

# What Is Gained by Asking Retrospective Probes after an Online, Think-Aloud Cognitive Interview?<sup>1</sup>

September 2020

William Mockovak

Bureau of Labor Statistics, 2 Massachusetts Ave, N.E., Washington, DC 20212

## Abstract

Recent research (Behr, 2012; Meitinger and Behr, 2016; Lenzer and Neuert, 2017) has demonstrated that cognitive testing can be moved online through the use of web-based probing. Researchers note that the benefits of web probing include faster and less expensive recruiting; access to more diverse and larger sample sizes that can lead to an estimate of measurement error; and by using a self-administered mode, the control of interviewer effects, thereby increasing the reliability and comparability of results. Additionally, findings suggest that web probing and cognitive interviewing uncover similar problems that ultimately lead to the same question revisions. However, in discussing limitations of their study, Lenzer and Neuert (2017) mention that, of several possible cognitive interviewing techniques, they applied only one technique: verbal probing. They also suggest that given the technical feasibility of creating an audio and screen recording of a web respondent's answering process, future studies should look into whether web respondents can be motivated to perform think-aloud tasks while answering an online questionnaire.

Fortunately, online platforms currently exist that can provide the functionality described by Lenzer and Neuert. These platforms provide an audio and screen recording of a participant completing online tasks,<sup>2</sup> and have been used successfully to conduct think-aloud, cognitive interviews (Mockovak and Kaplan, 2016). This study demonstrates how one of these platforms was used to conduct a think-aloud test of survey questions that asked about the cognitive demands of occupations. The study also expanded the research objective by demonstrating the additional benefits of asking retrospective probe questions after the think-aloud procedure. This objective ties into the greater challenge of identifying best practices when testing questions online.

Twenty five cognitive interviews were successfully conducted. A total of 41 potential problems were uncovered, with 78% (32) identified in the think-aloud section, and an additional 22% (9) problems identified in the retrospective, web-based probing section. The types of problems identified dealt mostly with comprehension and response-selection issues. Findings agreed with results obtained in a field test of the interviewer-administered questions, with results from both studies being used to revise the survey questions.

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<sup>1</sup> Paper presented at the General Online Research Conference, Berlin, Germany, September 2020 (conducted virtually).

<sup>2</sup> [www.TryMyUI.com](http://www.TryMyUI.com). This platform was created to conduct usability testing, but can be adapted for unmoderated, self-administered cognitive interviewing.

## 1. Introduction

Although cognitive interviewing is a very popular tool for evaluating survey questions and has attained the status of an industry best practice (Blair and Brick, 2009), researchers have long noted that there is a lack of agreement about what cognitive interviewing is, as well as what constitutes best practices (Blair and Presser, 1993; Presser et al. 2004; Beatty and Willis, 2007). However, one clear trend is that cognitive interviews have progressed from the simple think-aloud protocol introduced by Ericsson and Simon (1980) to variations that use embedded, spontaneous, or retrospective probing (Beatty and Willis, 2007).

Standardization and identification of best practices are seen as desirable goals in qualitative research because when procedures are kept constant it's more likely that results will be confirmed if a study were replicated. Attempts have been made to provide more formal guidance for conducting and reporting results from cognitive interviews. For example, the U. S. Office of Management and Budget (OMB) sponsored an interagency committee that produced standards and guidelines for agencies that conduct cognitive interviewing studies within the federal statistical system.<sup>3</sup> However, although these high-level standards provide some general guidance, they do not address best practices for conducting cognitive interviews, which still vary widely among practitioners in federal agencies.

While the debate about what constitutes best practices in face-to-face cognitive interviewing remains unresolved, researchers have already moved to the use of online cognitive interviewing with web-based probing, which offers its own set of benefits, challenges, and practices.

Researchers argue that the benefits of web probing include faster and less expensive recruiting; access to more diverse and larger sample sizes that can lead to an estimate of measurement error; and by using a self-administered mode, the control of interviewer effects, thereby increasing the reliability and comparability of results. Additionally, some research suggests that web probing and cognitive interviewing uncover similar problems that ultimately lead to the same question revisions (Behr, 2012; Meitinger and Behr, 2016; Lenzer and Neuert, 2017).

Among the disadvantages of web probing, Lenzer and Neuert (2017) note that no additional probes can be asked, an interviewer is not present to motivate respondents, and a relatively large proportion of web respondents (14%) satisfice by not providing good answers to probing questions, or by simply skipping the probing questions altogether.

In discussing limitations of their study, Lenzer and Neuert (2017) mention that, of several possible cognitive interviewing techniques, they applied only one technique: verbal probing. They also suggest that given the technical feasibility of creating an audio and screen recording

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<sup>3</sup>[https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/directive2/final\\_addendum\\_to\\_stat\\_policy\\_dir\\_2.pdf](https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/directive2/final_addendum_to_stat_policy_dir_2.pdf)

of a web respondent's answering process, future studies should look into whether web respondents can be motivated to perform think-aloud tasks while answering an online questionnaire.

Online platforms currently exist that provide some of the functionality described by Lenzer and Neuert. For example, some online platforms provide participants who are used to thinking aloud, as well as audio and screen recordings of a participant completing online tasks.<sup>4</sup> Moreover, such platforms have been adapted to conduct think-aloud, cognitive interviews when used together with other software for presenting the instructions and survey questions (Mockovak and Kaplan, 2016).

As noted by Willis (1999), cognitive researchers are increasingly using verbal probing as an alternative to the think-aloud interview. Willis goes on to identify two general types of verbal probing: (1) *concurrent* probing, and (2) *retrospective* probing. To quote Willis, "With concurrent probing, the interchange is characterized by the:

- a) Interviewer asks the survey question.
- b) Subject answers the question.
- c) Interviewer asks a probe question.
- d) Subject answers the probe question.
- e) And, possibly, further cycles of (c-d).

In retrospective probing, on the other hand, the participant is asked the probe questions after the entire interview has been administered (sometimes in a separate part of the interview known as a 'debriefing session')." As researchers continue to strive to identify best practices, a methodological question facing the use of web probing is do these approaches differ in effectiveness? For example, Meitinger et al. (2018) showed that the order of different types of follow-up web probes had an impact on response quality.

In line with Lenzer and Neuert's suggestion (2017), the present study directly explores the evaluation of survey questions through the completion of think-aloud tasks guided by an online questionnaire (instrument). However, this study expands the scope of the research objective by demonstrating the additional benefits provided by asking retrospective probe questions after the think-aloud procedure. Key research objectives were to determine how well a self-administered, unmoderated approach to a think-aloud, online cognitive interview worked; how much additional information was provided by the use of follow-up, retrospective web-based probing questions; and how well the general findings agreed with the results of debriefings and other analyses conducted as part of a traditional field test.

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<sup>4</sup> [www.TryMyUI.com](http://www.TryMyUI.com). This platform was designed to conduct usability testing, but has been adapted for unmoderated, self-administered cognitive interviewing

## 2. Method

This study tested 13 questions that asked about the cognitive demands of occupations, but as will be explained shortly, due to time limitations only nine questions were probed retrospectively. Since the question-presentation capabilities of the online platform used (TryMyUI) were limited, SurveyMonkey was used to display the instructions, survey questions, and retrospective probes to participants.<sup>5</sup> Once participants completed the SurveyMonkey instrument, they returned to the TryMyUI platform to complete some follow-up questions and to close out the case.

As shown in Section 1 in Figure 1 below, participants first completed 13 questions online using a think-aloud cognitive interviewing procedure with **no** embedded probes (Ericsson and Simon, 1980). The think-aloud procedure was used first because it avoids the problem of introduced artificiality described by Willis (1999), since the use of probe questions could change a respondent's thought processes and behavior. Participants were given the following general instruction at the beginning of Section 1:

### Introduction Preceding Section 1:

Please read each question out loud. As you answer the question, please point out anything that is potentially vague or confusing about the question or the possible answers. On the other hand, if a question is easily understood, please mention that as well.

In Section 2, retrospective probes were asked about nine of the questions. Participants were told that the purpose of this section was to ask a few clarifying questions to help researchers better understand how participants interpreted each question. Participants were also given the instruction, which was read out loud, that they did not have to repeat comments already made about a question in Section 1, and that if they had already addressed an issue raised by a retrospective probe, they could just skip the question. These instructions are shown below and led to participants largely avoiding duplicative comments in Section 2.<sup>6</sup>

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<sup>5</sup> SurveyMonkey - <https://www.surveymonkey.com/>. A URL to a SurveyMonkey instrument was made available on the TryMyUI testing platform.

<sup>6</sup> Duplicate comments in Section 2 were rare, but if made, they were ignored.

## Introduction Preceding Section 2:

Those are all the questions. Now that you've had a chance to answer each one, we would like to ask you a few clarifying questions to help us better understand how you interpreted the question.

In this review, all of your answers will be verbal. You don't have to type anything.

If you have already commented on an issue, skip the question.

Take your time answering these questions. Don't worry if you run out of time.

Click *Next* to begin.

Section 2 of the protocol is a variation of the retrospective probing described by Willis (1999). Rather than have a cognitive interviewer read the survey questions and ask follow-up probe questions, the instructions, survey questions, and retrospective probes were presented using an online instrument and read out loud by each participant. Similarly, answers to the probe questions were spoken. An example of the use of retrospective probes for one survey question follows:

### Example of Retrospective Probes (blue italicized text) Used in Section 2:

The first question that you were asked is shown below in red. Please answer the questions in the blue text that follows by thinking out loud.

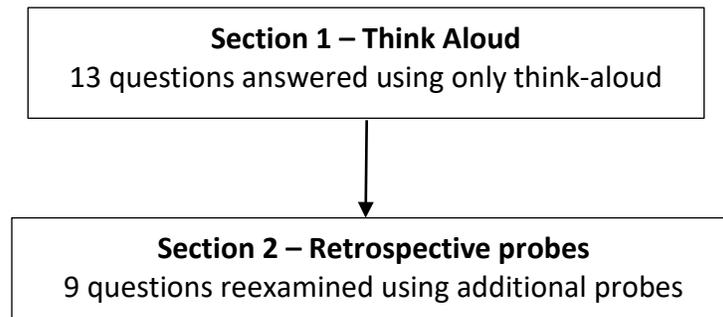
#### Question 1

How frequently is work checked in this job by a supervisor or lead worker?

*What does it mean to have "work checked" in the job of {Insert Job}?*

*Does the frequency of having work checked vary widely? If so, how did you arrive at your answer?*

Figure 1. Flow of Protocol



Only nine of the original 13 questions were probed in Section 2 to ensure that the entire protocol could be covered in 20 minutes, which was the maximum length of a testing session (and video) provided by the online platform when this study was conducted.<sup>7</sup>

To accommodate the time limit of 20 minutes for each session, only those questions judged to be most problematic, as identified in a prior expert review, were probed retrospectively.

***Participants.*** Participants were recruited through an online testing platform (TryMyUI) that also provided videotapes of each session. Each videotape records participants’ voices and shows their full screen and cursor as they progress through the interview. Twenty five people, who were either currently supervising a worker or had supervised someone recently in a past job, participated. The 25 participants in this study were judged to be experienced and comfortable with “thinking aloud,” since the company they work for supports a variety of online testing (primarily usability testing) that relies heavily on think-aloud observations. In addition, not only are participants comfortable with thinking aloud, they are also used to having their performance rated after a session. Participants comfortable with thinking aloud are not commonly available in many cognitive interviewing studies, so the findings in this study are constrained by that fact.

All 25 sessions were coded by a trained coder<sup>8</sup> using a system that assigned 14 codes organized into the following four general categories.<sup>9</sup> The complete coding scheme is shown in Attachment 1. A problem code was assigned when a respondent’s comment revealed difficulty understanding a question or expressed a difference in understanding versus the question’s stated intent. Multiple codes could be assigned to the same utterance. The codes identified possible problems with:

1. Question comprehension
2. Response selection
3. Retrieval

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<sup>7</sup> The site now offers plans that provide longer videos.

<sup>8</sup> Appreciation is expressed to Amy Swallow, who coded the data.

<sup>9</sup> Resources were not available to double code the responses.

4. Other (for example, positive comments, inconsistent answers)

Positive comments such as “this is a clear question” were coded, but are not summarized in this study.

### 3. Results

Only results for the nine questions that appeared in both Sections 1 and 2 of the protocol were analyzed. As shown in Table 1, two questions (“What most determines pace of work?” and “Describe work flow”) accounted for 34.4 percent of the problems uncovered in the pure think-aloud section, and all (100 percent) of the problems uncovered in the retrospective probing section. Overall, across both sections, these two questions accounted for 48.8 percent (20/41) of the total number of problems.

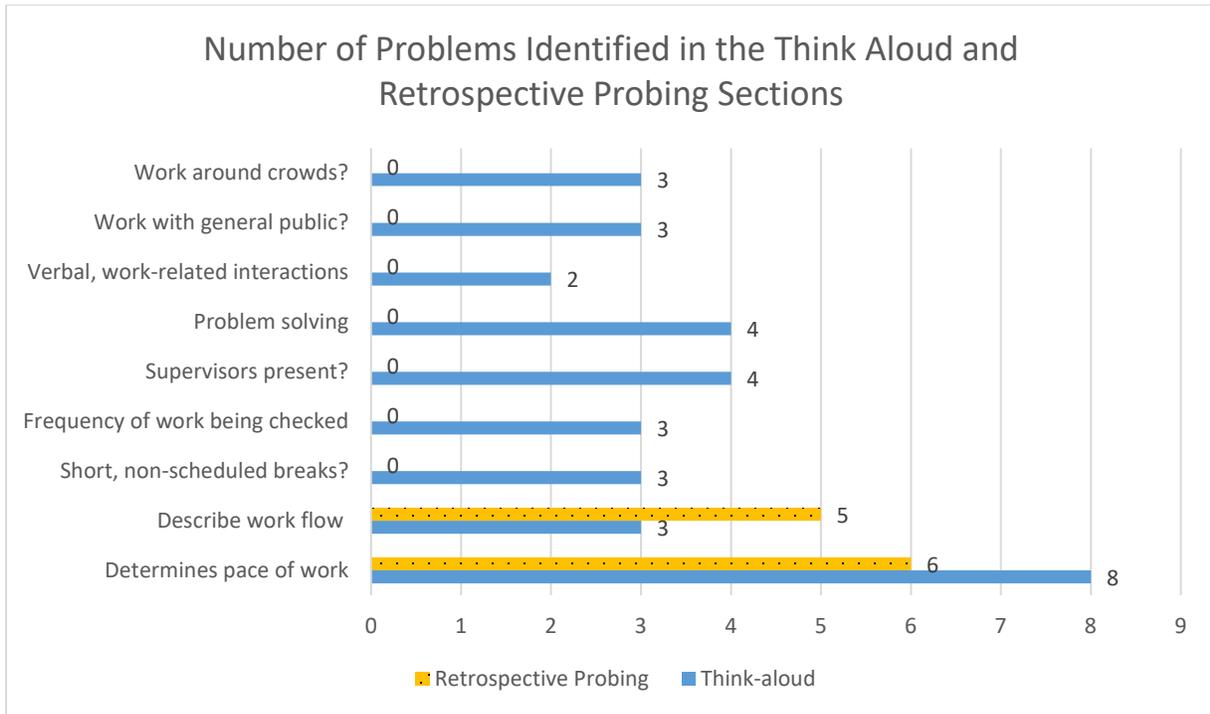
Table 1. Number of Problems Identified by Question and Section

Question*	Think-aloud	Retrospective Probing	Total
What most determines pace of work?	8	6	14
Describe work flow	3	3	8
Can take short, non-scheduled breaks?	3	0	3
What is frequency of work being checked?	3	0	3
Are supervisors present?	4	0	4
How often does problem solving occur?	4	0	4
How often are there verbal, work-related interactions?	2	0	2
Work with general public?	3	0	3
Work around crowds?	3	0	3
Total	32	9	41

\* Abbreviated questions are shown in Column 1

These results are also shown graphically in Figure 1.

Figure 1.



### 3.1. What types of problems were uncovered in the think-aloud and retrospective probing sections?

The next table shows the frequency of types of problems that were uncovered, along with how often they occurred. For the purpose of this study, all identified problems were given equal weight. As noted previously, most problems (32) were uncovered in the pure think-aloud section, whereas Section 2 uncovered nine additional issues.

Looking at the distribution of type of problem (e.g., comprehension, response selection, retrieval), the most common problem involved comprehension, which accounted for about 61 percent of all the problems.

When comparing the frequencies of types of problems uncovered in each section (for example, Comprehension vs. Response Selection vs. Retrieval vs. Other), about 30 percent more of the problems in Section 1 were classified as Comprehension vs. Response Selection. In Section 2, problems were equally divided between Comprehension and Response Selection. Although the distribution of the type of problem varied somewhat between sections, these differences were not statistically significant. As an aside, retrieval problems were likely not a major issue with the questions tested in this study because all of the questions were asked about jobs that a person supervised - hence, something that each participant was highly familiar with. Interestingly, a new type of problem (classified as "Other") was uncovered in the retrospective

probing section. However, this only occurred once and involved a participant giving inconsistent answers for two questions.

Table 2. Types of Problems Uncovered in the Think-aloud and Retrospective Probing Sections

	<b>Number of Problems in Think-aloud</b>	<b>Number of Problems in Retrospective Questions</b>	<b>Total in Sec 1 &amp; 2</b>	<b>% of Problems Overall</b>
Comprehension	21	4	25	61.0%
Response Selection	11	4	15	36.6%
Retrieval	0	0	0	0.0%
Other (inconsistent answer)	0	1	1	2.4%
Total	32	9	41	100%

Another variable that was investigated was the time taken to complete each section. A timer started after a participant finished reading the instructions for a section out loud and ended when the last question in that section was answered. Because a small number of participants had either very short or very long completion times, both median and average times were calculated and are shown in the next table.

Table 3. Average and Median Completion Times for Each Section (in minutes and seconds)

	<b>Average</b>	<b>Median</b>
Think-aloud	4:44	4:25
Retrospective	7:22	7:33

As shown in the preceding table, participants spent significantly more time in the retrospective-question section than in the think-aloud section taking; on average, two minutes and 38 seconds longer. On closer analysis, this outcome is not surprising because in addition to being asked to reread the original nine questions out loud, participants also read 12 retrospective probe questions out loud and then answered them. However, as noted previously, not all of the retrospective probe questions were answered because participants were told that they could skip a question if they had already addressed the issue in the think-aloud section.

#### 4. Discussion

Since conducting successful online, think-aloud cognitive interviews had been previously demonstrated (Mockovak and Kaplan, 2016), this study served as a replication of the approach with different types of survey questions and a different protocol (use of retrospective probes vs. embedded probes). The current study demonstrated once again that think-aloud cognitive interviews could be conducted successfully online with results that agreed well with other approaches. Most of the problems identified were linked to only two questions, and dealt with

comprehension and response-selection issues. Another objective of the study was to explore the added value of asking retrospective probe questions after completion of the think-aloud procedure. Use of these extra probe questions added additional information and uncovered an example of a new type of problem (inconsistent answers between two questions).

The current study explored the effectiveness of using a protocol that first used an online, think-aloud cognitive interview followed by the use of retrospective, web-based probing. Other approaches are, of course, possible and should be studied in an effort to identify best practices for online cognitive interviewing. For example, a future study could compare the use of concurrent (embedded) vs. retrospective probes with the same set of survey questions. However, an alternative approach such as the use of concurrent probing carries its own set of risks.

Concurrent probing by either an interviewer or using the Web interrupts the flow of an interview and can create artificiality (for example, by changing the questions' content and flow), a problem that the use of think-aloud interviews can presumably avoid (Conrad, Blair, and Tracy, 2000). As Conrad, Blair, and Tracy point out, it is possible that apparent problems with a survey question could be products of a unique interaction between cognitive interviewers and participants, rather than "real" questionnaire problems (Beatty, Willis, and Schechter 1997), or as in the current study, result from interactions between the cognitive-interview protocol and participants. The issue of artificiality raised by Conrad, Blair, and Tracy is the major reason why Oksenberg, Cannell, and Kalton (1991) proposed that follow-up probing, when used, should follow only a few questions in an interview to avoid interrupting the flow of the interview and possibly biasing answers to subsequent questions.

Web-based retrospective probing, as used in this study, largely avoids the problem of inducing artificiality because the probes come after all the survey questions have been asked. However, the risk still remains that when motivated participants see these additional retrospective probing questions they might feel the urge to mention minor problems to help the researcher or to "fix" the question. Trying to avoid this possible outcome is why participants in this study were asked to comment positively about questions when appropriate, as well as to point out possible problems. The instructions made it clear that if participants felt a question was clear and unambiguous, they should say so, and many often did.

Since this study was conducted concurrently with a field test of the same questions with 427 establishment respondents, results from both tests could be compared. Both tests identified the same problem questions, but feedback from the online study was more detailed, nuanced, and obtained much more quickly. In addition, the accompanying videos provided better examples about the specific types of problems that participants were encountering, and also improved communication because the videos could be shared among staff and used to highlight and discuss certain types of problems, as well as improve training.

Previous researchers (Behr, 2012; Meitinger and Behr, 2016; Lenzer and Neuert, 2017) noted that web probing and cognitive interviewing uncovered similar problems that ultimately led to

the same question revisions. That conclusion cannot be unambiguously reached in this study. When question revisions were made in this study, an interagency team decided what changes would be made based on the combined results of the field test data (e.g., analyses of response distributions), field economists' (interviewers') observations recorded in the field test, paradata, debriefings, and the online cognitive testing. The online testing was viewed as supplemental data, so the strongest statement that can be made is that the online testing did not contradict field test results and provided more detailed, supplemental feedback that could be used in training and field manuals.

As for the effectiveness of the online protocol itself, the use of retrospective probes identified a few additional issues with questions, and even a new category of problem (inconsistent answers) that had not been encountered in previous testing. For this reason, asking the retrospective probe questions was judged to be worthwhile even though they added significantly to the length of the protocol.

More generally, explorations of alternative approaches to online research are gaining momentum across the world. Recently, a U.S. federal government interagency team summarized research on the use of online testing for supporting survey-methods research and pretesting (Yu et al., 2019). This paper provides a foundation for thinking about when online testing methods are appropriate, guidance on how to use online testing methods to supplement and complement in-lab research, and case studies from experienced researchers using several platforms.

#### **4.1 Limitations**

Limitations of the current study are that it was a quasi-experimental study, there was a single coder (albeit experienced), and the results are limited to a set of survey questions and a unique online platform that provides participants skilled in thinking-aloud. Moreover, mode effects may affect the results, since in the actual survey the questions are asked face-to-face, whereas in this testing, they were read by the respondent. However, as noted previously, comparisons made between field testing results and the online testing showed consistency of findings between the approaches. In addition, some online tools allow audio files to be inserted, so a face-to-face interview could be simulated.<sup>10</sup>

Motivated participants comfortable with thinking aloud such as those used in this study are generally hard to find. Therefore, future research will be required to determine if similar results occur with other platforms and with participants who were not as comfortable and skilled with thinking aloud as those used in this study. With less skilled and motivated participants, online unmoderated thinking aloud might not have worked as well, or possibly at all, and the retrospective probes might have had a different impact.

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<sup>10</sup> According to its website, SurveyMonkey, which was used in this study, allows the insertion of video files, but not sound clips.

Motivation obviously plays an important role because in the current study none of the 25 participants failed to comment on a question or skipped a retrospective probe unless they had already commented on the issue raised in Section 1.<sup>11</sup> This behavior is quite different from that reported by Lenzer and Neuert (2017), where 14 percent of the respondents satisfied by not providing good answers to web-probing questions, or simply skipped the web-probing questions altogether.

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<sup>11</sup> Two participants ran out of time and were not able to answer the last retrospective probe question.

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## Attachment 1 – Coding Scheme for Participant Responses

### Question Comprehension

- a  **Question stem.** A comment was made that wording of the **question stem** was ambiguous, unclear, too abstract, or confusing
- b  **Response option.** A comment was made that wording of a question **response option** was ambiguous, unclear, too abstract, or confusing
- c  **Incorrect interpretation.** Respondent interpreted question incorrectly
- d  **Read question more than once.** Respondent read the question more than once
- e  **Long, wordy.** A comment was made that question was long or wordy

### Response Selection

- f  **Missing response.** None of the response option(s) applied; correct response option was missing
- g  **Struggled over selection.** Struggled with selection of best response option
- h  **Expressed uncertainty.** Answered question but expressed uncertainty or lack of confidence about accuracy

### Retrieval

- Don't know answer.** Entered (or stated) a “don't know” response
  - i  Reason: could not recall information
  - j  Reason: did not have the knowledge to answer question (e.g., was not sure how often employer reviews work)
- k  **Not relevant.** A comment was made that a question was not relevant to respondent
- L  **Recall difficulty.** The respondent had difficulty recalling, formulating, or reporting the answer

### Other

- M  **Positive comment.** A positive comment was made, for example, question was easy, straightforward, etc.
- N  **Inconsistent answer.** Answer to a current question is not in agreement with, or is inconsistent with, an answer to a previous question

### No problems

- O  **No problems.** No problems were noted