

LONG-TERM RESULTS OF TOUCHTONE DATA ENTRY IN THE CURRENT EMPLOYMENT STATISTICS SURVEY PROGRAM

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Note: Any opinions expressed in this paper are those of the authors and do not constitute policy of the Bureau of Labor Statistics.

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Background: The Current Employment Statistics (CES) survey is a monthly panel survey of over 390,000 business establishments. The survey publishes key economic statistics including employment, average hourly earnings, and average weekly earnings for the nation, as well as by industry, state and area. The employment estimates are closely watched by businesses, financial markets and policy-makers as a leading economic indicator.

The CES is a time-critical survey. Each month, there are only ten to fifteen days to collect and process the data before the preliminary estimates are published. Historically, most CES establishments have reported data by mail. Response rates for mail average only 55% by the cut-off date for preliminary estimates. Because of the low response rate for mail, the preliminary estimates have been subject to considerable revision.

Collecting data by mail is slow and labor-intensive. A mail report can spend days in transit between the respondent's office and the survey's office. The survey staff must open envelopes and key-enter data into the processing system, and later mail the form back to the respondent to begin the next collection cycle. Rising labor and postage costs make mail collection increasingly expensive. Another drawback of mail collection is that it is difficult to monitor and control. For example, if a mail report is late, it is not known whether the contact person is delinquent or whether the report is in transit, and the appropriateness of non-response prompting is uncertain.

Conversion to Automated Collection: In an initiative to improve estimates, raise response rates and reduce program costs, the CES has developed and implemented a number of automated collection methods.

In 1984, CES began to develop Computer Assisted Telephone Interviewing (CATI) in which live

interviewers call respondents and collect their data over the phone. The interviewers also educate respondents about the importance of the CES program and of timely reporting; determine when each respondent's data are usually available; assess the accuracy of the data; collect updated contact information, and resolve any problems. CATI regularly achieves response rates in excess of 90%, but because it is relatively expensive, it is used by CES primarily as a transition mode. Larger reporters -- 50 or more employees -- spend six months on CATI and then are converted to automated self-response. Smaller reporters are converted with a single telephone call without collecting data.

Most reporters are converted to Touchtone Data Entry (TDE), a system CES started developing in 1986. Under TDE, the respondent initiates a phone call to a computer system and enters data directly using a touchtone telephone. Data are available to the survey in minutes instead of days, and in machine-readable format. The costs of postage, handling and key-entry are greatly reduced compared to Mail, and self-response makes it much cheaper than CATI. Respondents have been very receptive to this collection mode, producing average response rates of 80%. Over the past decade, CES has converted 50% of the sample to TDE. The key long-term performance results of TDE are detailed below.

CES has also developed a number of other automated self-response data collection systems for reporters meeting special criteria. For respondents without touchtone service, CES developed a Voice Recognition (VR) system that recognizes spoken responses to the automated interview. For respondents who report for dozens of establishments each month, Electronic Data Interchange (EDI) enables them to transmit all of their reports at once quickly and easily, computer-to-computer. For respondents with Internet access, CES developed a secure site on the World Wide Web that collects data and provides interesting and useful feedback to our respondents.

Features Favoring Automated Collection: Many characteristics of the CES survey favor automated

collection. As a monthly panel survey, its respondents continually report data over the course of months and years. Therefore the one-time expense of converting respondents to automated collection brings long-term returns in increased response rates and savings. The survey asks for only a few data items, and most respondents complete the automated interview in two minutes or less. The data items are available from hard sources, chiefly payroll summary reports, and our respondents are very familiar with them. All of the data items are numeric and are easy to enter with the touchtone keypad. The time patterns of reporting are well defined and strongly linked to payroll periods and business hours, which facilitates data management and follow-up activities.

Features of Touchtone Data Entry: Over 195,000 units currently report by TDE, with over five thousand new units converted from mail each month. Each TDE reporter receives a report form and instructions.

In the middle of each month, each reporter gets an "advance notice" message either by FAX or postcard, which shows suggested reporting dates and the toll-free number.

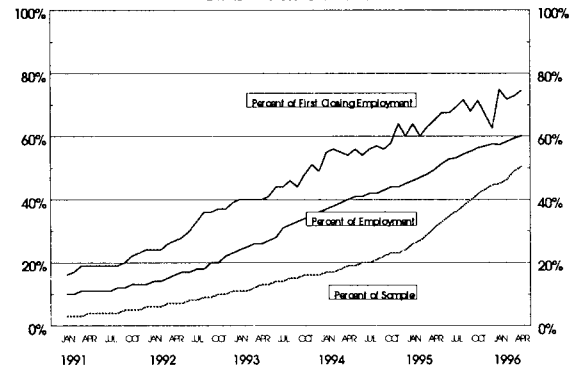
When the establishment's payroll data are available, the respondent initiates a call to the computer and is guided through a brief interview. The respondent enters data by using the numeric keypad. Each response is repeated for verification. The average interview lasts two minutes, and the respondent may call at any time of the day.

As the reporting deadline approaches, missing reporters are prompted with either a phone call or a FAX.

Performance Results: Response rates for TDE units average about 80%. Performance is slightly higher for larger establishments because they receive the more expensive treatments of six-month CATI transition and NRP phone calls.

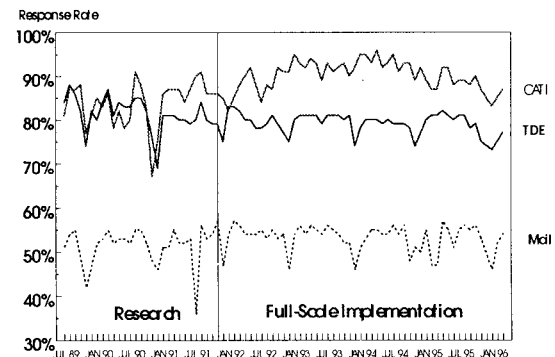
Over the past decade, nearly half of the sample has been converted to TDE. Initial conversion efforts were focused on larger establishments. Therefore, as shown in Figure 1, TDE reporters represent an even greater share of sample employment and over 75% of the employment received by the preliminary deadline.

Figure 1. Contribution of CATI/TDE to CES Data Collection



Over the five years of full-scale implementation, TDE response rates have averaged 25 points higher than those for Mail. As a result, average monthly revisions to the initial survey estimates have decreased by 38% in absolute terms. Figure 2 shows response rates by mode.

Figure 2. Performance of CATI/TDE 1989-96 for Preliminary Estimates



TDE has also demonstrated lower long-term attrition rates than Mail. In a matched sample, the average annual attrition rate for mail was 7.0%, whereas the TDE rate was only 5%.

Special Treatments: CES has developed two message treatments based on establishment size. Larger establishments receive a postcard or FAX for advance notice, and for NRP they receive telephone calls (Rosen, 1991). Smaller establishments receive FAX messages for advance notice and for NRP, or postcards if they do not have a FAX machine.

FAX messages are both inexpensive and fast. The average transmission time is under one minute per message. Once the FAX program is initiated, messages are sent out continuously and the system runs unattended. The outcomes of all calls are logged, and

if any transmissions are unsuccessful, the system automatically retries them. Incoming TDE data calls can be collected simultaneously on the same machine. Through the automated system, the system operator can initiate thousands of messages at once. To take advantage of lower telephone rates, FAX messages can be sent continuously overnight and will be waiting at respondents' offices in the morning.

Our latest research on FAX availability indicates that more than 30 percent of establishments have a FAX machine. The rate of availability is closely related to establishment size. Roughly 50 percent of establishments with fewer than ten employees have a FAX machine, as opposed to almost 100 percent of establishments with fifty or more employees.

Calling Patterns: The historical patterns and timing of responses by TDE reporters illuminate a number of key points regarding TDE workload and capacity. Although the TDE system is on-line 24 hours a day and 7 days a week, the vast majority of respondents call during standard business hours, from 8 a.m. to 5 p.m., Monday through Friday.

Across the month, daily calling volumes start to increase in the days following the end of the reference period and in response to advance notice and NRP messages. Figure 3 illustrates call volumes during the February 1996 collection period. Typically, calls are fairly evenly distributed throughout the day, with a slight dip between noon and 1 p.m. Figure 4 shows the distribution of calls by hour for the peak calling day during the February 1996 collection period.

Figure 3. Phone Line Usage for TDE Collection (February 1996 Collection Period)

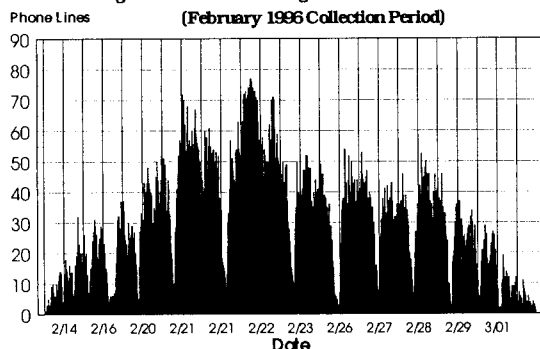
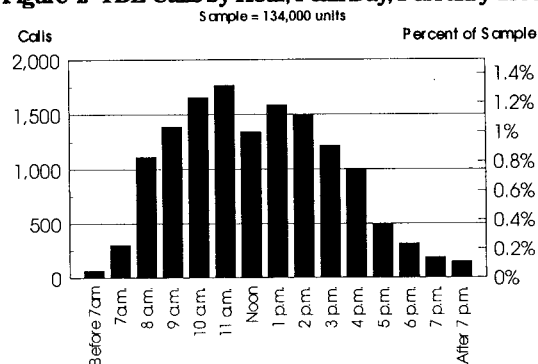


Figure 4. TDE Calls by Hour, Peak Day, February 1996



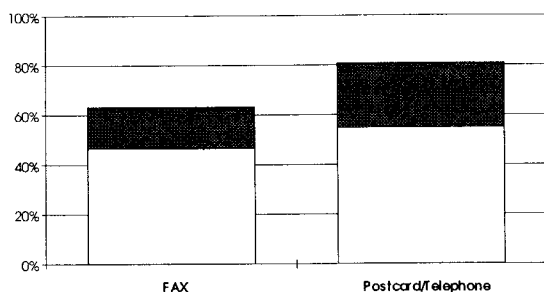
These patterns indicate the optimal timing for activities like system maintenance and generation of advance notice/NRP messages. They also indicate welcome economies of scale with increasing sample sizes. As the sample grows, the calling peaks tend to become smoother, and the amount of hardware required per capita decreases.

Non-response Issues: Non-response Prompting (NRP) is critical to the maintenance of high response rates. In a typical month, roughly 40% of the sample units do not report before receiving a prompt. Of those units that are prompted, approximately 60% report data prior to the deadline.

From month to month, it is not necessarily the same units that require prompting. Over time, many factors can cause a unit to require a prompt, including forgetfulness, unavailable data, vacations, illness, and contacts changing jobs. A twelve-month study of a representative TDE sample showed that 14% of the units required no prompts in any month, while less than 1% required a prompt every month.

Under TDE, respondents are eligible for different types of NRP messages, depending primarily on the establishment's size. Smaller establishments (fewer than 50 employees) receive FAX messages. Larger units receive phone calls, which are more effective than FAX but also more expensive. Because larger establishments have the proportionately greatest impact on the survey estimates, the extra expense of NRP calls is warranted. Figure 5 illustrates the effectiveness of FAX and postcard/telephone for advance notice and NRP messages. The dark portion of the bar shows the impact of each method on response rates.

Figure 5. Effectiveness of FAX for Initial Contact and Nonresponse Follow-Up



Telephone prompts are made by experienced CES interviewers, who call respondents during standard business hours. The interviewer speaks directly to the respondent, ensuring that the reminder is delivered to the right person on time. There are a number of ways that a FAX message may fail to reach the respondent on time: it may be set aside or covered by papers, or the FAX machine may be out of paper.

The FAX system is highly flexible. The operator can easily modify the criteria for which units receive FAX messages. The content of the messages can be updated in seconds to allow for seasonal reminders or special messages only for establishments in specified industries. Most of these messages are pre-programmed.

Cost Issues: Converting a large share of the sample from Mail to TDE produces significant ongoing cost-savings. Most of the unit cost for Mail is for labor and postage, the prices of which continue to rise. With TDE, most of the unit cost is for telephone service and computer hardware, the prices of which continue to fall. Data entry is eliminated. The two-way first class postage for the report form is replaced by one-way postage for a TDE postcard, with the elimination of monthly labor costs of opening, stuffing and sealing envelopes. The TDE FAX messages have nearly zero labor costs and also take advantage of the falling costs of telephone calls. (Clayton and Harrell, 1989).

The hardware required for the TDE system includes a 386/486 personal computer (under \$2000), a touchtone recognition board (\$1000 for 4-line board, \$4000 for 24 lines, manufacturer's software and drivers), and telephone lines. The TDE system software was developed in-house using "C" language under contract with a developmental specialist and required the purchase of an "applications generator." For the FAX

applications, a FAX board (\$2,000) is required and additional phone lines are suggested.

Summary: The ongoing conversion of Mail reporters to TDE in the CES survey has produced desirable long-term results. Over 200,000 units are currently on TDE, including 90% of firms with 50 or more employees. With automated reporting, response rates are higher, monthly revisions are lower and costs are reduced. CES has vastly improved its control over critical survey processes, and sample retention has improved. Through FAX technology, the program maintains regular contact with a very large sample inexpensively.

The TDE system is so successful and user-friendly that TDE is replacing mail as the initial collection method for newly solicited establishments. The reliable performance of TDE is the critical precursor to the program's next major step, its imminent sample redesign.

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