a call forwarding option to reroute calls to a central site should major problems occur at the State.

### 3. IMPLEMENTATION

#### 3.1 Major Issues

By the end of 1989, the Bureau had completed a very successful research program and had sustained the high performance levels over 7 years. However, there is a significant difference between the completion of successful research and full scale implementation of new methods. While over 10,000 units were being actively collected under these new techniques, these units represented under 3% of the CES sample. Proposed collection changes for a monthly sample of 350,000 units which has been collected for well over half a century under a decentralized State mail collection environment requires not only a very strong demonstrable user need but also broad-based support at national, regional and State levels.

As it turned out, the user need had begun to change in the early 1980s. During the 1980s, the U.S. economy experienced the longest sustained peace-time growth period in its history, with over 19 million jobs created, and unemployment rates at their lowest levels since the early 1970s. By the mid 1980s, economic policy was firmly focused on establishing non-inflationary economic growth. The monthly CES employment growth and wage data were being closely



monitored for signs of wage-induced inflationary pressures resulting from strong job growth during a period of low unemployment. With this greatly increased use and visibility of the monthly data, came a corresponding user frustration with the periodic large revisions to the preliminary estimates.

While monthly revisions to the preliminary estimates had always been a part of the CES survey process and even though the size of these revisions had been reduced over the years, large revisions of over 100,000 in the preliminary monthly employment estimates of over-the-month change were now being viewed as unacceptable. These user demands for greater accuracy in the preliminary estimates would lead the Bureau to develop proposals for the implementation of automated CATI and TDE collection methods into the U.S. government's largest monthly survey. While user demand is critical, major changes of this magnitude could not be undertaken without full support at the State level where data collection actually occurs. One guideline which remained constant throughout the research program was that the collection system was ultimately the States' data collection system and therefore must be designed to integrate well into their survey environment and create as minimal an organizational impact as possible. To that end, the CATI and TDE systems remained open for change throughout the research program. As many State suggestions and requirements as possible were taken into account with each new release of the systems. The success of much of the development work can be credited to the resiliency and endurance of the 14 research States as they made constant recommendations for improvements in systems and procedures. In the end, the CATI interview instrument had moved from an awkward simulated household survey type interview approach to a fast and efficient "screens" and "windows" approach well suited for capturing and editing longitudinal economic data. Thus, at the conclusion of the research phase, the systems and procedures were well tested and refined across a wide range of States. This approach to testing brought with it a strong sense of confidence in the methods and the systems at the State level. This would prove to be essential for the Bureau's proposed quick production implementation timetable of these state-of-the-art collection methods.

### 3.2 Approach and Impact

The main focus of the implementation proposal was the control of revisions in the preliminary estimates. Over the past 5 years, approximately 40% of all revisions were over 50,000 with 13% of the revisions exceeding 100,000 (*i.e.*, large revisions) (Figure 6). The goal of the implementation study was to identify a minimum set of late responders which, if obtained by the publication deadline, would control the size of revisions to what was considered to be in an acceptable level (under 50,000 revision in the over-the-month employment change). While one obvious approach was to convert all 175,000 late respondents to the new collection methods, this approach was considered to be lengthy and costly. While there was a need to responsibly control the size of revisions (*i.e.*, not necessarily completely eliminate all revisions), there was also a corresponding need to resolve this problem in as timely a fashion as possible (*i.e.*, convert the smallest number of units necessary to control revisions to under the 50,000 level).

Establishment surveys, unlike household surveys, generally have differential weighting for individual units with very large units being "certainty" units in the sample design. In the CES sample design, units with 100+ employees make up only 20% of the sample (*i.e.*, 75,000 units), but account for over 83% of the unweighted sample employment. These units tend to have a much lower response rate for the preliminary estimates so that if the late respondents' employment trend differs from the early respondents, these units can create a substantial revision in the sample estimates. Revision impact studies were conducted to assess the affect of large employers 100+ on the preliminary estimates. To test the impact of large employers,

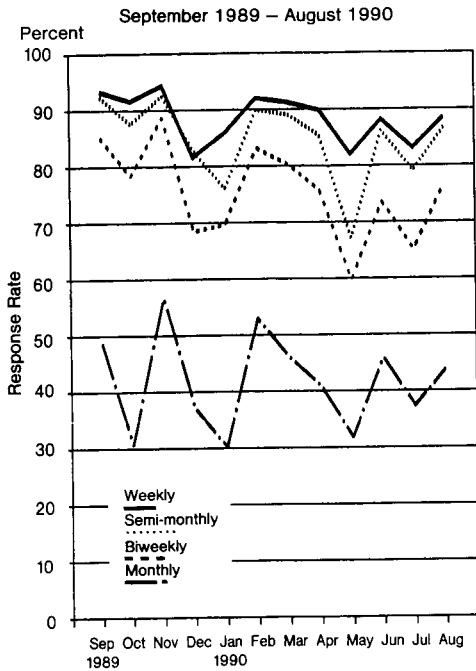


Figure 3. CES CATI First Closing Performance by Length of Pay Period

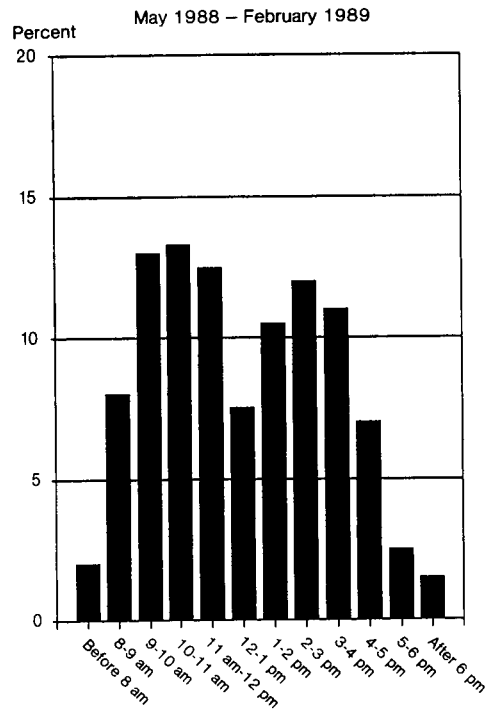


Figure 4. Touchtone Data Entry Distribution of TDE Calls by Time of Day

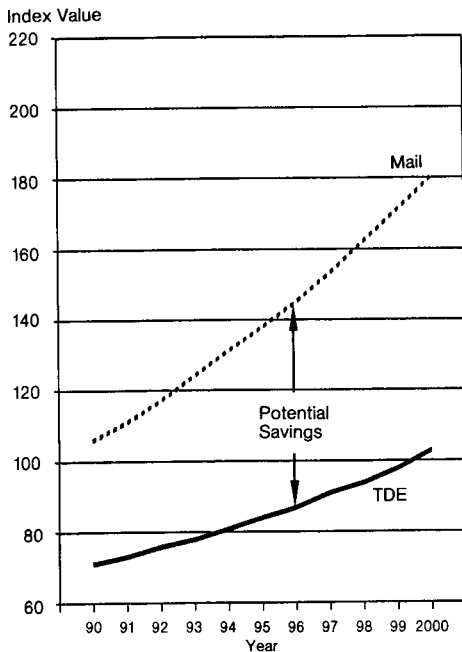


Figure 5. Estimated Unit Costs by Mode: 1990-2000

Note: Not official BLS projections

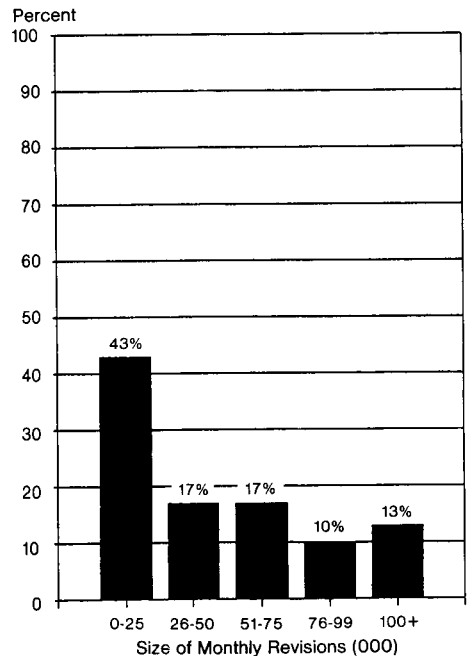


Figure 6. Distribution of Magnitude of Revisions (1985-1989)

late respondents in size class 100+ were included in the original sample used for the preliminary estimates and the estimates were recalculated. These new estimates were then compared to the original preliminary estimates to determine the impact of 100+ employers on revisions. The results indicated that from one-half to two-thirds of the revision was attributable to these units. These studies were repeated over several months with similar results. Applying these projected reduction rates in revision size to revisions over the past 5 years resulted in over 97% of all revisions being below the 50,000 level as compared to the current level of only 60%. This greatly reduced targeted sample size for conversion to CATI/TDE provided for an accelerated implementation time schedule consistent with controlling conversion costs to the minimum level necessary to protect against large revisions in the preliminary estimates. The Bureau will begin the implementation of CATI/TDE collection methods in 25 States in 1991 with planned expansion to all States in 1992. With the implementation of the new collection methods, the Bureau will be able to help resolve one of the most difficult and visible quality issues affecting the CES user community.

#### 4. SUMMARY

The decade of the 1980s has brought about many changes for survey agencies. Some of the changes can be viewed in terms of our accomplishments made over the decade while others are more subtle and need to be viewed in terms of the changes in the survey environment in which we operate.

The 1980s created a far more quality conscious user constituency which is quick to identify and point out our product limitations. While our products may not have deteriorated, our users' expectations on quality and "fitness for use" have greatly increased. This is an issue which we as statistical agencies must be able to respond to in order to maintain our credibility with the user community. The 1980s also ushered in dramatic new technological breakthroughs most notably in microcomputers. The new technology has offered survey agencies many new opportunities for improving data collection control and quality including: CATI, CAPI, TDE, VR and FAX. Some of these options offer improved quality and control at lower ongoing costs. The decade of the 1990s may well offer even greater opportunities for using technology to improve our data collection timeliness and quality at lower costs.

As we look at the status of our statistical programs, we often find very rigid environments. The data collection approach for our surveys often date back to their inception. Our data collection cost assumptions and cost studies are usually well outdated and often simplistic in approach. Since data collection generally represents the largest part of a survey's cost, it is usually well entrenched in the agency's organizational structure and can be quite difficult to restructure in order to accommodate large scale change. It is within this survey environment that we will face the major challenges and opportunities of the 1990s.

The challenge for statistical agencies in the 1990s will be threefold:

- to be responsive to the changing quality needs of our users;
- to attempt to have our research stay up with the rapid change of technology and automated data collection approaches; and perhaps more importantly
- to continue to find ways to incorporate successful research into our ongoing programs.

These challenges will determine the cost and quality competitiveness of our programs and our agencies in the future.

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