COMBINING COGNITIVE AND MOTIVATIONAL RESEARCH PERSPECTIVES FOR THE DESIGN OF RESPONDENT-FRIENDLY SELF-ADMINISTERED QUESTIONNAIRES[1]

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[1]Revision of a paper prepared for presentation at the annual meetings of the American Association for Public Opinion Research, St. Charles, Illinois, May 20-23, 1993. Cleo R. Jenkins is a Survey Statistician in the Center for Survey Methods Research, U.S. Bureau of the Census, and Don A. Dillman is Senior Survey Methodologist, Office of the Director, U.S. Bureau of the Census, and Professor and Director of the Social and Economic Sciences Research Center at Washington State University. The views expressed in this paper are those of the authors and are not necessarily those of the U.S. Bureau of the Census or Washington State University. Questions concerning this paper should be addressed to Cleo Jenkins, U.S. Bureau of the Census, 433 Washington Plaza, Building 1, Washington DC, 20233-4700 (301-763-7331).

Acknowledgments: The authors would like to thank Elizabeth Martin and Theresa J. DeMaio of the Center for Survey Methods Research, U.S. Bureau of the Census, for reviewing this paper and providing insightful suggestions.

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Cleo R. Jenkins and Don A. Dillman

Designing self-administered questionnaires involves communicating in a language that is not perfectly understood, yet alone formalized. By definition, language includes any system of symbols, signs, gestures, or the like, used or conceived as a means of communication. There is, for instance, the language of mathematics, with its well defined set of rules and notation, or the language of the deaf, with its set of systematized hand gestures. These are examples of language void of our commonly held notion of language as oral and written speech. In their book Human Problem Solving, Newell and Simon (1972) quote John Dewey:

> ...we must recall that language includes much more than oral and written speech. Gestures, pictures, monuments, visual images, finger movements--anything consciously employed as a *sign* is, logically, language.

Part of the reason for the undeveloped state of self-administered questionnaires may be due to the gap that exists between survey methodology and graphical design. For the most part, survey methodologists have concentrated their efforts on writing good questions; that is, they have concentrated on the oral and written aspects of speech, while independent of this, graphical designers have focused their efforts on the visual presentation of information.

To a large extent, writing good questions became the domain of survey methodologists because this sufficed in the construction of face-to-face and telephone-administered questionnaires. What could not be accomplished through writing became the interviewer's responsibility. They were charged with motivating respondents to complete the questionnaire, to provide an answer to every question, and to answer each question accurately.

Unlike face-to-face and telephone-administered questionnaires, however, writing good questions is necessary, but not sufficient in the construction of self-administered questionnaires. Without an interviewer to administer the questionnaire, the questionnaire must, in and of itself, effectively express the goals of the survey. As a result, the graphical presentation of information is every bit as important as the written aspect of a questionnaire.

In this paper, we attempt to bridge the gap between survey methodology and graphical design by presenting principles we think will improve both response rates and the accuracy of responses. Our principles address what we see as two necessary objectives. First, a questionnaire should be designed to aid respondents in their attempts to accurately answer the questionnaire and second, it should be designed to motivate them to respond. Thus, this paper draws upon two complementary bodies of research--cognitive psychology and motivational or influence psychology--in order to state design principles for self-administered questionnaires.

We begin with a brief review of questionnaire design research from a cognitive and motivational perspective. We then state and elaborate on 20 principles drawn from these perspectives. The response effects of these principles

remain generally untested at this time, and might best be considered reasonable hypotheses for improving response, lowering item non-response, and improving accuracy. Thus, a major reason for writing this paper is to encourage research on these important issues.

I. APPLICATION OF COGNITIVE AND MOTIVATIONAL RESEARCH TO QUESTIONNAIRE DESIGN

Since Tourangeau (1984) presented a cognitive model of the survey interview process, much has been written about the application of cognitive research methods to questionnaire design (e.g., Forsyth and Lessler, Forsyth and Hubbard, and Tanur and Fienberg, 1992; Jobe and Mingay, 1991 and 1989; Dippo, 1989; Lessler and Sirken, Loftus et al., and Tourangeau et al., 1985). Primarily, this body of research has focused on question (and/or response category) wording (and/or sequencing effects) in interviewer-administered questionnaires. Research efforts continue to be focused on these areas because they are seen as large contributors of measurement error in important national surveys, which tend to be interviewer administered. In addition, the effect of memory on data quality has been much studied for this same reason (e.g., Jobe et al., 1990; Lessler, 1989; Mathiowetz, 1988).

While it is equally important to understand these sources of error in self-administered questionnaires, it is not sufficient. In Tourangeau's question-response model, as well as other models of the survey interview process, the first step is specified as "comprehending the question." Depending on the model, different steps follow, but generally, "retrieval of the relevant facts, judgment, and finally, response" are mentioned. While "comprehending the question" is the first step in an interviewer-administered survey, the task is somewhat different in a self-administered survey. In a self-administered survey, respondents must first "perceive the information" before they can comprehend it. Once they perceive it, they must "comprehend the layout of the information" as well as "the wording of the information." Furthermore, respondents must comprehend much more than just the wording of the survey questions and response categories. In a self-administered survey, respondents are given from one to several pages of introductory material. Generally, this includes a cover page, a cover letter, global instructions, and definitions. Finally, in order to efficiently and accurately answer a self-administered questionnaire, respondents must comprehend directions that are meant to guide them through the form.

Early cognitive research suggests that measurement error arises when respondents misunderstand the presentation of information (e.g., Jenkins and Ciochetto, 1993; Jenkins et al., 1992a and 1992b; Jenkins, 1992; DeMaio and Jenkins, 1991; Bates and DeMaio, 1989; Gower, 1989). In fact, a thorough review of this literature suggests that relatively few errors in self-administered questionnaires arise strictly from the effects of question wording or ordering. According to the results of this research, most errors are in some way associated with the graphical presentation of the information. The primary objective of cognitively based questionnaire design research--specifically, the frequently used concurrent think-aloud interviewing technique--has been to gain in-depth knowledge of respondents' thought processes (Russo et al., 1989; Ericsson and Simon, 1980). Understanding these processes helps us understand how and why respondents interpret information as they do, which in turn can effectively aid us in developing questionnaires that work with respondents' natural tendencies rather than against them.

Unfortunately, one drawback of the cognitive interviewing technique is that it may not accurately represent the thoughts of less motivated respondents, especially less motivated self-administered survey respondents.

Cognitive interviewing takes place in a relatively controlled framework. Depending on the questionnaire and population under investigation, the interview may take place at the research site in a specially designed room equipped with audio and video recording capabilities. Since, however, a large proportion of the Census Bureau's self-administered censuses and surveys require respondents to access administrative records, these interviews need to be conducted at the respondent's site. As a result, the researcher may need to travel to the respondent's site.

Subjects in a cognitive interview setting are likely to be more willing and motivated to answer a questionnaire than respondents who complete self-administered forms under natural conditions. After all, cognitive interviewing subjects are recruited: generally they have agreed in advance to participate in rather lengthy interviews, lasting upwards of two hours; often they are paid for their services; made to feel as comfortable as possible; told the importance of their participation to the goals of the research; and most importantly (because it deviates the greatest from a self-administered setting), are asked to complete the questionnaire in the presence of a research interviewer (and sometimes more than one interviewer) who patiently and encouragingly sits through the experience with the respondent, all the while asking and recording the respondent's thoughts. In some cases, as noted above, the researcher may travel across the country to conduct the interview. Such effort on the researcher's part typically leads to greater motivation on the respondent's part (a form of reciprocity) than might otherwise be the case. Tourangeau et al. (1985) point out this, as well as other disadvantages to laboratory research, when they write "laboratory research tends to be long on hypothesis testing and control of extraneous variation, but short on generality across different types of people and different settings." In Campbell and Stanley (1963) parlance, this type of research lacks external validity.

Therefore, while cognitive interviewing has important and useful contributions to make to the development of well-designed questionnaires, one should not rely solely on the results of this technique to design a self-administered questionnaire. One needs to keep in mind the reactions of less laboratory-studied respondents; that is, one needs to draw on motivational research as well.

A voluminous literature has developed on what motivates people to fill out and return self-administered questionnaires (e.g., Dillman and Sangster, 1991). Most of this literature has focused on the implementation process, showing for example, that number of contacts and financial incentives are particularly powerful inducers of response (e.g., Dillman, 1991; James and Bolstein, 1990; Goyder, 1985; Heberlein and Baumgartner, 1978; Scott, 1961).

Much less emphasis has been placed upon the questionnaire and its role in facilitating and encouraging response. Even the effect of questionnaire length has been open to question. Although it is generally thought that shorter length can improve response, this has not always been found to be the case (e.g., Heberlein and Baumgartner, 1978).

It has been argued that designing questionnaires with attractive covers, laying out questions with "vertical flow" so that respondents can follow a

straight path in responding to questions, and numerous other principles of questionnaire layout, will improve response (Dillman, 1978). The basis provided for this argument is the assumption that questionnaire response rates (including fewer skipped or missed items) can be improved by increasing the rewards of responding and decreasing the costs as they are perceived by the respondent. Making a questionnaire look easier to comprehend and faster to fill out and preventing mistakes and frustration from occurring as a result of respondents inadvertently answering questions which do not apply to them are among many ways that the perceived costs of responding can be decreased. However, for the most part these specific principles have not been experimentally tested in actual surveys. In addition recent advances in the capabilities of word processing and printing equipment, including the use of color, make some of these principles obsolete. However, a recent attempt to conceptualize and test a "respondent-friendly" design for a U.S. decennial census questionnaire found that such a design significantly improved response rates by 3.4 percentage points (Dillman et al., 1992), and reduced item non-response rates on certain questions (Bates, 1993a).

Substantial research has been done on how people influence other people to behave in a preferred manner. Cialdini has argued that people decide whether to perform a requested task on the basis of the inherent attractiveness of that task and other social or psychological influences (1988). The latter influences include: reciprocation, commitment and consistency, social proof, liking, authority, and scarcity. In an explication of these concepts to encouraging survey participation, Groves et al. provide examples of how each can be utilized for that purpose (1992). Although most of the cited examples refer to interviewer behavior and or the implementation process, some can be applied to questionnaire design. For example, a societal norm of reciprocation suggests that when questions can be easily understood and respondents can easily see how to answer them, that they will reciprocate with clear answers. Groves et al. also argue that helping tendencies of people can be utilized to encourage response (1992). For example, one would expect that people are likely to become angry and therefore less likely to respond to a mail survey when faced with a questionnaire that seems difficult to understand, unattractive, or provides unclear instructions. However, very little research has been done to apply concepts such as these to the issue of improving response to self-administered questionnaires.

II. SELF-ADMINISTERED QUESTIONNAIRE DESIGN PRINCIPLES

In developing the principles which follow it became apparent that ideas drawn from cognitive and motivational research are most often mutually supportive. However, there are also instances in which they conflict. For example, we hypothesize that using clearer question formats will ease the respondent's task. On the other hand, this often lengthens the questionnaire, which may decrease a respondent's motivation to complete it. Consequently, we attempt to specify the influence of these perspectives on each of the twenty principles outlined below.

1. Present information in a format that respondents are accustomed to reading.

Initial observations of respondents' reading behavior suggest that respondents can be divided into two camps: (1) "readers"--those who read all or most of the material presented on the questionnaire and (2) "skimmers"--those who read

only as much as they think they need to answer the questions (Jenkins et al., 1992a). The implication of this observation is that one need not worry as much about respondents who painstakingly read every piece of information on the questionnaire. Although there are certainly exceptions to this rule, generally readers are less likely to make quick judgments and are more likely to slowly maneuver their way through even poorly placed information. As a result, readers are more likely to correctly comprehend even poorly presented information than skimmers. Skimmers, however, are a worry. Unless information is presented to them in a way that can be easily and correctly understood, they are very likely to be misguided. Even worse, they may become frustrated with the effort required to respond and decide not to respond. This suggests that from both a cognitive and motivational perspective improvements made to the questionnaire in an effort to help skimmers can only help, not hinder, the readers.

A critical part of any questionnaire is its introductory information, since the purpose of this information is to present a survey in such a way that respondents are motivated to complete it. However, respondents do not necessarily read the introductory information as intended (Jenkins et al., 1992a). This report presents the results of cognitive research in the Schools and Staffing Survey conducted by the Census Bureau. It concludes that one reason respondents did not understand the school for which they were to report on the Public School Questionnaire was because many of them never read the school named on the label of the cover page (see Example 1). Neither the instruction referring to the label nor the school's name itself is prominent. Both are buried among a lot of information on the cover page. In fact, the school's name is not only buried, it is turned sideways.

The readers, persistent as they were, usually did a good job of following the cover page's reading structure until they reached the end of the first column. These respondents read through the title information, then the first two paragraphs on the left-hand side of the page. Because these paragraphs refer to the label, they turned the questionnaire sideways to look at the label. When done, they turned the questionnaire back, returned to where they had left off on the left-hand column, and continued to read down the column. Instead of continuing to the top of the second column, however, generally they turned the page. Since they had already read the label on the right-hand side of the page, chances are they mistakenly thought that they had already read all of the information on that side of they page. In other words, they never perceived the information in the upper right hand corner.

A diagrammatical representation of this page's reading structure is given in Example 2. This diagram reveals the eye's necessary reading movement across the page. As one can quickly see, this format requires respondents to make some unexpected leaps across the page, unexpected in the sense that a person anticipates reading a line of information from left to right, moving down the page a line and continuing this process until the end of the page.

In comparison to the readers, the skimmers did not bother to read this page at all. Generally, they glanced at it and turned the page. This led respondents whose school was closely associated with some other school to systematically over report student and teacher counts on the form. Bates and DeMaio (1989) write "If respondents do not initially grasp the overall nature of the task, they may never begin the form, may make serious errors, or perhaps leave large areas of the form unanswered." The research presented by Jenkins et al. (1992a) seems to confirm this proposition.

2. Present only the most relevant information using graphical design features and composition.

Another problem with the Public School Questionnaire's cover page is that it presents too much information, all of which looks of equal value. Skimmers quickly dismissed this information, probably because nothing was made particularly salient to them and they were not of a mind to sift through a lot of information looking for that which was important. This suggests that the most important information needs to be made easily perceptible. One way to do this is to decrease the amount of information that is presented and the other is to use graphical design features to hierarchically highlight information.

Based on these findings, a "user-friendly" cover page is presented in Example 3. This cover page is adapted from Jenkins and Ciochetto (1993). As can be seen, this cover page presents only the information the respondent needs to begin completing the questionnaire and it does so using a natural reading format. Example 4 exhibits the straightforward reading structure of this page. No need for the eye to do anything out of the ordinary.

Looking back at Example 3, the cover page is divided into four blocks of unequal sizes. The blocks are meant to present information to respondents in manageable pieces and the unequal sizes are meant to visually convey a sense of hierarchy about the information being presented, as well as add visual interest. The unequal size attribute is based on the drawing principle that asymmetrical composition is more interesting to the eye than symmetrical composition (Edwards, 1989).

Within each block, the contents are centered with plenty of blank space, both within and outside the block. This is meant to highlight the information being presented. The first block contains the name of the questionnaire, the form number, and the sponsorship information, and as can be seen, different size typefaces are used to convey different levels of importance. The second block contains an unshaded area within a shaded area. This feature is deliberately used to showcase the very important instruction that was overlooked on the original questionnaire: "Please complete this questionnaire with information about: [the school's name]." The use of an unshaded area within a shaded area is meant to catch the respondent's attention and to motivate him or her to continue completing the questionnaire for two reasons: one, because the questionnaire is personalized, and two, it quickly explains what lies ahead. The third block, the smallest of the blocks, contains information about returning the form. In the last block, an eye-catching picture of an apple sitting on some books is presented. A picture was placed on the cover page because a small exploratory study conducted by Jenkins and Ciochetto (1993) suggested that subjects were overwhelmingly drawn to a cover page containing a picture. Also, the work of Nederhof (1988) and Dillman (1978) suggest that prominent graphical designs on covers encourages recipients of questionnaires to respond.

3. Pique respondents' interest early in the questionnaire.

A final problem with the Public School Questionnaire's introductory information is that respondents found themselves being asked to passively read a lot of information: the cover page, the cover letter (which was placed on the inside cover of the questionnaire booklet), and instructions (see Example 5). Skimmers skipped over this material entirely, overlooking important information as a result. These respondents went directly to question (a) in the middle of page 4 to begin completing the questionnaire. Consequently,

Jenkins et al. (1992b) and Jenkins and Ciochetto (1993) recommend rearranging this material. As shown in Example 6, they suggest beginning the questionnaire by asking a question or two. Dillman (1978) argues from a motivational perspective that the first questions should be topically related to the subject of the questionnaire explained in the cover letter and on the questionnaire cover. An important lesson to be drawn from both the cognitive and motivational perspective is that, despite the strong temptation to do otherwise, the questionnaire should begin with a relevant question or questions.

If it is necessary to provide respondents with additional information to complete the questionnaire--such as why the survey is being conducted, or who to include in the counts or as members of the household--Jenkins and Ciochetto recommend giving this information to respondents after they have begun to answer the questionnaire. They believe that respondents are more likely to read this information once they become actively engaged in answering the questionnaire, as long as the information is kept brief. They also recommend putting this information in a question-and-answer format to keep the respondent actively engaged.

4. Dominantly feature questions over additional explanatory information.

The most important part of any questionnaire are its questions and response categories, since this is the mode by which information is gathered about the unit under investigation. Not only has cognitive research given us a better understanding of how respondents deal with the presentation of introductory information, it has provided us with valuable insight into the question and answer process as well. An example of poorly presented question and response information is discussed in DeMaio and Jenkins (1991). This paper presents the results of cognitive research on the "dollar value of business" item, a key data item, from the 1989 Census of Construction Industries Pretest Questionnaire. Depicted in Example 7, this item, like all of the items on the questionnaire, begins with a brief capitalized heading in bold that is meant to quickly convey the nature of the item. Part (a) asks for the value of construction work done. Also, it contains a subquestion that asks whether the respondent's answer to part (a) is based on billings, revenues, receipts, or another estimate. In parts (b) and (c), respondents are asked to report their receipts from other kinds of businesses and the total dollar value of business done, respectively.

DeMaio and Jenkins conclude that respondents tended to rely heavily on the heading for their source of information about this item, often not reading the questions or other information provided. Since the heading did not contain the specific information found in the questions, respondents mistakenly concluded that part (a) was asking for the total dollar value of business done, when, in fact, the question of part (a) really asks for the value of construction work done. This resulted in the systematic over-reporting of construction work done in part (a).

Research presented by Gower and Dibbs (1989) supports this finding. They write "Respondents read only what they think is necessary to read. They read the boldface print first, and then decide if they should read further." In the example above, respondents often neglected to read beyond the heading because the heading provided them with just enough information to formulate their own question.

DeMaio and Jenkins present a newly designed version of the "dollar value of business done" item based on a collaborative effort between subject matter and survey methods experts. Shown in Example 8, the item heading is replaced with a bold-faced, comprehensive question. This was done to eliminate the confusion that arose from the use of the heading and to make the question the main thrust of the item. Bold-faced type is used to convey to respondents the importance of the question. Also, it serves as a road map for questions like this that have a leading phrase followed by several parts that are interrupted with other information, such as a list of examples. The list and other instructions are put in light-faced type.

5. Include in each question all of the relevant information necessary for respondents to answer it, rather than specifying information in a subsequent instruction.

Another example of a problematic question and answer format comes again from the DeMaio and Jenkins paper. Shown in Example 9, the "number of employees" item, like the previous one, begins with a brief capitalized heading in bold. The heading is followed by a more specific question, which in turn is followed by a paragraph that explains who is to be included in the counts. Respondents are supposed to report the number of construction workers, other employees, and the total number of employees in parts (a), (b), and (c), respectively. A list of examples is provided to help respondents with this task.

It was observed that after reading the heading, (and sometimes the question), respondents would turn their attention to the answer boxes at the right. At this point, their eyes were drawn immediately to the column headings rather than the header that spans the headings. As a result, they overlooked essential information. The header reads "Number of employees of this establishment during the pay period including the 12th of--," and since "pay period" is not mentioned in either the heading or the question of this item, several respondents mistakenly thought this item was referring to monthly or quarterly time periods rather than to the four specific pay periods listed. This led to systematic over-reporting of number of employees.

A revised version of this item is depicted in Example 10. Besides removing the heading, the pay period header that was overlooked in the original version was made the leading phrase in the revised version. Consequently, the revised question contains all of the information the respondent needs to answer the question. The pay periods are also repeated in each of the column headings to ensure that respondents do not mistakenly conclude that this question is asking for monthly or quarterly data.

6. Vertically align the questions and response categories.

A third example of a problematic question and answer format comes from the Public School Questionnaire. As can be seen in Example 11, this questionnaire uses a question-on-the-left-answer-on-the-right format. Jenkins et al. (1992a) conclude that respondents often did not read instructions in this format. This was because respondents generally began to search for the answer once they read the question. As a result, their thoughts and consequently, their eyes were drawn away from the left-hand side of the page, where the instructions lay, to the right-hand side, where they knew the answer categories to be. The researchers conclude that vertically aligning the question and answer, as shown in Example 11, and ensuring that the instructions are placed directly before the answer categories, where respondents are more likely to perceive them, may help to alleviate this

problem. Similarly, Dillman (1978) has argued that a vertical alignment cuts costs of responding by eliminating potential confusion.

Cumulative research on this subject leads us to agree that it is advisable to vertically align the questions and answers because, as demonstrated earlier, it is in keeping with respondents' natural reading tendencies, but it may not solve the problem of respondents either overlooking or ignoring the instructions. As mentioned earlier, respondents have a tendency to read only as much as they think is necessary to answer a question. Therefore, even if they perceive the instructions, they may still ignore them. If the instruction is relatively simple to begin with, a better solution may be to incorporate it into the body of the question, as demonstrated in Example 11.

7. If incorporating needed information into the question makes it too complicated to understand, then provide accompanying instructions at the place where they are needed.

If an instruction is long and/or complicated, incorporating it into the body of the question is likely to fail. Respondents have a tendency to read only as much of a question as they deem necessary and to have difficulty comprehending complicated questions and sentence structures. The Jenkins et al. report provides an example of a question with a complicated sentence structure. As can be seen in Example 12, item 2 of the Public School Questionnaire asks how many students were enrolled in the school on or about October 1 of this school year. This item was difficult for respondents to read and understand because the flow of the question is interrupted by two parenthetical phrases and an instruction. Consequently, half of the respondents answered this question before finishing it. They often overlooked the instruction, but invariably missed the ending phrase in part a. All of this leads us to conclude that one should never try to insert a stand-alone instruction between phrases of a continuous question. Further research, however, is needed to establish the best method for coaxing respondents to read information they feel capable of ignoring, especially when this information is not easily incorporated into the question.

Frequently, writers of questionnaires will provide a set of instructions at the beginning of a questionnaire. The following is representative:

> Most of the items on this questionnaire are arranged so that the questions are on the left side of the page and the answer categories or spaces for written answers are on the right. Please answer the questions by marking the appropriate answer category with an x, or recording your answer in the space provided. We suggest that you use a pencil, rather than a pen or marker. Notice that at the end of some answer categories and answer spaces, there are instructions to skip to later items or to continue with the next item on the questionnaire. If you are unsure about how to answer a question, please give the best answer you can and make a comment in the "Remarks" space. Please include the item number. If you have an questions, call the Bureau of the Census Collect....Return your completed questionnaire to the Bureau of the Census in the enclosed postage-paid envelope. Please return it within 2 weeks (U.S. Bureau of the Census, 1990).

In addition to the likelihood of not getting read at all, much of the information in the above paragraph can be placed where it is needed. Even if it is read, much of it will not be retained by the reader.

8. Utilize single-task formats rather than multi-task formats.

Cognitive research suggests that respondents not only have difficulty understanding complicated sentence structures, they have difficulty comprehending multi-task question and answer formats. From a motivational perspective, having to constantly switch one's thinking from one task to another incurs costs to respondents (Dillman, 1978). To the respondent's detriment, these formats seem to come about as the result of questionnaire designers trying to condense multiple requests into one, thereby saving space. As can be seen in Example 13, item 30 from the Public School Questionnaire asks respondents to cross-classify their employees by full- or part-time status and assignment. Respondents were able to process only one aspect of this item--the categorization of employees by job description--and were unable to simultaneously deal with the additional request to report these employees by full- or part-time status (Jenkins et al., 1992a). This resulted in respondents recording their answers in only one of the columns in the answer table.

A newly designed version of this item was developed. As can be seen in Examples 14a and 14b, the original multi-task format was replaced with a simpler one. This was accomplished by focusing on only one request at a time--first, classifying part-time employees by job description in part a, followed by classifying full-time employees by job description in part b. As a result, the original question was divided into two subparts, each with its own heading, question, and list of job titles. Because this format repeats information, it may appear more difficult to someone who is not actually answering the questionnaire. However, it is precisely because it repeats information at the point it is needed that it should make the respondent's task easier.

9. Utilize single-question formats rather than matrix-question formats.

Respondents have more trouble answering matrix-question formats than single-question formats for what appears to be the same reason as that above; the matrix format presents them with too many tasks at once (Dillman, 1978). Example 15 presents a set of questions developed by Jenkins and Ciochetto (1993) for the Student Records Questionnaire. They used a matrix format because it was in keeping with the layout of the original Student Records Questionnaire. As can be seen, item 1 asks the respondents if they currently have the students for class listed down the left-hand side of the page. If the respondents do, then they are to answer three follow-up questions. They are to list the classes in which the student currently has the teacher in item 2, the number of times per week the class meets in item 3, and the total number of students enrolled in the class in item 4. (This set of questions also used a visual skip instruction in place of the conventional verbal one. We discuss skip instructions later.)

Cognitive research with this set of questions led the researchers to conclude that the use of a matrix format contributed to many errors. This format presents respondents with a choice, but provides little guidance for making the choice. They may choose to answer a full set of questions about one student at a time. In this case, they work across the rows. Or they many answer the same question for each of the students. In this case, they work down the columns. Respondents stalled momentarily while they decided which of these approaches to choose. Half worked across the rows, while the other half went down the columns.

Given these findings, the researchers developed a newly formatted version of these questions. Ignoring the skip instruction for now, one can see in Example 16 that the matrix format is replaced with a single array of questions pertaining to one student at a time, with the questions running vertically rather than horizontally. In this version, respondents need only be concerned with answering one question about one student at a time, and they need not deviate from moving down the page in search of the next question. Although the researchers recommend further work in this area, a small number of cognitive interviews showed that the respondent's task was simplified, thereby resulting in less error.

Additional research supporting the single-question format comes from both focus group and experimental research on the 1990 Decennial Census Questionnaire. Focus group research on the Census Questionnaire in which respondents were asked to answer a series of questions for each member of their household in a matrix format (questions in left-hand column to be answered for household members listed across the top of the page) identified the matrix format as a barrier to response (Dillman et al., 1991). Furthermore, a revised questionnaire, which used a single-question rather than a matrix-question format, attained an improved response rate (Dillman et al., 1992).

10. Make headings and instructions at the top of a page more prominent than those in the middle of a page.

Questionnaires are generally written to collect information about a particular subject. Since questionnaires employ the use of language, it makes sense that many of the rules for writing questionnaires will be the same as those for writing rhetoric. One such rule is that related ideas should be logically grouped together, with these being logically organized to form the subject matter. Another is that writers need to inform their readers how the topics they have chosen to write about are related. Not surprisingly, the results of both cognitive and motivational research suggest that the same is true for questionnaires; that is, respondents find transitions between topics helpful (Jenkins et al., 1992b; Dillman, 1978). If the results of cognitive research with the Public School Questionnaire are any indication, these transitions need not be complicated, they simply need to be enough to warn the respondent the topic is about to change. For instance, the heading "SECTION 2--STAFFING PATTERNS" in the middle of the page in Example 17 was enough to convey to respondents that the topic was about to change.

In contrast to this, Example 18 shows a transitional heading followed by an instruction that comes at the top of a page. Contrary to expectations, the researchers discovered that respondents invariably read the transitional headings and instructions that came in the middle of a page, but precious few read information that fell at the top of a page. Based on this finding, the researchers recommend that headings and instructions coming at the top of a page need to be made larger than those falling in the middle of a page. Refer back to Examples 14a and 14b for instances of this.

We hypothesize that respondents may be exhibiting a similar kind of behavior here as they exhibited with the introductory information. Many respondents skipped over the introductory material in an effort to get to the questions, but once they were actively engaged in answering the questionnaire, the researchers hypothesized that they were more likely to read information put into their path. Perhaps respondents skip over information at the top of a page in an effort to get to the next question, but once they become involved

in answering the questions on that page, they are then more likely to see other information.

11. Provide directions in a natural reading format and utilize graphical design features to make the directions more salient.

In order to efficiently and accurately answer a self-administered questionnaire, respondents must be able to maneuver their way through the questionnaire. One very important instruction for doing this is the skip instruction. In a conventional skip format, as shown in Example 19, the words "skip to ..." are placed to the right of the answer categories. This branching approach to answering questions is necessary, since not all questions apply equally to all respondents. It also presents self-administered survey respondents with an additional task over interviewer-administered survey respondents, for now not only do the self-administered respondents need to concern themselves with answering the current question, they must decide which question to answer next.

Cognitive studies demonstrate that respondents commonly overlook skip instructions (Gower, 1989), or any information for that matter that is placed beyond what they consider to be a question's answer space (Jenkins, 1992). Respondents often conclude that they are done with the response task once they mark an answer, and assume they are supposed to go to the next question on the form. As a result, they are likely to spend a great deal of time and energy either needlessly answering inapplicable questions or trying to discover where they made a "wrong turn," thus adding "cost" to the task of responding. Answering inapplicable questions is likely to result in inconsistent data between parts of an item, and depending on the editing rules that are applied to this data, the data may be biased.

Jenkins and Ciochetto (1993) conclude that respondents overlook skip instructions for two reasons, one of which is derived from the other. The primary reason respondents overlook the skip instruction is because they do not perceive it, but the reason they do not perceive it is because of the convoluted reading structure presented by the skip instruction. Item 29a shown in Example 19 illustrates this. A respondent begins to answer this item by first reading the question "Were there any teaching vacancies in this school for this school year, i.e., teaching positions for which teachers were recruited and interviewed?" In this particular example, respondents will move to the right-hand side of the page to answer the question, see the answer boxes, and continue to the right of these to read the answer choices "yes" and "no." The next step in the process is to choose one of these, say the "no" response, and to move back to the left of this response to mark the answer box. Note what is happening at this moment--the respondents are moving away from the skip instruction. If the skip instruction has not been made salient in some way to respondents before they begin their journey back to the left, chances are they are never going to see it. Once they mark the answer box they are going to conclude they are done answering this question and are going to begin to look for the next question. This means they are going to continue to move down the page and to the left, where they expect to find the next question. In other words, they are going to move even further away from the skip instruction.

Experimental data presented by Turner et al. (1992) confirms the hypothesis that respondents only see information to the right of an answer category if it is in some way made salient. Among other questionnaire design issues, the Turner et al. paper studied the extent to which respondents and interviewers

correctly executed branching instructions embedded in alternative versions of the 1990 National Household Survey on Drug Abuse (NHSDA) questionnaire. It concludes that respondents were more likely to overlook a visually obscured branching instruction, as shown in question 1 of Example 20, than a visually salient one, as shown in question 5. The researchers conclude that both the length and visual salience of questions a through e in question 5 assisted respondents in correctly following the branching instruction in question 5.

These studies suggest that directions need to be presented in a more natural reading format and graphical design features and composition should be used to make the directions more salient. Given this information, three alternative skip instruction formats are presented below, each of which appears to have advantages and disadvantages: (1) the salient skip instruction, (2) the intermediate skip instruction, and (3) the natural reading sequence skip instruction.

Salient Skip Instruction. Example 21 shows the salient skip instruction. Rather than having information placed to the right of the answer categories, directional arrows are placed to the left of both answer boxes. These arrows extend horizontally from each answer box towards the left-hand margin of the page and then turn vertically downwards. One of these arrows proceeds to the next question and the other ends with a verbal instruction within a shaded box.

This format was designed to overcome the conventional skip instruction's highly convoluted reading format (moving from left to right, right to left, back again to the right and finally, back to the left) and to replace a more-difficult-to-perceive verbal instruction with a more-easily-perceived combination visual/verbal instruction. In our judgement, the advantage of this format is that respondents may visually take in, if only briefly, the skip instruction information while moving from left to right in search of the answer categories.

The disadvantage, however, is that while respondents may be more likely to see this information, they also may be more likely to misunderstand it. It is possible that the wrong respondents (those who are supposed to continue to the next question) may mistakenly execute the skip instruction because of its visual salience, leading to a serious error--the omission of data. Another disadvantage with this format is that a question with a complicated skip instruction may become visually cluttered.

Intermediate Skip Instruction. Example 22 presents the intermediate skip instruction. This format relies on two features: (1) graphical instructions (an arrow) for going to the next question and (2) words to direct other respondents through a skip pattern. The two paths are further distinguished by originating the arrow from the left of the answer choice, and placing the words to the right.

In our judgment, the advantage that this format may have over the salient skip instruction is that respondents are unlikely to make the serious error of incorrectly executing the skip instruction. Another advantage is that it may not appear as visually cluttered to respondents. However, a small number of cognitive interviews suggest that it may not be as efficiently executed as the salient skip instruction. Just as with the conventional skip instruction, the word instruction to the right of the answer category may be overlooked at first. However, it is likely to be more efficiently executed than the conventional skip instruction, in which nothing but words are used off to the

right of the answer choices. Therefore, this skip instruction format is a deliberate compromise between the conventional and salient skip instruction.

Natural Reading Sequence Skip Instruction. In contrast to the above skip instructions in which a respondent must move from left to right in search of the answer categories and then reverse this direction and move from right to left to answer the question, another possibility might be to establish a skip instruction format with a more efficient, natural, and logical flow. This format is shown in Example 23. As can be seen in this example, the answer boxes are placed to the right of the answer categories and the skip instructions to the right of the answer boxes. To maintain the vertical alignment of the answer boxes, the answer categories are right-justified rather than left-justified. Also, if the answer categories need to be double or triple-lined, as is the case with the category "Dropout/Chronic Truant (See Definition Below)" in question 1 of Example 23, then the answer box should follow the last of these lines. This is to help maintain the respondent's natural reading structure, for which we have been arguing all along.

This skip instruction seems to have several advantages over the preceding skip instructions. The first and probably best advantage is that the information is presented to respondents in the sequence they need it: first the answer categories, then the answer boxes, and finally, the skip instruction. Example 24 compares the reading format of the natural reading sequence skip instruction with that of the conventional skip instruction. As can be seen, respondents need not ever reverse their direction with the natural reading sequence skip format. Another advantage is that the natural reading sequence format is not cluttered looking.

A disadvantage, however, is that respondents may overlook bracketed skip instructions using this format. Although these instructions will be closer to the answer boxes in this format than they are in the conventional skip instruction format (that is, if the answer categories come between the answer boxes and the skip instruction), they be just far enough away from the answer boxes as to be out of the respondent's view.

Another disadvantage is that from an overall perspective, the questionnaire's vertical alignment is disrupted. In the previous formats, the questions, answer boxes, and categories are all left justified and begin in the same horizontal position on the page. While vertical alignment of the questions can be maintained using the natural reading sequence skip instruction format, the answer categories will certainly not be vertically aligned. The answer boxes can be made to maintain vertical alignment within a question; however, they may not be able to maintain alignment from question to question, further disrupting the overall look of the questionnaire.

A final disadvantage with the natural reading sequence skip instruction is related to data processing. In this format, the location of the keycodes is problematic. One possibility is to place the keycodes before the answer category, but this puts them quite a distance from the answer box from the keyer's perspective. This may slow down production and/or increase keyer error. Another possibility is to place them either directly before or after the answer box, but this may confuse the respondent.

We have described skip instructions at some length because it is an area which is exceedingly important, but now lacks ideal solutions. The alternatives presented need extensive testing in large samples.

12. Utilize graphical design techniques to establish a clear path through the questionnaire for the respondent to follow.

Many questionnaires intermix questions and items of information, utilizing space wherever it is available. It is sometimes unclear to the respondent where to begin, and most important in what order the information is to be read (see Example 25). This issue can be addressed in several ways.

12a. Identify all answer spaces for respondents in a uniform way, e.g. white boxes(to check) and white spaces for written answers against a lightly colored background.

12b. Align all answer spaces vertically under the question so that the respondent does not have to meander back and forth over a page to provide answers.

12c. Utilize step instructions which clearly label tasks for the respondent when a complicated, unalterable sequence of tasks is involved.

The combined use of the first two subprinciples is illustrated in Example 22, taken from a NSF/Bureau of the Census Survey of Scientists and Engineers. On this survey a light blue background[2] contrasts with the white answer spaces, which to the extent possible are placed in vertical alignment. The message intended for respondents, and communicated by graphical layout rather than words, is to associate the white spaces with the "need to provide an answer." The vertical alignment helps assure that answers do not inadvertently get missed.

A contrasting example (26) illustrates the lack of color to define answer spaces, and separation of questions and answers into left and right columns, respectively. In this example no vertical flow is established, and the questionnaire is more difficult than necessary for respondents to complete.

In some cases, it may be advisable to establish a path through the questionnaire by using "step" instructions which clearly label tasks for respondents. An example is discussed in DeMaio et al. (1987a). This paper presents the results of initial research aimed at improving the design of the Census long form. This form involves a complex sequence of tasks, the order of which was traditionally dictated by Census needs to provide Congress with mandated information by the end of the census year. The problem, however, is that these tasks are haphazardly ordered from the respondent's point of view. The researchers addressed this problem by disaggregating the form into steps, and labelling and describing each of the steps. The following is an example of the step instructions that were placed throughout the form:

Step 1. Make a list of the people who live here.
Step 2. Think again. It's very important that the census gets an accurate listing.
Step 3. Fill the circle that matches the total number of people on your list.
.
.

[2]The colored examples presented in this paper are not original prints, but colored reproductions of the originals.

.
Step 8. Give your name and look over the form.

Each of these solutions represent attempts to reduce respondent effort needed for completing the questionnaire and, therefore, the "costs" of responding.

13. Avoid using the same design feature to request different respondent actions.

The essence of this principle is to associate particular design features of a questionnaire with what the respondent is being asked to do, and to be completely consistent with their use. One result of rapid advances in word processing is an ability to achieve nearly infinite variability in the combination of type fonts, sizes, and boldness used in a questionnaire. Keeping their use consistent facilitates comprehension and prevents errors. Research presented by DeMaio and Martin (1987b) and Parsley et al. (1989) supports this proposition.

Examples of such consistency is illustrated by the following subprinciples:

13a. Use dark type for question stems and light type for response category options.

13b. Write all definitions and special instructions for a particular question in italics placed within parentheses.

13c. Use capital letters for words to be emphasized to the respondent in both questions and answers.

Note, the important point here is not that capitals must be reserved for words of emphasis, and italics for instructions, or that bold type is better for questions than is light type. Doing the opposite may work just as well--the issue is consistency of use, so that as a respondent gets into a questionnaire they begin to associate the chosen procedure with a particular piece of information or request for action. Example 22 illustrates each of these subprinciples.

14. Utilize variability in design features judiciously.

Closely associated with the need to be consistent is the desirability of limiting the variability of type fonts, sizes, and graphical symbols. One would never consider writing a paragraph in which every word is written in different type fonts and sizes. Doing so would slow down the reader's reading and comprehension speed. The many options now available to questionnaire writers sometimes leads to utilizing variations in boldness, underlining, capitals, italics and different fonts in the same question, and the result is the same. This principle suggests selecting a limited number of design elements, which are then to be used consistently as suggested in other principles discussed here.

15. Visually emphasize information the respondent needs to see and de-emphasize information which the respondent does not need to see.

Many questionnaires include coding information for use by coders, data entry persons and others who process the questionnaire. Their needs often become a driving force in the construction of questionnaires inasmuch as their speed

and accuracy are improved by locating the codes near respondent answers, and having them prominently displayed. In some cases this has led to the use of bold type and isolating these codes with boxes (which draw more attention to them), as shown in Example 26. Indeed the entire layout of putting answer choices on the right side of the page only seems driven by the preferences of processors. One result is that respondents must mentally process information irrelevant to them in order to respond, thus making the task of responding more time consuming and difficult than necessary.

One solution to this problem is illustrated by the previously referred to example 22. Here the light blue background is a 10 percent screen. The coding information for key punchers is printed in small numbers without boxes in 100 percent color. The respondent, who is already being guided "towards" the white answer spaces by black type of questions and answers and "away from" the blue background seems less likely to see or be confused by the dark blue lettering. Yet, for a person who is searching for the blue code numbers, they are easily visible.

This example also illustrates how different design features can support one another. If the decision had been made to print the questions in dark blue and the source codes in black, these codes would have been more apparent to the respondent.

16. Utilize graphical layout of questions on the page to distinguish among different types of question structures; maintain consistency within types.

If a questionnaire begins by listing answer categories below the stem of a question vertically (as suggested by a vertical flow format described under principle 12), it is undesirable to occasionally present answer choices horizontally, or even to sometimes use a second or third column of answer choices. Once a format is selected it needs to be followed consistently.

In addition, we follow the procedure of listing answer choices to the left of items when a choice among vertically arranged categories is to be made (see Example 27, C7, C8). In contrast when several items in a series are to be evaluated and the same categories are to be utilized for all items, these answer choices are placed to the right of the items and the respondent instructed to choose from among horizontally arranged categories (see Example 27, C9, C10). In simplified form the principle becomes to choose from among vertical choices when boxes are to the left and horizontal choices when boxes are to the right.

17. Provide descriptive captions either above, beneath, or to the right of blank answer spaces and utilize appropriate signs or symbols whenever numbers are requested.

When people are asked to report income, number of weeks worked, or other data by filling in blank spaces, inaccuracies result from utilizing the wrong units or from not remembering exactly what was asked when focusing on the blank answer space. In addition, numbers are sometimes illegible. It is for these reasons that putting dollar signs, ".00" to eliminate cents (as in Example 27, C13) and dotted lines with the white space surrounded by background color (as in C12) help elicit accurate answers. Recapitulation of "Total 1991 earned income" under the answer box for C13 also helps clarify what is wanted.

In recent years some optical scanning forms designed to elicit numbers have been produced which used colored lined boxes surrounding white space which are in turn surrounded by white space. In our view these boxes are extremely difficult to respond to because of the difficulty of focusing just within boxes. A colored background would help greatly in getting people to respond clearly within the boxes. This technique appears to be successfully used on charge forms in many hotels.

18. Utilize dominate graphical markings to provide the most important information needed by the respondent to guide them through the answering process.

In general, people's eyes are drawn to the most dominant graphical features of a page. This principle is violated in Example 25 where by far the most dominant marking is the "return to" instruction. It is also violated in Example 28 where the seemingly randomly placed black boxes (needed for optical scanning purposes) are the most dominant design feature. In neither case do the dominant marks guide the respondent to where they need to begin answering the questionnaire.

In Example 29 an attempt has been made to follow this principle. The most dominant marking is the questionnaire title, followed by the **PERSON 1** and **PERSON 2** markings. Also important is the single arrow (itself a powerful conveyor of "direction") that leads to person 1 with a definition of who that person is. The path for responding to the questionnaire is also clarified by the two step process of specifying Person 1, 2, etc. in sequence, each with a clearly identified separate space for answers to several questions.

19. Avoid the separation of questions through the use of lines and rectangles in favor of an open format in which the respondent's answering path is clearly shown.

Frequently designers of questionnaires utilize lines and rectangles to separate questions from one another. In general this practice makes questionnaires more rather than less difficult to answer. The use of rectangles, as shown in Examples 25 and 30, give no clear indication of where to go next; the lines function in much the same way as "stop" signs, requiring one to stop and contemplate the next steps. This is especially the case in these two examples, where it is not readily apparent which box comes next, and requires additional information, e.g. prominent section numbers. Also, the use of lines is one additional use of ink on a page which must then be cognitively processed by the reader, in contrast to white (or other background color) space which one can pass over without pausing to think about what it means.

In contrast, the formats used in Examples 22, 27, and 29 are open, using lines mostly to identify the page space in which answers are to be provided. These pages are easier for respondents to follow. Also, the respondent path is easily recognized, following the cultural norm of left to right within the defined answering space, and top to bottom on the page.

20. Structure and organize the questionnaire in such a way that it, first, makes sense to respondents and, second, avoids leaving the choice of the order in which questions get answered up to the respondent.

On the surface, this principal seems obvious and easy to implement. Many questionnaires, however, are constructed without this principle foremost in mind. Two very good examples are the 1990 Census long and short forms. The Census long form is probably one of the most complex questionnaires in existence. It has a fold-out flap on which a listing of all household members is obtained, followed by a matrix of short-form information collected about every person, then three pages of housing information and finally two pages of sample population questions for each person. As mentioned earlier (under principle 12), this form involves a complex sequence of tasks, the order of which was traditionally dictated by Census needs to provide Congress with mandated information by the end of the census year. Early research showed, however, that these tasks were not properly organized from the respondent's point of view (DeMaio et al., 1987a). This finding was subsequently confirmed in a split-panel experiment with the long form known as the 1990 Alternative Questionnaire Experiment (AQE) (DeMaio et al., 1992).

Along with the control form, which was identical to the 1990 Census long form, five experimental questionnaires were tested in the 1990 AQE. Two of the experimental questionnaires (Panels 2 and 3) incorporated many of the principles we have discussed concerning color, step instructions, the consistent use of typeface and answer spaces, etc. However, three of the experimental questionnaires (Panels 4, 5, and 6) incorporated dramatic changes to the structure and organization of the form. Panel 4 became a matrix booklet in which the flap was eliminated and all of the person items were placed together. Panels 5 and 6 became "kits" in which individual questionnaires for each person in the household were placed in a folder.

The main finding was that "small" format changes alone (as incorporated in Panels 2 and 3) did very little to improve either item or overall response rates, but it took changes to the structure and organization of the questionnaire (as incorporated in Panels 4, 5, and 6) to make improvements. This suggests that "small" format changes are not enough to overcome the difficulty of completing a prohibitively demanding and haphazardly organized questionnaire. This is an important point and one that should not be overlooked. It seems to be further proof that a set of cohesive design principles is important for designing questionnaires.

Results from a split-panel experiment with the 1990 Census short form called the 1992 Simplified Questionnaire Test (SQT) further substantiates the importance of organizing a questionnaire properly (Dillman et al, 1992). Similar to the long form, the short form contains a response matrix in which household member's names are listed across the top of the page and the questions to be answered for each person are listed down the side of the page. This format is shown in Example 28. In this context the first question "How is this person related to PERSON 1?" requires the respondent to undertake a difficult task, that is, to constantly consider the column and person for which they are currently reporting in relation to the person reported in column 1. Research showed that this confused respondents, and led to their not completing the form (Dillman and Reynolds, 1991; DeMaio et al., 1987b). This form also lacks a vertical flow and uses color in a way that does not help guide the respondent through the form.

In contrast, the 1992 SQT short form (Example 29) resolves the row column dilemma by establishing a separate and clearly identifiable space for the information about each person. This form also uses color to help demarcate each person's space. An additional justification for using the individual person space was the finding from a post 1990 Census survey that the lowest

mail-back response came from households within which unrelated adults lived (Fay et al., 1991). By clearly identifying each person's space this design facilitates turning the questionnaire over to other household members so each can provide his or her own information. Restructuring the Census short form in this manner improved completion rates in a non-census year test from 63.4 to 66.8 percent.

Finally, results from another split-panel experiment with the 1990 Census long form, known as the 1993 Appeals and Long Form Experiment (ALFE), lends further credence to principle 20 (Bates, 1993b). Restructuring the Census long form using the individual-space format improved response in a separate non-census year test from 51.8 percent to 55.9 percent. At the same time, simply improving the graphics while retaining the row-column format resulted in a completion rate of 54.4 percent, which was not significantly higher than the control.

The results of these three tests suggest that restructuring and organizing a form in a way that makes sense to respondents, in addition to incorporating the other kinds of "respondent-friendly" changes we have advanced in this paper, improves response rates.

III. BARRIERS TO UTILIZATION

Discussion of the above principles with potential users has produced occasional and understandable objections to their use. Many of these objections stem less from whether following them is desirable from the standpoint of respondent reaction than to other considerations. These "other" considerations are discussed here.

There is an obvious trade-off between the goal of keeping questionnaires as short as possible, in order to utilize the minimum amount of paper necessary, and adherence to many of the above listed principles. The desire to use the minimum amount of paper, besides being an ecological concern, stems from the processing advantages and lower postage costs associated with shorter questionnaires. Example 30 is a questionnaire which consists of one sheet of paper, printed on both sides. To revise it according to the principles outlined above would require more pages. Converting the Census questionnaire shown in example 28 from one oversized (28" x 10 1/2") page suitable for optical scanning to a respondent-friendly design resulted in expansion to an eight page booklet (two sheets of paper printed on both sides). When conducting surveys of millions of households the efficiency versus respondent-friendly tradeoff is not a trivial issue.

However, a complete picture of the trade-offs involves additional considerations. The printing of cover letters and addition of address labels onto the questionnaires as done for examples 25 and 30 probably reduces response rates and results in substantially higher follow-up costs. In order to adequately assess the costs and other trade-offs involved in utilizing respondent-friendly designs, it is necessary to consider survey costs that go well beyond paper, mailing, and processing costs associated with one questionnaire.

Another barrier to the utilization of principles such as those described here, is simply tradition. Frequently, designs of whatever nature, get used simply because they have been utilized in the past on some surveys, and the formats

are transferred to other surveys where paper constraints are far less. Requirements associated with a Census questionnaire for which 100,000,000 responses must be processed need not apply in the same way to a survey being sent to 5,000 school teachers.

Tradition has prevailed, in part, because of forms design equipment limitations. However, the increasing availability of modern word processing and forms design equipment makes possible the use of degrees of color and choices on spacing unavailable only a few years ago. The possibilities now available for design makes adherence to the design principles outlined above far easier than in the past.

IV. CONCLUSION

In this paper we have drawn on both cognitive and motivational perspectives to state twenty principles of questionnaire design for improving both the accuracy of individual responses and overall response rates. It is perhaps inappropriate to conclude this paper; rather it is intended to stimulate a beginning. Many of the principles outlined above have not been tested carefully on controlled designs, although we tried to cite those occasions in which they have been. Stopping with twenty principles is arbitrary; more could be stated, and even more need to be developed. However, even the twenty principles should make one issue clear: they are not isolated entities from which one might randomly pick and choose in order to develop effective designs. In our view, they are frequently dependent on one another. Often they are mutually supportive, and occasionally they conflict with one another.

For too long research on how to improve response to mail surveys was hampered by researchers attempting to isolate response stimulating factors--e.g., reminders, questionnaire length, color of paper, stamps on return envelopes, personalization, and prior notice--in order to find the magic bullet that would allow one to ignore all of the others. Not until we began to look at the above factors as mutually supportive did we begin to realize the potential for high response rates. Similarly, we should avoid searching for the magic questionnaire design bullet. Instead, we should turn our attention toward developing, testing, refining and expanding on a set of cohesive design principles.

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