

**ADAPTING COGNITIVE INTERVIEWING METHODOLOGIES
TO COMPENSATE FOR UNIQUE CHARACTERISTICS OF ESTABLISHMENTS**

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1. INTRODUCTION

When attempting to conduct cognitive interviews with business respondents, we have often run into the following problems:

- In many cases, business respondents will not complete the form in the presence of a cognitive interviewer, often because it is difficult or inconvenient to access the relevant records. This limits our ability to conduct concurrent think-alouds.
- Business respondents may be willing to complete a form that's been mailed to them in advance if it's simple, but not if it's complex. This makes it difficult to use retrospective debriefings.

Because of these obstacles, we have adapted traditional cognitive interviewing methodologies for use with establishment surveys in the following ways:

- 1) asking probes in a hypothetical manner, e.g., “what would you do...?,” and
- 2) developing vignettes that mimic business situations for a hypothetical company and asking the respondent to complete the form in our presence using these data.

This paper will describe our use of these methods on two establishment surveys – one testing the layout of a form and the other testing questions and instructions for a highly technical concept. We will illustrate the success of these methods with establishment respondents and discuss some limitations of inferences from the results.

2. USE OF HYPOTHETICAL PROBES

Cognitive interviewing typically utilizes probes to explore respondents' thought processes during cognitive debriefings. Typical probes are of two types: 1) meaning probes (tell me in your own words what this question is asking/what this term means in this question) and 2) process probes (how did you arrive at your answer?). In household surveys, these probes are utilized in “real time”

either during or immediately following respondent's completion of the survey question.

In many cases on Census Bureau economic surveys, our questions require the reporting of figures, such as employment, payroll or revenues, which require consultation of records. These types of questions also contrast with closed-ended questions offering response categories. Therefore, respondents may be unable to provide an answer if records are not available during the cognitive interview. In these cases, we often use hypothetical probes to supplement standard meaning and process probes. We still ask the basic meaning probes (e.g., “tell me in your own words what this question is asking” and “tell me in your own words what “term” means in this question”), the remaining probes about the response process/strategy are phrased in a hypothetical manner, such as:

- “How would you come up with an answer to this question?”
- “Where would you go in your records to get this information?”
- “Who in your company would you go to to get an answer to this question?”

Sometimes, respondents do not have their record books available, or are not willing to show them to us. In these cases, we use descriptive and hypothetical probes to determine how their records are organized, such as:

- “What types of files (electronic and paper) do you have?”
- “What kind of accounts are there?”
- “Does this item appear in your records? Could you pluck it directly from records to enter on the questionnaire or would you have to do some sort of calculations? Please describe.”
- “Explain how these records are organized. Describe the items that are in your records.”

For these types of probes, it is helpful for the cognitive interviewer to have base knowledge about the subject area as well as knowledge of how records are generally kept. This knowledge allows the interviewer to know what types of questions to ask. For example, when

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asking about expenses for temporary employees, an interviewer would need to know there are expense accounts and payroll accounts in order to probe appropriately. Familiarity with accounting practices is also helpful in using hypothetical probes for these types of questions (see Willimack, Nichols & Sudman, 1999).

3. USE OF VIGNETTES

3.1 Literature

Cognitive interviewing has been a valuable tool for developing questionnaires, especially for surveys of households and individuals. This same tool can also be used to develop and improve questionnaires for business establishments. Indeed, the same cognitive interviewing methods used for individuals can also be used for businesses: think-aloud techniques, vignettes, and probes.

The process a business respondent goes through to fill out a survey is similar to that of an individual, but with the added complication of needing to access information from external sources (Edwards and Cantor, 1991). It is precisely because of this additional burden that establishment survey forms should be clear in terms of the information being requested. Cognitive interviews are one way of determining how to present requests for information to respondents. One of the purposes of the cognitive interview might be to determine how easy it is for respondents to access the information needed (Gower and Nargundkar, 1991).

Cognitive interviews have also been used to test questionnaire formatting and layout. Jenkins and Dillman (1993, 1997) addressed issues of visual language in addition to verbal language, outlining principles for designing respondent-friendly questionnaires, including placement of instructions and explanatory information so respondents will read them. Von Thurn and Moore (1994) also researched format issues, related to the American Housing Survey. Zukerberg and Lee (1997) discussed steps taken in a particular survey to make it look less burdensome and more attractive.

A vignette is a tool that allows researchers to study respondents' understanding and treatment of a survey instrument. Traditionally, vignettes have been used in cognitive testing for household surveys. They are often presented as short narratives that describe a particular situation of interest (Gerber, 1996). Respondents are asked to interpret the situation and then apply it to the survey instrument being studied. We adapted this approach to study how respondents interpret wording and layout in a business survey.

Other literature referencing vignettes in cognitive testing include a study for the 2000 Decennial Census exploring how respondents identify members of the household (Gerber, Wellens & Keeley, 1996). Vignettes have also been used by the Bureau of Labor Statistics to

understand how respondents define "working" (Stinson or other BLS staff, 19xx). There has been some previous undocumented use of vignettes in establishment surveys.

3.2 Use in the Economic Directorate at the Census Bureau

In the Economic Directorate of the Census Bureau, we have used vignettes in cognitive interviewing for two different purposes:

- 1) To bypass the difficulty of accessing records during a cognitive interview, and
- 2) Because we weren't confident we would face the problems we were concerned about with the limited number of respondents selected for cognitive testing.

We have found vignettes helpful in the case of a long, complex form, where it would take too much time during the cognitive interview for the respondent to access all the appropriate records and answer questions. In addition, we have not been able to convince respondents to complete such forms before the cognitive interview.

To use vignettes, we mock up several scenarios covering potential problem situations so we can watch as respondents are faced with them. We observe the respondent's reaction as well as the process that they use when taking the data from the vignette and transferring it to the form (sometimes after altering it to fit on the form being tested). We are most interested in seeing what happens at the judgment step of the cognitive response process.

4. EXAMPLES

We will now describe our use of these methods in two cognitive studies. The first study used hypothetical questions to learn about reporting strategies for a complex form which would have required hours to complete. Vignettes were also used to enable observation of the judgment and communication steps. The second study used vignettes to facilitate exploration of a difficult, complex technical concept.

4.1 Economic Census for Manufacturing Industries

The census of manufacturing industries, part of the Economic Census, is a mandatory mail-out/mail-back census sent to approximately 280,000 multi- and single-unit establishments every five years. The purpose is to provide periodic statistics about manufacturing establishments, activities, and production. Forms for manufacturing industries have traditionally used a tabular format, internally referred to as a "spanner," to display ordered levels of detail for collecting data.

Other industries typically indent this information on their forms. The census of manufactures collects up to five levels of product detail and does not allow for

aggregate reporting. See Figures 1 and 2 for examples of the tabular and indented layouts.

In planning for the 2002 Economic Census, efforts were made to achieve consistency in forms design across various industries. Therefore, it was proposed that the manufacturing forms be converted to use indentation to collect product line data. However, the manufacturing subject experts were concerned about the potential for misreporting called first-line bias, the reporting of aggregate data on the first detailed line available. The primary objective in testing the redesigned forms was to learn about the potential for first-line bias under indentation.

From February - April, 2000, cognitive interviews were conducted on-site with respondents from 17 single and multi-unit establishments in three different industries with past reporting problems. Two different methods were used to evaluate both the "spanner" and indented layouts: 1) think-aloud and debriefing and 2) vignettes. Half of the respondents first received the original, tabular version to complete using their company's data, while the other half received the indented layout. A think-aloud method was used to encourage respondents to talk out loud when reading questions, locating data in their records and entering data onto the form. Primarily hypothetical probes were used to explore respondents' thought processes regarding the items of interest.

Although we had sent respondents copies of the form and asked them to complete it in advance, none had. A few had completed a subset of the items, but none had responded fully. Because of the length and complexity of the questionnaire, we could not expect respondents to complete the entire form in our presence. If they had, we would not have had time left for probing or discussion, failing to touch on the issues of importance to our study. Therefore, the use of hypothetical probes and vignettes was critical to the success of the cognitive interviews for this project.

Vignettes were then used on the format not yet tested. To ensure that our vignettes were comprehensible to the respondents, separate vignettes were developed for each of the three industries being studied. The vignettes were presented as mock internal documents from a fictitious company and contained product descriptions and values (see Figure 3 for example of vignette for this study).

The vignettes were designed to encourage respondents to make difficult choices that might result in first-line bias. That is, the data provided in the vignette did not match exactly the categories requested on the form. In some cases, aggregation of multiple items were provided in the vignette, without appropriate detail breakdowns. In addition, we required that each respondent write numbers down on the form, as if they were completing a form with their own data. This

allowed for an evaluation of whether the "spanner" or indented versions were related to the likelihood of a respondent entering data incorrectly.

Additional scripted and impromptu follow-up probes were asked after respondents completed each vignette. These probes focused on the layout and navigation of each form. Respondents were then asked to make a comparison between the two forms in terms of ease and clarity and were asked which format they preferred.

In general, we found in the cognitive interviews that entering aggregate level data on the first detailed line was not related to the layout of the form. Cognitive testing did not indicate that the indented version of the economic census would result in an increase in measurement error for the manufacturing establishments studied.

The use of vignettes was able to show how respondents react to a forms' layout even though (purposefully) the data provided within the vignette did not fit perfectly within the available answer categories. Differences in a respondent's reporting behavior due to the change in formatting were not seen although the respondents used different methods for determining how to report the data given in the vignette. Many respondents chose to split the aggregated totals from the vignette among the detailed choices, equally or based on the estimated percentage in each subcategory. Many respondents made an informed decision on which detailed line to report the aggregated total, basing these decisions on their knowledge of the industry or on a sense of which product subcategory was the largest. A few respondents did report aggregated data on the first detailed line, but they did so equally on either version. These decisions were not related to the tabular or indentation layout of the form.

Overall, respondents were reluctant to take the time to access their records to complete the form. Therefore, using vignettes allowed the researchers to observe the respondents using the different layouts to determine how to enter their data.

4.2 Economic Census Co-employment Questions

Co-employment (also known as "employee leasing") is an employment arrangement where an employee leasing firm contractually assumes responsibility for managing key human resource and employer services for a client firm. Functions handled by the leasing firm include payroll, employee benefits, unemployment and workers' compensation. For employees, the transfer to an employee leasing firm is almost transparent because their original employer retains the supervisory role.

In order to maintain consistency in employment figures, the Census Bureau has decided to request information about co-employees on the 2002 Economic Census form. This way, co-employees will be

summarized in the industry and county where they actually work, rather than as employees of the leasing company.

However, co-employment arrangements are rare (approximately xx% in 19xx, expected to grow to yy% by 2001). In addition, while “co-employment” is the terminology advocated by the employee leasing industry, we were uncertain how pervasive this terminology was and whether co-employers would recognize themselves in the questions. Furthermore, there are a variety of alternative arrangements by which people can work at businesses, such as temporary employees, contract employees and consultants. In addition, not a small number of firms use payroll services that do many of the same functions as leasing firms, but without reporting the client company’s employees under their Employer Identification Number. Both co-employers and non-co-employers could confuse these alternative arrangements with co-employment, resulting in measurement error in employee and co-employee counts. Because of this concern about the method and wording used to ask about co-employees, cognitive interviewing was conducted.

Our goal in the cognitive interviewing was to understand the cognitive processes used by respondents in completing the draft employment and payroll section of the Economic Census form in order to identify potential problems with the form’s wording or layout, paying particular attention to proposed references and questions related to co-employment. Essentially, we were trying to understand how respondents understand and interpret a very difficult, technical concept in order to ease reporting for respondents with and without co-employees.

From January - March, 2001 we conducted forty cognitive interviews with establishments in seven industries. Respondents represented co-employers, non-co-employers and Professional Employer Organizations (PEOs, that is, leasing firms).

Respondents were asked to complete the employment and payroll section with data for their firm. This section essentially requested number of employees/co-employees during the pay period including March 12 of the reference year, number of production workers in manufacturing/mining industries, and annual and first quarter payroll. Respondents were then asked to complete the same section for hypothetical companies described in five vignettes, which outlined various employment arrangements (see Figure 4 for examples of vignettes used). We then probed respondent’s definitions and distinctions among co-employees, “leased employees,” temporary employees, contract employees and consultants.

In this case, because we were essentially testing less than 10 questions that were not overly complex,

respondents were able to answer the key questions during the interview. Many respondents referred to records to retrieve employee counts and payroll figures. In a few cases, respondents described how the data appeared in records and any necessary calculations, in response to hypothetical probes such as those in Section 2.

Our use of vignettes to supplement the think-aloud and debriefing did allow us to more naturally draw out respondents on their interpretations of various types of employment arrangements. Although we tried to probe on these topics during the earlier part of the interview, we found that respondents were much more willing to discuss their knowledge of these employment arrangements once the vignettes raised them. Often, respondents had not used these other types of employment arrangements in their current job (or in the last year) so discussion of these arrangements did not come up in response to the questions. However, when they came up during the vignettes, we noticed that respondents articulated their knowledge easily. They often reinterpreted the information provided in the vignettes in the context of their company or industry, which we found to be quite beneficial.

Use of vignettes in this cognitive testing helped us sort out respondents’ defining criteria for temporary help, contracting, leasing, etc., as well as their interpretation of other related activities, such as use of payroll services, and terms, such as “outsourcing.”

The primary conclusions from our cognitive testing were that 1) it was necessary to ask about employment and co-employment in two separate questions and 2) the terms “leased employees” and “leasing company” be used instead of the cognitively more difficult “co-employment” and “PEO” terms.

In addition, we found it was important to specify types of employment arrangements which should be excluded under leasing. It was less important that respondents correctly understand the actual, technical definition of leasing. Respondents who were co-employers or who were familiar with employee leasing understood the questions when they were framed in terms of leasing. Both co-employers and non-co-employers were further assisted by instructions to exclude other employment arrangements, which were listed specifically by name. While respondents unfamiliar with employee leasing were rarely accurate in understanding what leasing is, this “exclude” list helped them to correctly assess that they should not report these alternative arrangements in questions on leasing, and they also knew they didn’t have leasing, even though they could not define it correctly.

5. LIMITATIONS AND IMPLICATIONS FOR INTERPRETATION

Using either of these two methods – hypothetical probes or vignettes – does have some limitations regarding the interpretation of results:

- 1) Respondents may feel obliged to answer. As a result, they may construct an answer that might not have occurred to them otherwise.
- 2) Some respondents felt that they were being tested when answering the vignettes. Although we reassured them that there were no right or wrong answers, it seemed they still had this underlying feeling.
- 3) We purposely made the vignettes somewhat vague, which some respondents found frustrating. This allowed us to explore their interpretations of multiple scenarios (e.g., if interpretation #1 then this answer, if interpretation #2 then this answer). In addition, we were able to see how respondents interpreted the vignettes, in the context of different industries or kinds of business. This ended up being a benefit to us, enabling us to learn more about the effect of the industry on the interpretation of various terms, their use of different arrangements for different purposes, language to describe these arrangements, etc.
- 4) Similarly, it is the nature of vignettes that respondents are reporting for other than their own entity. This again lead to interpretation, which provided us with lots of colorful information. This enabled us to discern criteria that define the various employment arrangements. We used this information to specify instructions in the “exclude” list. For example, we discovered that an “exclude” bullet of “Purchased or managed services, such as janitorial, guard, or landscape service” was too specific in that all the examples listed were blue-collar occupations. In interpreting the vignettes, respondents were not excluding white-collar purchased or managed services, such as accountants or computer programmers. We recommended adding an additional “exclude” bullet: “Professional or technical services purchased from another firm, such as software consulting, computer programming, or engineering or accounting services.”
- 5) In the case of the hypothetical probes, it may be that we are getting an estimate of their best behavior. Short of being a fly on the wall, we can never know whether respondents will actually do what they have told us. However, we suspect in cognitive interviewing in general we are already likely getting respondents’ “best” behavior, for two reasons: 1) these are helpful people who have agreed to do a cognitive interview; and 2) they may be trying to keep up appearances in front of their visitors.

6. CONCLUSION

In conclusion, we feel that the use of these two particular strategies – hypothetical probes and vignettes – helped overcome obstacles faced while conducting cognitive interviews in the establishment setting. We believe that these methods are tools that can be used while conducting cognitive interviews, in particular for business surveys. We have yet to observe any particular downside to the use of hypothetical probes and vignettes to supplement traditional cognitive methods.

We recommend the use of these methods for other business surveys and encourage further research into their effectiveness in particular applications. We also welcome additional research into other alternative methods for studying the reporting behavior of establishments.

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Figure 1: Example of Tabular Layout (aka “Spanner”) Used for Cognitive Tests (Elec. Comp. and Accessories)

Item 18B. PRODUCTS AND SERVICES OF THIS ESTABLISHMENT DURING 1997 – Continued								
Line No.	Products and services *Item corresponds to products reported on Current Industrial Reports			Census product code	Unit of measure for quantities	Products shipped and other receipts		
						Value, f.o.b. plant (E)		
	(A)	(B)	(C)	(D)	Millions	Thou- sands	Dollars	
63	Steel Nails, Staples, Tacks, Spikes, and Brads, Made in Plants That Draw Wire	Round wire nails, collated, prepackaged * (CIR MA33B, item code 1773, pt)	33152 51 3	Short tons		\$		
64	ROUND WIRE NAILS, NOT COLLATED, SMOOTH SHANK * (CIR MA33B, item codes 1773, pt)	Coated, plated, or painted	33152 52 1					
65		Galvanized	33152 53 9					
66		Vinyl, resin, or cement coated	33152 54 7					
67		Other	33152 55 4					
		Not coated, plated, or painted						

Figure 2: Example of Indented Layout from Economic Census - Services Sector

Item 9. SOURCES OF RECEIPTS – Continued					
Sources of receipts	Cen- sus use	ESTIMATES are acceptable. Report dollars OR percents.			
		Mil.	Thou.	Dol.	Per- cent
a. Wired telecommunications services receipts – Continued	400	401			402
2. Long distance services					
(a) Standard long distance service	7521				
(b) 800/888 service	7522				
(c) 900 service	7523				
(d) Other long distance service – Describe					
075	7524				
3. Network access receipts (including subscriber line charges and local inter-exchange carrier charges)	7540				
4. Telegraph and other wired telecommunications services – Describe					
077	7560				

Figure 3: Example of Vignette Used for Census of Mfg Cognitive Interviews (Elec. Comp. and Accessories)

ABC Widgets, Inc.
123 Street
Washington, D.C. 12345
Phone: (202) 123-4567

PRODUCT SHIPMENT REPORT

Instructions: Please take the information below and put it into the correct place(s) on form MC-3621 or form MC-33421(X).

Date	Description	Quantity	Value of Shipments	TOTALS
1/97-12/97	Etch	NA	\$ 3,145,000	\$ 3,145,000
1/97-12/97	Strip	NA	\$ 2,451,000	\$ 2,451,000
1/97-12/97	Aligners	NA	\$ 987,000	\$ 987,000
1/97-12/97	Vapor deposition	NA	\$ 1,541,000	\$ 1,541,000
1/97-12/97	Voltage ion implanters	NA	\$ 2,598,000	\$ 2,598,000
1/97-12/97	Polishing machines for semiconductor wafers	NA	\$ 751,000	\$ 751,000
1/97-12/97	Focused ion beam milling machines	NA	\$ 541,500	\$ 541,500
1/97-12/97	Machines that cut blank semiconductor wafers	NA	\$ 4,212,000	\$ 4,212,000
1/97-12/97	Die and wire bonders	NA	\$ 3,457,000	\$ 3,457,000
	TOTALS		\$ 19,683,500	\$ 19,683,500

Figure 4: Examples of Vignettes Used for Co-Employment Cognitive Interviews

JKL is a large telecommunications company with 300 workers. JKL has outsourced its data processing department to MNO Computing Inc. which provides all 40 computer specialists in JKL’s data processing department. Where should the 40 computer specialists and 260 other employees be reported on the Economic Census form?

Widgets.com manufactures custom widgets, and sells them online. Widgets.com has 20 part-time employees, who are leased from Leasing Services International. Where should the 20 employees be reported on the Economic Census form?