

# APPLYING COGNITIVE THEORY TO AN ESTABLISHMENT MAIL SURVEY

Polly A. Phipps, Bureau of Labor Statistics  
Room 2821, GAO Bldg., 441 G Street NW, Washington, DC 20212

## Introduction

This paper reports the results of a study using cognitive theory to assess an establishment mail survey. Two methods of evaluation are used in the study, a survey pretest and a Response-Analysis Survey (RAS). The paper is divided into four sections. First, background information on the mail survey is provided. Second, background information on and findings from the pretest and RAS are detailed. Third, recommendations for the survey are offered using information processing theory from cognitive psychology, as it has been applied to surveys (Tourangeau 1984). Three of the four stages of information processing most applicable to this research are highlighted, including respondent comprehension, retrieval and response. Fourth, the methods used in the study are discussed and conclusions from the study are drawn.

## Survey Background

The BLS, in cooperation with State employment security agencies, collects monthly survey data on employment, hours, and payroll from a sample of 300,000 nonagricultural establishments. In March 1989, a subsample of 3,600 monthly respondents was mailed a supplemental survey on annual nonwage cash payments and payrolls. The mail survey was a pilot test conducted to determine the feasibility of collecting nonwage cash payment and payroll data on an annual basis. Nonwage cash payments to employees, not captured in the monthly payroll data, were considered a growing part of total employee compensation and important to measure.

The mail survey requested information on nonwage cash payments made to production workers and all employees during the calendar year 1988. Respondents were asked to indicate if their establishment gave certain types of nonwage cash payments and to report their monetary amounts. Nonwage cash payments consisted of six categories: bonuses and awards, lump-sum payments, commissions paid less often than monthly, cash profit sharing, severance pay, and other. Respondents were also asked to report the amount of 1988 payrolls for production workers and all employees.

Two survey designs were used in the pilot, a long and short form. Each survey was on a single sheet of paper, with both sides utilized. However, the layout of the front page of the two forms differed. The short form requested four pieces of information near the top of the front page. They included the nonwage cash payment monetary totals for all employees and production workers, and the payroll totals for all employees and production workers. There were four boxes for a respondent to place the totals. Further down the front page of the short form, respondents were to check a grid-like series of yes/no questions on the six categories of nonwage cash payments. The questions included: did the establishment make the payment type, was the payment included in the all-employee box, was the payment made to production

workers, and was the payment included in the production-worker box?

The long form differed from the short as the totals boxes were placed at the bottom of the front page, rather than near the top. Near the top of the front page of the long form was a grid with the six categories of nonwage cash payments on the side and several questions across the top. Questions included: did the establishment make the payment type, and were any payments made to production workers? After the respondents checked answers to the questions they were to report the monetary totals for all employees and production workers for each payment category. Then they were to go on to fill out the nonwage cash payment and annual payroll totals at the bottom.

The back of the short and long form was identical. It included examples of three types of employer payments in a list format. The employer payments included nonwage cash payments, payroll, and other payments, the latter were to be excluded from the report. Further down the back page were item instructions and survey definitions. The survey was primarily printed in a size eight Helvetica font.

## Pretest Results

The nine-unit pretest procedures included initial telephone contact with establishments to elicit respondents. Following the telephone contact, respondents were mailed a survey to complete. Then a personal interview was conducted with six of the respondents at their establishments, and three respondents were interviewed by telephone. A retrospective think-aloud protocol was used. The procedure involved open ended questioning of the respondent on completed survey responses. The areas of questioning for the pretest focused on respondent comprehension of instructions and definitions and problems retrieving the data, including reasons for item nonresponse and potential errors of omission.

The pretest interviews indicated that all but one of the nine respondents thought they had a good understanding of the survey. Respondents tended to focus on the unavailability of records. They attributed item nonresponse to retrieval problems with records, i.e., the company's records did not break out the specific categories the survey requested. This was true for both payments and payrolls. For example, in four of the nine establishments, severance payments were not identified as such, and were included as part of the regular payroll. Thus, respondents were unable to generate a monetary amount for severance payments. In the case of payrolls, the majority of establishment records did not discriminate between production workers and all employees. Totals for the production-worker category were either unavailable or very time consuming to calculate.

Pretest questions on the understanding of payment types led to some very specific discussions on what should be included and excluded. Since the survey defined payment types primarily by examples, the discussion of specifics was understandable. But

during the discussions it became clear that respondents did not have a global understanding of what was encompassed by the term "nonwage cash payment." For example, one respondent could not understand why an employer contribution to a thrift plan was not a nonwage cash payment. She knew the payment was in a list of example exclusions, but she did not see the reasoning. When she was told it was not immediately available from the employer as cash, it became clear. However, that global definition was not part of the survey.

One of the pretest questions involved reading off a list of specific bonuses and awards types and asking if the establishment made the payment during the year. This question elicited errors of omission from three of the pretest respondents. The errors were primarily omission of small awards, such as safety and employee-recognition awards. Even though the monetary value of the payments was not great, the omissions clarified that we were dependent on the respondent's memory in item reporting.

### **Response Analysis Survey (RAS) Results**

In the RAS, a subsample of establishments responding to the mail survey were subsequently surveyed on the data they had provided. Questions covered the same major areas as the pretest, however, the RAS was structured as opposed to an open-ended instrument. It was designed to be carried out over the telephone in a short period of time.

Establishments were selected into the RAS sample on the basis of several types of actual and possible response and nonresponse errors listed below (1-5). The sample design was chosen to study potential problem areas for future survey improvement, not to measure error in the survey population.

1. An establishment indicated they made a nonwage cash payment to all employees but gave no monetary amount.
2. An establishment indicated they made a nonwage cash payment to production workers but gave no amount.
3. A nonwage cash payment was indicated for all employees, and the production-worker amount was equal to that of all employees.
4. No amount was given for the all-employee annual payroll.
5. No amount was given for the production-worker payroll.

Establishments who had not responded to payroll items (4 and 5) accounted for about 60 percent of the sample. The correspondence between production worker and all employee amounts for nonwage cash payments (3) accounted for about 30 percent of the sample. After the fact, this turned out not to be a true error. A RAS question was asked concerning the figures. Most respondents said that the figures were truly equal: payments were only given to production workers. Not providing a monetary amount for nonwage cash payments for all employees (1) was the only other category accounting for a noticeable amount of error.

The RAS was conducted by telephone interviewers in the Automated Collection Techniques Laboratory of the BLS. The sample included 350 establishments; a 96 percent response rate was achieved. All

establishments received a prenotification letter explaining the RAS and a xeroxed copy of their original form for reference purposes.

Similar to the pretest, certain questions in the RAS interviews indicated respondents thought they had an understanding of the survey content. Most respondents said they did not leave out any payments due to uncertainty of whether a payment was to be included or not. In addition, establishments who checked on the survey form that they made nonwage cash payments, but gave no amounts (errors 1 and 2), stated difficulties with records as reasons for the nonresponse, rather than any misunderstanding or overlooking of what was to be provided. This included 66 omissions from approximately 35 establishments.

However, questions were asked of all RAS respondents to elicit possible "errors of omission," i.e., payments that should have been included, but were not. All respondents were asked if their establishment gave Christmas or executive bonuses, or merit, incentive or employee recognition awards during calendar year 1988. If they gave any of the payments, they were asked whether they included it in the figures they reported, and if not, the reasons for any omissions.

The reporting errors are shown by payment type in Table 1. The questioning did elicit errors: (A) 115 establishments reported they gave Christmas bonuses, while 37 (32 percent) did not include them as nonwage cash payments; (B) 70 reported executive bonuses, and 30 (43 percent) did not include them; (C) 25 reported merit awards, and 11 (44 percent) did not include them; (D) 40 reported incentive awards, but 16 (40 percent) did not include them; and (E) 22 reported employee-recognition awards, and 12 (54 percent) did not include them. Some of the establishments are included in more than one of the payment categories. Approximately 13 establishments did not report their payments in two of the categories; four establishments in three of the categories, and five establishments in four of the categories. Thus, 22 respondents accounted for half of the 106 unreported payments.

Table 1. Payment Reporting Errors

PAYMENT TYPE	GAVE PYMT.	DID NOT INCL.
Xmas bonuses	115	37
Executive bonuses	70	30
Merit Awards	25	11
Incentive Awards	40	16
Employee-recognition awards	22	12
TOTAL	272	106

Table 2 shows the reasons for payment omissions. Since the "all-payments" category includes some employers more than once, a separate column is included for one category, Christmas bonuses. Respondent difficulty reporting the payments due to the unavailability or limitations of records (categories 1, 5, 6, 7) accounts for the largest share of underreporting. Second, approximately 15 of the 106 omissions (category 2) are due to reporters simply forgetting the payment, a retrieval problem. In addition, of the 34 respondents who may have

understood that they should include the payments they left out (categories 1, 3, 5, 7, 8, 10), over a third checked the bonus and awards box no on the original survey form, indicating they did not make the payment.

Table 2. Reasons for Payment Omissions

REASONS	ALL PYMTS.	XMAS BONUS
1. No separate records for payment	29	13
2. Forgot it	15	7
3. Too time consuming	10	2
4. Did not understand survey	8	3
5. Too difficult to prepare	6	0
6. Included in payroll/W2	4	3
7. Unavailable from records	4	0
8. Confidential	4	0
9. Thought it meant cash/\$bills	4	1
10. Unavailable from this office	3	1
11. Other	19	5
12. Missing	4	2
TOTAL	106	37

As discussed earlier, establishments not reporting payroll items accounted for the largest proportion of those selected into the RAS sample. Table 3 shows the reasons given by respondents for not reporting the annual-payroll totals. RAS respondents were not at all clear that they were to provide payroll totals, shown by the overlooked or did not understand categories. Additionally, those reporters omitting production worker payroll had more difficulties with records, shown by the 21 reporting no separate records for production workers.

Table 3. Reasons for Payroll Omissions

REASONS	ALL EMP.	PROD. WRKR.
1. Overlooked it	37	59
2. Did not understand they were to provide it	17	24
3. Not available from this office	6	4
4. Too time consuming	4	9
5. Same as production workers/all employees	3	8
6. Unavailable from records	3	5
7. Don't know why	3	4
8. Too difficult to prepare	2	5
9. Not available at the time	2	5
10. Confidential	1	0
11. No separate records for PW	--	21
12. Other	5	9
13. Missing	0	6
TOTAL	83	159

Since the first two categories of overlooking and lack of understanding overlap, there was a great deal of confusion about providing the payroll totals. This is partly due to a form difference, shown in Table 4. The short form had the all-employee and production-worker payroll near the top, while the long form had it at the bottom. Of the RAS respondents who received the short form, 82 percent completed the all-employee payroll, as opposed to 72 percent of long form recipients. For the production worker payroll, 61 percent of short-form recipients completed the

item, compared to 49 percent of long-form respondents. Of the 33 respondents who reported overlooking both annual and production-worker payroll, 24 received the long form.

Table 4. Percent Completing Payrolls by Form Type

	Long Form	Short Form
All-Employee Payroll	72%	82%
Production-Worker Payroll	49%	61%

In summary, the main problem was not reporting payroll items. Payroll nonresponse was primarily caused by the respondent overlooking the item or not understanding they were to provide it. For production workers only, records unavailability was also a reason for payroll nonresponse. Item nonresponse for nonwage cash payments was less of a problem. Respondents indicated the primary reason for not reporting payments was records unavailability. Finally, errors of omission for bonuses and awards were uncovered by the RAS. Reasons for payment omissions included both records unavailability and respondents lack of retrieval of the payment.

### Survey Recommendations

#### Comprehension

1. Instructions should be made clearer. Abbreviated instructions should be located next to answer spaces.
2. The request for annual payroll from all reporters, regardless of whether they had payments, needs to be made clear by putting the request in a more prominent location.
3. The term "nonwage cash payment" should be defined clearly, and put in a prominent location on the survey form.

Mail and other self-administered surveys are heavily dependent on a respondent's reading and language abilities. However, there is research on format, language, and printtype, that identifies factors which can improve respondent comprehension. When designing forms, Wright (1980) recommends using a format similar to a question and answer dialogue, finding it is easier for the respondent. Redish (1986) suggests reducing the number of steps that a respondent has to take in filling out the form, which reduces burden and decreases nonresponse. Research on both household and establishment surveys indicates that questions and instructions are best placed together, as respondents immediately begin to fill in a form and do not refer to separate instructions (DeMaio and Bates 1989; Gower 1989). Along with other researchers, Wright (1980) points out that language should be easy to understand and free of jargon, and print should be legible.

These findings are applicable to the problems with comprehension found in the pretest and RAS. The survey format included instructions and definitions located on the back of the form, a standard practice in BLS establishment surveys. Given the complexity of what is requested, the details on nonwage cash

payments and payrolls are on the back, including a few questions, and category headings which suffice for questions. Further down the back page are instructions on how to complete the form. Since the instructions and question details are separated from the front-page answer spaces, comprehension problems in the survey have clearly been increased. For example, to follow survey instructions or know what is included in certain categories, the respondent has to xerox the back page of the survey to refer to, or flip back and forth as necessary. As another example, definitions for bonuses and awards are at the bottom of the back page. It is unlikely that a respondent will read and remember that information, given the location and the smallness of print. Increasing the size of the text would have enhanced its readability.

Since respondents do not readily refer to separate instructions, abbreviated instructions placed by the questions themselves might have solved some of the nonresponse problem. RAS respondents receiving the long form were less likely to provide the annual-payroll totals, stating that they overlooked it or did not understand they were to provide it. Many of these respondents had indicated in the yes/no questions that they did not have nonwage cash payments. Without any further instructions, it appears that respondents simply stopped at that point, rather than go on to the payroll section. It is likely that they thought since they had no payments, the rest of the form was not necessary to complete. The short form, requiring the totals at first, appears to have caught the respondent's attention, pointing to the importance of format in obtaining complete data.

The survey language appeared to be a problem in the pretests, in that respondents did not have general knowledge of what was encompassed by a "nonwage cash payment." Some RAS respondents reported an extremely narrow interpretation of nonwage cash payments, one of which was to include only cash bills. Another group of respondents did not report certain payments when in fact they gave them, saying they did not understand the survey. A global definition of nonwage cash payments, rather than only using specific examples, may have increased survey understanding.

#### **Retrieval**

4. Examples of payments should be included on the front of the form.

During the pretest, a number of respondents when cued stated that they simply forgot to report certain payment types. This finding was repeated in the RAS. Establishment surveys, assumed to be based exclusively on "hard" records data, had been exempted from concerns with respondent memory. However, the pretest and RAS results indicated that respondent memory was a factor contributing to nonresponse.

Certain changes to the survey format have the potential to aid retrieval. First, the definitions of nonwage cash payments are imbedded in text on the back page of the form. Placing the examples in the lists of nonwage cash payments on the back page could have decreased nonresponse, as persons have a greater recall when items are placed in a list, rather than text (Wright and Reid 1973). Second, memory

cues, i.e., examples of awards and bonuses could be added to the front of the survey form. The examples should probably be based on the most frequently given or largest monetary awards or bonuses, such as holiday awards or executive bonuses. While there may be a concern that only example payments will be elicited, site visits have not substantiated that. Asking a respondent if they have a particular type of payment seems to jar respondents' memories, and payments of the same category besides the examples are recalled.

#### **Response**

5. Experimentation using persuasive-communication techniques should be considered to increase respondent motivation.

In selecting a survey response, satisficing can occur: choosing a sufficient rather than ideal, thought-out response (Krosnick 1990). In a voluntary mail survey, motivation rests primarily with the respondent. In this paper, item nonresponse has been primarily interpreted as due to problems in comprehension and retrieval. An alternative possibility is that a number of RAS respondents reporting "no" to payments and leaving items blank were communicating that they did not wish to respond to the survey. Whether that is the case or not, the number of omissions suggest a potential problem with respondent motivation.

#### **Conclusion**

Given the limitations of individual research methods, it is best to utilize multiple methods to identify error in mail surveys. Both the pretest and the RAS were useful in finding survey weaknesses, but they identified different problems. Pretest findings indicated that respondents lacked a global understanding of survey terms, while the RAS identified more errors of omissions. The detailed questions from site visit respondents on what constituted a nonwage cash payment stand in contrast to the errors of omission of many RAS respondents. Pretest respondents had probably read the definitions quite carefully in preparation for the site visit; they may not have been so careful when completing the survey under real conditions. Given the pretest results, we did not think omission of payments would be a problem, but the RAS indicated otherwise. The two methods together proved useful.

Wright (1980) discusses four types of research methods that can be used for quality control checks on written information. They include: observational field studies, survey procedures, in-depth interviews, and laboratory comparisons. According to Wright, observational studies are important in seeing how forms are used, while surveys of users or records checks (RAS included here) and in-depth interviews (such as the pretest) isolate unclear terms and concepts. Observational studies could have been utilized in this research, but as with in-depth interviews, they must be limited in number due to their time and expense. Wright points to laboratory comparisons as potentially useful in measuring the effect of a change in language or layout. Comparisons are frequently used outside of a laboratory in survey field experiments, where question wording and position are varied to see the effect on responses. Although the purpose of the two

forms in the survey was not to measure format effects, they were valuable in identifying comprehension problems.

In conclusion, this study provided an opportunity to use a theory from cognitive psychology outside of a laboratory setting to improve survey quality. Through the use of such methods as pretesting and a response analysis survey, problems with comprehension, retrieval and judgment were identified, and solutions were recommended. Information processing theory and retrospective think-aloud techniques were found to be useful in guiding the study, and further BLS work on establishment mail surveys is now underway.

#### End Notes

The author wishes to thank Darrell Philpot for his assistance with this research.

#### References

DeMaio, Theresa J. and Nancy A. Bates. (1989). Using Cognitive Research to Improve the Design of the Decennial Census Form. Presented at the Fifth Annual Conference (ARC-V), Arlington, Virginia.

Gower, Allen R. and Ruth Dibbs. (1989). Cognitive Research: Designing A Respondent-Friendly Questionnaire for the 1991 Census. Presented at the Fifth Annual Conference (ARC-V), Arlington, Virginia.

Krosnick, Jon A. (1990). The Impact of Satisficing on Survey Data Quality. Presented at the 1990 Census Bureau Annual Research Conference, Arlington, Virginia.

Tourangeau, Roger. (1984). Cognitive Sciences and Survey Methods. Pp. 73-100 in Thomas B. Jabine, Miron L. Straf, Judith M. Tanur and Roger Tourangeau (eds.), Cognitive Aspects of Survey Methodology: Building a Bridge Between Disciplines. Washington, D.C.: National Academy Press.

Wright, Patricia. (1978) Feeding the Information Eaters: Suggestions for Integrating Pure and Applied Research on Language Comprehension. Instructional Science 7:249-312.

Wright, Patricia. (1980). Strategy and Tactics in the Design of Forms. Visible Language 14:151-193.

Wright, Patricia and Fraser Reid. (1973). Written Information: Some Alternatives to Prose for Expressing the Outcomes of Complex Contingencies. Journal of Applied Psychology 57:160-166.

Wright, Patricia and P. Barnard. (1975). 'Just fill in this form'-a review for designers. Applied Ergonomics 6:213-220.