THE IMPACT OF COMPUTER-ASSISTED PERSONAL INTERVIEWING (CAPI) ON INTERVIEWER PERFORMANCE: THE CPS EXPERIENCE

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1. Introduction

For the past several years, the Census Bureau and the Bureau of Labor Statistics (BLS) have been working on a major redesign of the Current Population Survey (CPS) with the aim of producing both improvements in data quality and savings in time and money (see Butz and Plewes, 1989). Key elements of the redesign include extensive changes to the basic CPS questionnaire, the collection of a subset of interviews from centralized telephone facilities (using CATI) and the use of personal laptop computers for household interviewing (using CAPI). In order to test the impact of such design changes on key estimates of employment and unemployment, the Census Bureau and BLS developed the CATI-CAPI Overlap (CCO) study. The CCO began in October 1991 and will conclude in December 1993, with the design changes being implemented on the full CPS in January 1994. The CCO study is based on an independently selected national sample of about 15,000 households per month designed to test the new instrument (known as the Monthly Labor Survey or MLS) and the use of computer-assisted interviewing (both CATI and CAPI). This paper focusses on the CAPI portion of the CCO Study.

One issue surrounding the CPS design changes is the potential impact of the use of CAPI on the Bureau's workforce of field interviewers. Bateson and Hunter (1991: 24) note that the role of the interviewer is by far the most changed under CAPI. To date, however, much of the research effort on CAPI has been focussed on improvements in hardware and software, while little attention has been given to interviewer performance. In an effort to examine the impact of CAPI on the CPS interviewer, a variety of data collection efforts were launched at the Census Bureau in conjunction with the CCO Study. Key among these was a series of mail surveys to CCO interviewers, designed to elicit their attitudes and expectations toward, their experiences with, their reactions to, and their performance on, CAPI. Two rounds of the questionnaire were administered, one prior to training and the other after two full MLS assignments had been completed.

Two key questions can be raised with regard to the implementation of CAPI and its effect on survey interviewers:

1. How do interviewers react to the introduction of CAPI?
2. What effect does CAPI have on interviewer performance?

We addressed the first of the questions in an earlier paper (Couper and Burt, 1993) based on the same data. We found that interviewers are generally positively disposed toward the use of CAPI, and indeed become more positive with use of the new system. This supports the findings of a number of other studies (see e.g. Baker, 1992; Edwards, *et al.*, 1993). Despite these generally positive attitudes, some interviewers express concerns about various aspects of CAPI and its impact on their jobs. Experienced CPS interviewers, and those with no prior computer experience, appear to be somewhat less enthusiastic about CAPI.

In this paper we turn our attention to the second question, namely the effect (if any) of CAPI on interviewer performance. Why is this question important? We believe that interviewer acceptance of and performance on CAPI may have both cost and error implications for survey data collection. First, if interviewer turnover (particularly among more experienced interviewers) is adversely affected by the introduction of computers, the costs associated with recruiting and training new interviewers will increase. We have noted elsewhere (Couper and Groves, 1992) that interviewer experience is a positive factor in response rates. Changing the nature of the interviewer labor force through increased turnover may have effects beyond those of training. Second, data quality may be impaired by the differential ability of interviewers to use a computer for interviewing. Use of a laptop computer is an added measure of interviewer performance that may affect the quality of the data collected.

This paper does not involve a comparison of CAPI with PAPI. Rather, we examine the role of various interviewer characteristics in predicting differential performance on a CAPI survey. If we are able to identify prior to training those interviewers who may have the most difficulty with CAPI, we may be able to deal with potential performance problems **before** the interviewer is assigned sample cases to interview. Additionally, if we can identify characteristics associated with high levels of performance, we can

tailor recruitment, selection and training procedures to reflect these.

2. Design of the Study

2.1 Interviewer questionnaire

We administered two rounds of the interviewer questionnaire. The first round was sent to the CCO interviewers along with self-study material (including the computer) prior to training. They were instructed to complete the questionnaire before working on the self-study. This round of the questionnaire was intended to obtain background information on interviewers (demographic characteristics, work experience, computer experience, etc.) as well as to elicit their attitudes and expectations prior to exposure to CAPI.

The second round of the questionnaire was mailed to each of the CCO interviewers who responded to the first survey, after two assignments had been completed (i.e. after 2 months). These were mailed directly from Headquarters. This round repeated the attitude questions asked in round 1, and added a series of items to elicit their reactions to their initial experience with CAPI. A series of questions on training were also included.

A total of 404 CCO interviewers were considered eligible for this study (all those who completed training and at least two assignments before December, 1992). Of these, 385 completed the first-round questionnaire, for a response rate of 95.3%. A total of 380 interviewers completed both the round 1 and round 2 questionnaires, for an overall response rate of 94.1%. The analyses described here are based on these 380 interviewers.

2.2 Performance measures

In addition to the questionnaire responses, an attempt was made to collect performance data on interviewers that would reflect their success or otherwise in using the new technology for data collection. For paper-and-pencil surveys (PAPI), interviewer performance at the Census Bureau is based on response rates, accuracy rates, and production rates. Objective performance criteria for computer-assisted interviewing are still under development. One problem is separating measures of interviewer performance from measures of computer competence, and addressing how the latter may affect the former. Given the nonproduction nature of the CCO, we had to make use of such measures as were available to us.

We examine the following indicators of interviewer performance on CAPI:

Drop-out rates

We have record of all interviewer terminations on CCO prior to the end of 1992. Although interviewers may leave their job for a variety of reasons (unknown to us), we wish to explore whether their attitudes toward computers and prior computer experience played any role in their decision to depart from the CCO Study.

Data quality indicators

Nonresponse rates and refusal rates were obtained for all CCO interviewers for a six-month period (July 1992-December 1992). Items error rates (item "don't know's" (DKs) and item "refusals" were obtained for a three-month period (October 1992-December 1992).

Self-reports of difficulties with CAPI

In addition to these "objective" indicators of performance, in the second round of the questionnaire we asked interviewers to report whether they had experienced any difficulties with various aspects of CAPI, including hardware, software (the survey instrument), case management, and telecommunications. These self-reports after two monthly assignments are also used as indicators of the successful (or otherwise) adoption of CAPI.

There are major limitations associated with these measures of interviewer performance. First, there are many factors beyond the control of the interviewer that may affect both unit nonresponse and item nonresponse. We lack appropriate controls for determining the effect of interviewer characteristics on performance, as opposed to the characteristics of the areas and respondents to which they are assigned. Second, the link between CAPI and the particular performance measures used here is tenuous. Determining what proportion of these errors is attributable to CAPI, and indeed what the appropriate measures are for evaluating successful CAPI performance, are beyond the scope of this paper. Nonetheless, this paper represents a first attempt at examining the effect of CAPI on interviewer performance, rather than exploring subjective interviewer reactions to CAPI.

3. Characteristics of CCO Interviewers

Based on the responses to the first round questionnaire, CCO interviewers appear fairly typical of the general interviewer workforce at the Census Bureau in terms of demographic characteristics (see Table 1). The majority (82%) are female, and their average age is 50.3 years, with 60 being the modal age. Most (75%) have at least some college education.

More than half (54%) of the interviewers have previous CPS interviewing experience, while a further 29% have worked on other Census Bureau surveys. Interviewers with CPS experience have an average of

9.0 years experience at the Census Bureau. Those with experience on other Census Bureau surveys have an average of 2.5 years experience.

A measure of computer experience was constructed from the responses to two items in the questionnaire. Those with no computer experience (51%) reported that they had never used a personal computer or had not used one within the last year. Those with a moderate amount of experience (25%) reported using a computer once or twice a month or less in the past year, while those with extensive experience (24%) used a computer at least once or twice a week in the past year.

4. Interviewer Performance on CAPI

The key question we address in this paper is whether interviewer computer experience and attitudes predict performance, controlling for other factors. To the extent that CAPI will impact on measures of performance, we expect that lack of computer experience prior to training, and negative expectations about CAPI will adversely affect performance using the laptop computer, other things being equal.

A series of linear regression models were fitted with each of the performance measures in turn as the dependent variable. We examined each of these variables using the same set of predictors. As the data quality indicators were measured at the same point in time, but interviewers were trained on a staggered basis over a period of several months, it was necessary to control for training date in these models. This is measured as months elapsed since training. Other predictors included in the models are: age, gender, education, survey experience, computer experience, typing skills and attitudes toward CAPI.

In general, few (if any) of these variables proved to be significant predictors of interviewer turnover or performance. We will thus summarize the results of the analyses here without presenting coefficients from the regression models.

For the analysis of interviewer turnover, we included all interviewers who completed the first round of the interviewer questionnaire. Of these 418 interviewers, 40 had left CCO as of December 1992. For the remaining models, we used only the 380 who completed both rounds of the questionnaire. Further, we excluded all supervisory interviewers from these analyses. This group tends not to have regular assignments and thus do not have reliable measures of performance.

Interviewer terminations

A logistic regression analysis was performed with interviewer termination as the dependent variable. In this analysis the only significant predictors of interviewer drop-out from CCO are the two survey experience dummies. These have a negative effect on turnover. More experienced interviewers are less likely to quit CCO, while newly hired interviewers are more likely to leave. This fits the conventional wisdom of self-selection into the job of survey interviewer. The highest turnover is among new recruits, as they discover the work of an interviewer is not for them, and seek work elsewhere.

There is no significant effect for either computer attitudes or computer experience in the multivariate model. Bivariate tests of these two variables with interviewer terminations also produce no significant results. It thus appears that those with less computer experience, and those with more negative attitudes toward CAPI, are (as of December 1992) no more likely to quit the CCO Study than their counterparts.

Nonresponse and refusal rates

For each interviewer a nonresponse rate for the 6 month period is simply the ratio of nonresponding units to all eligible sample units). Similarly, the refusal rate for this period is refusals over all eligible sample units.

Computer attitudes and computer experience appear to have no significant effect on interviewer-level nonresponse rates or refusal rates. The only predictor that has any significant effect on these two variables is the number of months since training, and this is in an unexpected direction. Those interviewers who were trained earlier appear to have **higher** nonresponse rates. This runs counter to the hypothesis that interviewer's improve with experience, but it may reflect other factors relating to which interviewers were trained when.

Item error rates

Three item error rates were used as dependent variables: item DKs, item refusals, and the combination of DKs and refusals. The denominator for each of these rates is all questions asked in all interviews by the interviewer. As with the unit nonresponse measures, neither computer experience nor computer attitudes had any effect on interviewer-level item error rates. Survey experience is positively associated with refusals, and negatively associated with DKs, although there are no significant effects for total error rates. This suggests that experienced interviewers appear more inclined to classify a missing item response a refusal rather than a DK. However, the reason for this does not be related to CAPI in any way.

Self-reports of problems

In the second round of the questionnaire, interviewers were asked whether they had experienced any difficulties with 63 different aspects of CAPI. These were grouped into the following categories: hardware (including care and maintenance of the computer, battery management, etc.), case

management, survey instrument (movement within the instrument, changing answers, use of function keys, etc.) and telecommunications (using of the modem to receive and transmit work). First, the total number of problems reported was modeled using linear regression. For the separate categories of problems, the measures were collapsed into whether any problems were reported and modeled using logistic regression. Training date was not included in these models, as every interviewer completed the second round of the questionnaire the same length of time after training (approximately 2 months).

A number of significant effects are found for the total number of CAPI-related problems reported by interviewers. The results of the linear regression are presented in Table 2. First, age is positively related to the number of problems reported. This may be attributable to concerns about weight of the computer and visibility of the screen. Survey experience does not appear to have a significant effect on problems reported with CAPI.

A joint significance test of the two computer experience dummies reveals this variable to approach significance (p=.054). It is interesting that those with extensive computer experience appear to report more problems (relative to those with no prior computer experience). A similar effect is found for typing skills. Those with extensive or moderate typing skills report significantly more problems than those who were unfamiliar with a keyboard prior to CAPI training. These may be due to heightened expectations on the part of experienced computer users that may not have been met by this particular CAPI application. In addition, the move from a desktop computer to a laptop and the need to type with one hand when standing may nullify the effect of experience when using CAPI.

Finally, interviewer attitudes toward computers prior to training has a significant negative effect on the number of problems reported. The more positive an interviewer's attitude toward CAPI, the fewer problems are reported. This variable remains the only significant predictor when we move to a series of logistic regressions with particular types of problems (hardware, case management, instrument, telecommunications) as dependent variables. We hesitate to ascribe a causal effect to this relationship, however. It may be that those who have less positive attitudes toward CAPI at the outset may be looking for things to complain about, to produce a self-fulfilling prophecy. Again, without appropriate objective measures of performance, we cannot examine the true effect of prior expectations.

5. Conclusions

The results from these analyses are encouraging. It appears that differences in interviewer computer experience and attitudes toward CAPI prior to training have little or no effect on their performance using CAPI. However, this conclusion should be treated with caution. Much work needs to be done in developing reliable and accurate measures of interviewer performance using CAPI. The use of the laptop computer has added a further dimension to the skills and knowledge required of interviewers, and we need to find ways to evaluate their acquisition and retention of such knowledge, and the successful application of CAPI skills. Until we have developed appropriate measures of interviewer performance in a CAPI environment, we cannot fully examine interviewer variation in successful use of the technique.

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Table 1 Characteristics of CCO Interviewers

	Number	Percent
ALL	380	100.0%
Age		
44 or younger	115	30.7%
45-60	191	51.0%
61 or older	68	18.2%
Education		
High school or less	95	25.1%
Some college	149	39.4%
Completed college	234	35.4%
Survey experience		
New hire	63	16.6%
Other survey experience	111	29.2%
CPS experience	206	54.2%
Supervisory status		
Supervisory interviewers	68	17.9%
Non-supervisory interviewers	312	82.1%
Typing skills		
Unfamiliar with keyboard	30	8.0%
Experienced hunt and peck typist	72	19.1%
Slow touch typist	195	51.7%
Fast touch typist	80	21.2%
Computer experience		
None	193	50.8%
Moderate	95	25.0%
Extensive	92	24.2%
CAPI/CATI experience		
No	329	86.6%
Yes	51	23.4%

Table 2 Linear Regression of Total Problem Reports

Predictors	Coefficient	Std. Error
Intercept	11.08	2.63
Education:		
(HS or less)	-	-
Some college	0.69	0.69
Completed college	0.87	0.71
Age	0.054 *	0.026
Gender:		
(Male)	-	-
Female	-0.20	0.74
Survey experience:		
(New hire)	-	-
Other survey experience	-0.99	0.76
CPS experience	0.036	0.75
Typing skills:		
(Unfamiliar with keyboard)	-	-
Hunt and peck typist	2.62 *	1.18
Fast touch typist	2.78 **	1.04
Computer experience:		
(None)	-	-
Moderate	0.82	0.64
Extensive	1.79 *	0.74
Attitude score	-2.87 **	0.53
R^2	0.13	
n	306	

* $p < .05$
** $p < .01$

Omitted categories in parenthesis.