Public Opinion Quarterly, Vol. 75, No. 5, 2011, pp. 889–908

THE FUTURE OF MODES OF DATA COLLECTION

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Abstract This article reviews recent trends in modes of survey data collection, with a view to speculating on the future of survey modes. I discuss the development of the idea of modes, review the many dimensions of mode, briefly review some of the research on mode differences, discuss recent developments in mixed mode surveys, and offer some thoughts on the likely future of modes of survey data collection.

Introduction

It is an honor to mark the occasion of *Public Opinion Quarterly*'s diamond jubilee with an essay on the likely future of modes. In order to know where we might be heading, we need to know where we've been, so I take a look at the past and present before attempting to address the future. This article is not an exhaustive or thorough review of the vast literature that has been published on survey modes in the past few decades, much of it in *POQ*. Rather, the goal is to highlight a few key trends and challenges facing the survey profession with respect to mode, and to offer some thoughts about the future.

This article provides one perspective on how the idea of survey "mode" has evolved, and offers some thoughts on the meaning of mode in the survey world of today. I also hope to identify key gaps in our knowledge, and to challenge the survey community to address these gaps.

THE HISTORY AND CHANGING MEANING OF MODE

The idea of modes of data collection has a long history in survey research, although the term itself didn't appear to come into vogue until the late 1970s. For example, in his classification of error sources, Deming (1944) referred to the

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doi: 10.1093/poq/nfr046

"different kinds of canvass," mentioning mail, telephone, telegraph, and direct interview. Similarly, Hochstim's (1967) classic mode comparison study referred to "strategies" or "methods" of data collection. The origin of the term "mode" cannot be traced to a single source and does not seem to have been defined, but Groves and Kahn (1979) used the term in their comparison of face-to-face and telephone surveys, and both Groves (1979) and O'Neil (1979) used the term in their papers in the same issue of *Public Opinion Quarterly*. To my knowledge, these are the first uses of the term in the journal.

Since then, "mode" has become part of the lexicon of survey research, even though the term may lack precise meaning. For instance, tests of paper-and-pencil versus computer-assisted interviewing are viewed as mode comparisons, although one could argue that it is the technology that changed, not the mode of data collection (see Fuchs, Couper, and Hansen 2000). But it is the broader use of the term, reflecting the many ways in which the methods of survey data collection may vary, that I follow here.

Recent trends suggest that the notion of "mode" may have become outmoded, at least the use of the term as a single descriptor of a survey. In the past, saying that a survey was completed by telephone (for example) gave us a lot of information about the likely sources of error in the survey. Increasingly, however, such simple descriptors as "a national face-to-face survey" or "an RDD telephone survey" are no longer sufficient. This is because of three related trends: 1) the proliferation of modes of data collection; 2) the increased complexity of modes; and 3) the rise of mixed mode approaches. I briefly review each of these trends in turn.

The proliferation of modes: In recent decades, we have seen a rise in the number of different modes, and in the variations within a particular mode. Mail and face-to-face surveys were the main modes of data collection from the 1940s to the 1970s (Lyberg and Kasprzyk 1991). The 1970s saw the development and widespread adoption of telephone surveys in the United States, and later in Europe and elsewhere. The growth of telephone surveys was spurred by several factors, including the increasing rates of telephone coverage over that time, the cost of telephone surveys relative to face-to-face, the speed with which telephone surveys could be conducted (making them particularly attractive for attitude and opinion measurement), and research showing that data of near-comparable quality to face-to-face surveys could be obtained (e.g., Groves and Kahn 1979). Since their introduction in the 1990s, Internet surveys began to threaten the dominance of telephone surveys, in turn because of their advantages in terms of speed and cost (Couper 2000). The rising nonresponse rates associated with telephone surveys, and the rise in cell phone usage affecting the coverage of RDD telephone surveys, along with the development of address-based sampling, in turn have led to a recent resurgence of interest in mail surveys.

The development of computer-assisted interviewing led to the introduction of new modes such as computer-assisted telephone interviewing (CATI) and

computer-assisted personal interviewing (CAPI). In addition, a growing body of research evidence on the benefits of self-administration for sensitive questions or those subject to social desirability effects led to the development of new methods of self-administration as part of an interviewer-administered survey. Thus, self-administered questionnaires (SAQs) evolved into computer-assisted self-interviewing (CASI) and its variants (e.g., audio-CASI), and telephone versions (interactive voice response [IVR] or T-ACASI) (see Couper and Nicholls 1998).

Increasing complexity: Along with the increase in the number of available modes, the complexity of modes has increased. For example, computer-assisted self-interviewing can involve text, audio, or video presentation of questions or stimulus materials (see Couper 2005). Internet surveys can involve a similar range of presentation modes (see Fuchs 2009 for examples of video-CASI). Whereas video-CASI delivered over the Internet may share many characteristics with video-CASI as part of a face-to-face survey in terms of measurement error, the implications of using two different "modes" (face-to-face and Internet) are larger for errors of nonobservation (sampling, coverage, and nonresponse).

To push this notion of the complexity of modes further, we can take the example of Internet or Web surveys. Whereas Web surveys can be viewed as a single mode, there are many different ways that samples can be drawn for Web surveys (see Couper 2000 for an early review). These can include both nonprobability- and probability-based methods, and include such approaches as online access panels (see AAPOR 2010a), intercept surveys, list-based samples, and the like. Other types of sample designs (e.g., area probability samples, random digit dial or RDD samples) imply a particular mode (face-to-face or telephone, respectively). These approaches all have very different implications for survey inference (see Brick, this volume). Further, there are many different ways one can implement Web surveys, sometimes resembling interviewer-administered surveys in some aspects of measurement, at other times replicating mail surveys. In other words, the Internet is a very versatile mode, and saying that one has conducted an Internet survey provides insufficient information to evaluate the quality of the survey or the estimates produced.

In similar fashion, the idea of a face-to-face survey simply involving interviewers asking respondents a set of questions is rapidly becoming a thing of the past. Such surveys may often include self-administered components and increasingly include observations by interviewers, physical measurements, the use of show cards, etc., all of which increase the complexity of the mode.

Mixed modes: The final related trend complicating the description of modes is the increased use of mixed mode approaches. The idea of mixing modes of data collection has a long history. For example, in 1964 Stanley Payne noted that "It is only recently that our eyes have opened to the fruitful idea of using the basic survey methods in combination. We may have been too blinded from looking

upon them as exclusive alternatives to observe that they may be applied as complementary parts of a single investigation" (Payne 1964, p. 61). Similarly, Lyberg and Kasprzyk (1991, p. 248) noted that "In practice ... few studies rely solely on one mode of data collection. Cost problems, incomplete coverage, nonresponse and measurement errors almost always result in the use of two or more modes for collecting data." But the past few years have seen a large increase in attention paid to mixed mode approaches, in part because of the trends noted earlier—the threat to telephone surveys, for many decades a mainstay of much public opinion research, the feasibility of address-based sampling and the resurgence of interest in mail surveys, and the measurement opportunities offered by Internet surveys.

Together, these three trends are serving to limit the utility of "mode" as a descriptor of a survey data collection process. I believe that "mode" should no longer be thought of as a categorical descriptor, but rather as a multidimensional construct. In the next section, I describe some of the dimensions along which modes can be organized or classified.

THE DIMENSIONS OF MODE

Rather than thinking of mode as a single descriptor of a survey, modes can vary along several related dimensions in terms of their effect on survey errors and costs. Here, I briefly review some of the key dimensions (see also Groves et al. 2009, Chapter 5; de Leeuw 2008).

One of the dimensions along which modes vary is the degree of interviewer involvement. Some modes (e.g., telephone surveys, face-to-face surveys) are fully administered by interviewers, who read the questions to respondents and record the answers (whether on paper or computer). Some modes are self-administered but in the presence of an interviewer. These include computer-assisted self-interviewing and paper self-administered questionnaires (SAQs). Group-administered surveys (such as in school settings) share similar characteristics. Further along the continuum may be drop-off questionnaires and outbound IVR/T-ACASI where the interviewer is involved in delivery of the instrument or handover to the automated system, and also possibly for pickup of the completed questionnaire or available if the respondent needs assistance, but is typically not present during the completion of the questionnaire itself. At the other end of the continuum are the fully self-administered modes such as mail surveys, Web surveys, and inbound IVR. The degree of interviewer involvement has implications not only for costs, but also for errors of nonobservation (e.g., sampling and nonresponse) and measurement errors (e.g., effects on sensitive questions, ability to motivate, probe, assist, etc.).

A second dimension on which modes can be arranged involves the degree of contact with the respondent. Again, at one end of the continuum are face-to-face surveys, where the interviewer has direct contact with the respondent, permitting the exchange of verbal and non-verbal cues. Such direct contact also

facilitates the use of written materials such as ID badges and letters to gain cooperation, and show cards to facilitate the task of responding, along with the opportunity to collect interviewer observations, perform a variety of physical and biological measurements, and so on. Telephone surveys involve less direct contact with the respondent, and mail and Web surveys are even more indirect. Modes that involve pictures or videos of interviewers reading survey questions (see Krysan and Couper 2005; Fuchs 2009) or even the use of avatars or animated conversational agents to represent interviewers (see Schober and Conrad 2008) also fall in the middle of this continuum.

A third dimension that can characterize different modes of data collection is that of channels of communication. Here, we again need to think in both directions—to the respondent and from the respondent. Telephone surveys (and IVR) typically involve a single aural channel of communication, while mail surveys are similarly restricted to a single visual channel. Face-to-face surveys offer more flexibility in this regard, permitting the oral delivery of survey questions and responses, as well as supplemental visual material. Delivery of the survey questions and delivery of the response options may not employ the same channel of communication, for example if show cards are used (see Jäckle, Roberts, and Lynn 2010; Nicolaas 2010). Paper self-administered components of a face-to-face survey could also employ visual materials. Audio-CASI permits both aural and visual channels of communication, often simultaneously (see Couper, Tourangeau, and Marvin 2009). Web surveys also offer flexibility in terms of channels of communication. While most Web surveys present questions verbally (as written words), other forms of presentation have also been explored, such as audio or video.

Modes also vary in their locus of control (see Couper 2008). In mail surveys, respondents have full control over whether, when, and in what way they choose to answer questions. In interviewer-administered surveys, control of the survey rests more with the interviewers, who determine the pace and flow of the interview. In computer-assisted surveys, some of this control is transferred to the survey software, which dictates which answers are permissible and which question is to be asked next. Web surveys can be designed to be more flexible, resembling paper surveys, or to exert more control over the interaction, in similar ways to CAI surveys.

Another dimension on which modes vary is the degree of privacy afforded the respondent. At the low privacy end of the continuum are exit interviews or intercept surveys, where respondents may be interviewed with others around them. Interviewer-administered surveys offer a medium level of privacy, given the possibility of other family members listening in to the interview. Telephone surveys conducted over mobile phones may have different privacy implications than those conducted over landline phones, depending on the circumstances of the interview. High-privacy modes include CASI, mail, and Web surveys, again to varying degrees depending on the design and on how respondents choose to complete the survey.

Finally, modes vary in their degree of computer technology used. This can range from paper-based surveys, whether interviewer- or self-administered, to modes where only the interviewer uses the technology (as in CATI or CAPI). Further along the continuum are situations where respondents use technology supplied by the survey organization (as in CASI), and finally cases where the respondents are using their own technology (Web surveys). This dimension may affect coverage, as well as nonresponse and measurement error.

In summary, then, mode may mean different things to different people. For some, mode is the medium of communication; for others, it is the technology used to conduct a survey. For still others, mode is the entire system of data collection chosen for a particular study. The point is that any one mode can be characterized in terms of each of these dimensions. This applies to existing modes as well as to future modes of data collection. Understanding the implications of these dimensions for survey errors and costs will help guide decisions about the best mode to use for particular surveys and help understand the effect of mode choice on the resultant survey estimates. Focusing only on one dimension or one source of error may lead to suboptimal design solutions.

Research on Mode Differences

The research literature exploring differences between modes is already large, and continues to expand. A significant proportion of the methodological papers presented at AAPOR conferences, for instance, involve mode comparisons or, more recently, mixed mode comparisons (see below). Here, I offer a few observations about the challenges we face in making sense of all this research, and particularly on the gaps in our knowledge of mode differences.

There are different ways to study mode effects (see Groves 1989, Chapter 11). Some studies focus on the outcomes, examining entire systems of data collection. For example, RDD telephone surveys are compared to face-to-face surveys, with the resultant estimates being compared without isolating the possible sources of any differences, whether these are due to coverage, sampling, nonresponse, measurement, or processing error. This approach leads to designs that are optimal for each mode without striving for equivalence. Other studies focus on particular sources of error, such as the coverage differences between Internet and telephone surveys, or on particular mechanisms producing such differences—such as response order effects or social desirability biases (e.g., Chang and Krosnick 2009). This approach leads to designs that try to make the modes as similar as possible in all aspects other than the one of interest in order to isolate the effects.

Although both strategies are useful, it is hard to synthesize the vast literature on mode effects for several reasons. First, because the focus of such research is either very broad or very narrow, it makes it hard to compare modes across multiple sources of error simultaneously. Second, it is relatively rare to find comparisons involving more than two modes (some exceptions include de

Leeuw 1992; Hochstim 1967; Kreuter, Presser, and Tourangeau 2008; Link and Mokdad 2006), so the reader is left to assemble the complete picture of mode effects from a large number of paired comparisons. Additionally, some mode comparisons are more common (e.g., telephone versus face-to-face, Web versus mail) than others (e.g., face-to-face versus Web), so there are gaps in our knowledge. Third, given that the designs of the studies vary greatly (in the populations being studied, in the sampling frames, in the questions asked, in the implementation of the data collection protocol, etc.), it is difficult to generalize from these case studies to other situations. Finally, many of the details of how each of the modes was implemented are not provided, giving us an incomplete picture of how such design features may affect the results we obtain. One example of this is the unexpected difference in response distributions between paper-and-pencil and computer-assisted telephone interviewing attributable to layout differences in the two instruments (Bergman et al. 1994).

Recently, a number of informal and formal meta-analyses have appeared, and help us gain a more holistic picture of the role of mode in survey errors and costs. But these still tend to focus on particular issues. For example, two meta-analyses have recently examined response rate differences in Web surveys versus other modes (mostly mail) (see Lozar Manfreda et al. 2008; Shih and Fan 2007). Though it now seems clear that Web surveys generally get lower response rates than mail surveys, there are some exceptions. We don't yet know *why* this is the case, and under what conditions we are likely to get bigger or smaller differences in the rates. Further, while we know quite a bit about nonresponse rates, we know considerably less about nonresponse bias differences between these two modes.

Similarly, a lot of research has focused on the measurement error properties of modes, and much is known about the various sources of differences between modes. However, many of these studies have focused on a single type or question (e.g., response scales) or type of effect (e.g., social desirability, response order effects). For example, Holbrook, Green, and Krosnick (2003) focus on satisficing and social desirability biases, while Ye, Fulton, and Tourangeau (2011) examine positivity and extremeness biases in response scales.

There is still some disagreement on the extent of measurement error differences between modes and on what (if anything) needs to be done about it. Some argue that there are intractable differences in the way people answer questions in different modes. Others argue that these differences are small or, in some cases, nonexistent. Part of the disagreement lies in the modes being compared, part in the questions being studied, and part on the methods being used to study mode effects. Further, some of the differences found may diminish over time as respondents become more comfortable with the newer technologies or survey designers learn to mitigate the effects of mode differences.

Some modes are closer in character to others, and one is likely to find few measurement differences between them. For example, there is a well-established body of literature, beginning with Groves and Kahn's (1979) classic work, which

shows few differences in responses between telephone and face-to-face surveys. However, differences have been found, and some of these can be accounted for by other variations, such as the use of show cards, or the use of self-administration for sensitive questions in one mode but not the other. Similarly, many studies have examined mail and Web surveys—particularly those designed to perform in much the same way—and found few differences. This should not be surprising, as both mail and Web are self-administered modes, and both are visual. However, when modes that are quite different—say, telephone and Web—are compared, we are likely to find bigger differences. Factors such as working memory capacity, social desirability effects, pace of the interview, and the like are likely to produce larger effects between these two modes, all else being equal.

Turning to the issue of the types of questions, we should expect mode differences for some types of questions but not for others. Factual questions, or nonsensitive questions with yes/no answers, should not be affected by the presence of an interviewer, and should generally be unaffected by the visual or aural presentation (presuming, of course, that the question itself is not complex). On the other hand, we know that sensitive questions are affected by mode. So, again, depending on what questions one is examining, one may or may not find mode effects.

Regarding the third point, a common research design for comparing measurement differences across modes is randomly assigning sample cases to one mode or the other. This often confounds selection effects (especially coverage and nonresponse) with measurement differences. In other words, the differences may be due to differential selection into the respondent pool, rather than the measurement properties of the mode. To get around this, researchers may limit the comparisons to volunteer subjects in a lab setting (e.g., Chang and Krosnick 2010). Another strategy used is a repeated measures design, with the same subjects administered the items in both modes, often in close temporal proximity. Under these circumstances, one would expect subjects to be able to recall their earlier answers and be motivated to answer in similar fashion the second time. We should be careful, on the basis of these studies, about generalizing to all mode comparisons. Mode differences in measurement error are particular to the modes in question (and the way they are implemented), and to the types of questions under consideration. Broad generalizations may be unwarranted.

Although the field has made good progress in recent decades in understanding the sources of measurement differences between modes, relatively few attempts have been made to examine systems of effects across multiple modes, or to offer theoretical integration of the different effects. Again, there are some notable exceptions, for example de Leeuw and van der Zouwen (1988), Tourangeau, Rips, and Rasinski (2000), and, more recently, Jäckle et al. (2010).

The continued development of models such as these will allow us to extrapolate from existing modes (or existing mode combinations) to as-yet-untested modes or even modes (or combinations thereof) yet to be developed, based on the characteristic features of these modes. In other words, what we need is not

simply more mode comparison studies, but studies that advance our understanding of why and when these differences between modes are likely to occur. To cite Deming (1944, p. 362) again, "The problem is not whether differences . . . exist but how great are the differences, and why do they exist, and what effect will they have on the uses that are made of the data?"

Choosing modes involves evaluating trade-offs among different sources of error. Although we may know quite a bit about the likely effects of mode on single sources of error (e.g., response rates, measurement error), we don't yet know enough about the relative effects on different error sources. The recent resurgence of interest in the total survey error perspective (see the *POQ* special issue 74(5)) may help provide the theories, tools, and data to make better-informed decisions.

MIXED MODES

To return to the issue of mixed mode data collection, this is an area of great interest of late, as is evidenced by the number of papers presented at recent AAPOR conferences on the topic. Mixing modes is much like cooking—one can't learn to combine ingredients until one understands the properties of the individual ingredients. There are many different ways to mix modes of data collection (see de Leeuw 2005), and the way in which different modes are combined can have an effect on all sources of survey error and costs. Modes are also mixed for a variety of different reasons, from reducing costs and increasing response rates, to addressing differential coverage, targeting specific subgroups, improving measurement, and so on.

De Leeuw (2005) offers a detailed classification of the different ways to mix modes of data collection (Dillman, Smyth, and Christian 2009 have a similar taxonomy). A key distinction is whether different modes are used for the contact phase, the response phase, or the follow-up phase. Mixing modes for advance notice or contact (e.g., an advance letter for telephone surveys, or a mailed invitation to a Web survey) has been common practice for some time. Similarly, the use of different modes for different parts of the questionnaire (as in CAPI plus audio-CASI) is also common. The recent surge of interest has focused on mixed mode designs where some part of the sample are interviewed or provide data using one mode and another part do so using another mode. This type of mixed mode survey can itself take several forms. One early example is the dual frame design involving RDD and area probability samples (Groves and Lepkowski 1985), where the part of the sample with telephone access is surveyed by telephone whereas those without are interviewed in person. Another example is where the mode used is determined not at the outset, but during the data collection process, for instance where the entire sample is initially approached using one mode, but remaining nonrespondents are then followed up using a different mode.

The terms "concurrent" and "sequential" mixed modes are being used to describe these approaches, but even this distinction does not fully capture the many variations. For example, we need to distinguish between mode

preference (where respondents are asked which mode of data collection they may prefer) and mode choice. The latter may mean either the situation where respondents are offered a choice of two or more modes, or the particular mode they selected, given the choice. Finally, mode assignment (steering people to a particular mode or sequences of modes) could be done based on frame information, respondents' stated preferences, random assignment, and so on. In other words, it is important to understand who the actors are in mixed mode designs, and which options are under whose control. These variations further complicate the discussion of mode effects in the mixed mode context.

Mixed mode designs can also be extended in time (e.g., in longitudinal studies) and space (e.g., in cross-national studies). For example, Martin (2011) identifies three extensions of mixed mode designs within the context of the European Social Survey, a multinational repeated measures design: (1) across-country mixed mode (ACMM); (2) within-country mixed mode (WCMM); and (3) across-time mixed mode (ATMM). Regardless of whether this terminology catches on, the point is that the adoption of mixed mode designs further complicates comparisons in time and space, especially when the mix of modes and the proportions of respondents using each mode are likely to be dynamic.

The promise of mixed mode designs—especially those involving self-administration—is that the drawbacks of one mode can be compensated for by the strengths of another. In other words, it is hoped that using more than one mode will increase response rates over a single mode, and/or bring in different groups of respondents than for a single mode, thereby potentially reducing nonresponse error. Thus far, the results appear to be mixed. For example, Link and Mokdad (2006) found that they could increase response rates for listed telephone numbers by adding mail and Web to the telephone mode, but found that the same groups that are overrepresented in (listed) telephone surveys are also overrepresented using the alternative modes. The mixed mode approach thus increased demographic biases.

A related hope is that by encouraging more people to use the cheaper mode, resources can be set aside to target particular subgroups with the more expensive mode. This is the assumption behind the U.S. Census Bureau's mixed mode strategy for the decennial census and the American Community Survey. The implicit assumption is that the measurement error differences between the modes are not large—or at least not large enough to negate the benefits of mixing modes.

Several studies offering respondents a choice of mode in concurrent mixed mode designs have found that doing so does not appear to increase response rates (e.g., Griffin, Fischer, and Morgan 2001; Tourkin et al. 2005; Gentry and Good 2008). However, sequential mixed mode approaches, in which sampled persons are offered first one mode and then the other, appear to be more promising (e.g., Holmberg, Lorenc, and Werner 2010; Smyth et al. 2010). But work is continuing on finding the optimal combination and sequences of modes for different types of studies.

Although mixed modes are often targeted at reducing errors of nonobservation—such as compensating for the coverage concerns related to Internet use or telephone access, or for the potential for nonresponse bias relating to literacy when using mail—mixing modes may add complications in terms of measurement error. Assuming non-ignorable differences between modes, there are two main approaches to addressing the problem of differential measurement error when mixing modes of data collection. One approach, which can be viewed as a "prevention" strategy, attempts to minimize measurement error differences between the modes. Martin et al.'s (2007) "universal presentation" and Dillman's (2007) "unimode construction" approaches to questionnaire design exemplify this strategy. An alternative approach, which we could call the "correction" or "adjustment" approach, argues that measurement differences are fundamental features of the mode, and cannot be designed away. This approach argues for maximizing the design benefits of each mode (or optimizing the design for each mode), rather than compromising to produce the lowest common denominator that may characterize the prevention strategy. The measurement differences then have to be statistically adjusted to produce comparable measurements across the modes used. Recent work in this area by Vannieuwenhuyze, Loosveldt, and Molenberghs (2011) offers some promise. In practice, I believe that a combination of these two approaches will be needed.

How easy or difficult this will be may well depend on the modes being used. For instance, the Web is a particularly versatile mode, providing the ability to emulate aspects of other modes of data collection. For example, scrolling Web surveys may be similar to mail surveys in many respects, whereas paging ones may behave more like telephone surveys. Similarly, item-missing data can be handed in ways similar to mail surveys or to interviewer-administered surveys. Similarly, audio and video can be added to Web surveys, again changing the fundamental nature of that mode. Face-to-face surveys also offer a lot of versatility, permitting (for example) self-administration for sensitive questions, the use of show cards, interviewer observations, physical measures, and a wide range of other survey enhancements. However, some modes are more intransitive. For instance, the (traditional) telephone mode permits aural communication only, and the mail mode is restricted to visual communication. In this sense, these two modes are the most restrictive. As a result, mixed mode designs involving these modes may have a harder time achieving mode equivalence.

Another type of mixed mode design is one where the modes are targeted at specific groups of questions, rather than at groups of respondents. Here, the focus is on measurement error. The more we know about the characteristics of modes and the effects they have on certain types of respondents given certain types of questions, the more we can exploit the flexibility of modes to improve the quality of measurement. For instance, research by Conrad and Schober (2000; see also Schober and Conrad 1997) suggests that conversational interviewing may be beneficial under certain circumstances, but not others. It is a challenge to expect interviewers to behave one way for one set of questions

and a different way for another. But as we develop new methods and understand their properties, we will be better able to target particular approaches to specific sets of questions. This is already being done with CASI components of CAPI interviews for sensitive questions. But one could also imagine different designs of Web surveys to accommodate more conversational interviewing at some points with more standardized questioning at others, within the same mode.

DOCUMENTING AND REPORTING ON MODES

One of the important implications of the recent trends described above relates to how we report on modes. We need better ways to describe the data collection methods employed in a survey. For instance, when reporting on a mixed mode study, providing a single response rate is insufficient. Knowing the response rate to each mode—and the characteristics of those who responded in each mode—would be important information to disclose. Similarly, details of the protocol utilized would be needed to judge the value of the survey or its results. Such detailed information would also be needed by those seeking to replicate the study, one of the key scientific tenets of surveys.

We also need better documentation for the user or analyst. I've already noted that "mode" used to be a property of a survey, but is now increasingly a property of an item and of a sample person. For example, it may be important to know whether a particular item was self-administered (e.g., in audio-CASI) as part of a face-to-face survey. But even this may be insufficient, as not all persons complete the self-administered portion as intended (e.g., Couper and Stinson 1999; Couper et al. 2009). Similarly, in mixed mode designs, it may be important for the analyst to know in which mode a particular respondent responded to a particular item. In a similar fashion to the increasing recognition that nonresponse bias is a property of a statistic, the effects of mode may be best understood at the item and person level.

This issue is of particular concern for those doing longitudinal analysis, where the way in which a particular item was administered may change across time and between respondents. The documentation challenge is not trivial, but as the modes we use become more complex, such detail will become increasingly necessary.

The Future of Modes and the Modes of the Future

Predictions are always risky, especially those appearing in print for posterity to judge. I'll offer some observations on a few selected issues, while trying to avoid sweeping claims about the future. What does seem certain, at least, is that survey modes will continue to evolve, both in response to societal changes in how people communicate and in response to technological developments that make new ways of communicating and collecting survey data possible.

Will some modes disappear or become obsolete? In the early days of the Internet, it was claimed that Web surveys would replace telephone surveys,

and possibly all interviewer-administered surveys (see Black, cited in Couper 2005). Such a prediction has not (yet) come to pass. Similarly, CATI and CAPI have not replaced their paper-and-pencil equivalents for all circumstances and all surveys. Although computer-assisted modes now dominate, there are still surveys for which paper-and-pencil data collection makes sense. The newer modes have tended to supplement rather than replace existing modes, in part because even though they address some problems (e.g., improvements in measurement, reductions in cost), they may not solve others (e.g., coverage, nonresponse). In other words, there is no one mode that can be all things to all research questions. Multiple modes, and mixes of mode, will continue to be a fact of life for survey research for the foreseeable future.

The specific predictions that interviewers will become obsolete will not soon come to pass, I believe. Although interviewers are expensive and may introduce errors, their value—in terms of implementing sample designs (both the listing and selection of households in an area probability design and the within-household selection of potential respondents), minimizing nonresponse, administering physical measures, conducting observations, and persuading, clarifying, and motivating respondents during the interview, etc.—cannot be ignored. It seems clear that the role of interviewers will continue to evolve, possibly with interviewers playing a more important role in gaining cooperation and in administering supplemental tasks such as physical measures, and less in the actual question-and-answer part of the measurement process.

Self-administered modes like interactive voice response (IVR) and Web surveys may be cheap and easy for survey organizations to use, and may offer some convenience to respondents in terms of when they complete the survey. But what would motivate them to do so in the first place? Relying on such modes, which require initiative from respondents, will likely lead to selective samples, raising concerns about nonresponse bias. Furthermore, relying on modes requiring some level of literacy, such as the Web or mail, may also limit generalizability for certain kinds of studies. For these reasons, I believe that interviewer-administered modes will continue to be an important part of the survey researcher's toolkit, albeit in increasingly limited roles.

Another related reason for the continued survival of interviewer-administered surveys is that Web surveys (in particular) have led to large increases in the number of surveys. As Beniger (1998, p. 446) noted about the rise in Web surveys: "Good luck to any serious survey firms which pin much of their futures on the hope of being heard for long above the mounting background noise and confusion of this swelling tide of amateur and slapdash pseudopolls."

In similar fashion, a large proportion of transactions one engages in online result in a request to complete a survey about that experience. In many cases, the survey takes longer than the transaction itself. Surveys have become commodities (Tourangeau 2007). There is much more competition for the attention of respondents, whom we should view as an increasingly scarce resource. Using

modes that require more time and effort on the survey organization's part may convey greater importance and legitimacy to potential respondents. Similar to the way that telemarketing could be blamed for the problems facing telephone surveys, the widespread adoption of Internet surveys could threaten to crowd out the legitimate research endeavors. The challenge we face is of educating the consuming public not to treat all surveys, regardless of provenance, equally. The parallel challenge is to educate potential respondents on which surveys are worthy of their time and attention, and which should be treated as entertainment rather than a contribution to society.

A key premise behind the automated approaches to survey data collection (such as river sampling, IVR or robo-polling, and even online access panels) is that respondents constitute an almost limitless renewable resource, and that one respondent is pretty much like another. It is expected that response rates will be low, but if the cost of contacting each potential respondent is close to zero, it doesn't matter how many requests one needs to generate to reach a target number of respondents. However, there is a growing realization that willing and able respondents are becoming an increasingly scarce commodity. Evidence for this can be found in the increased concern about "professional respondents"—the small number of people who complete a large number of surveys. Additional evidence for saturation can be seen in the declining participation rates among opt-in panels over time and the rise in the number of invitations sent to each panelist.

The implication for future modes is that finding new ways to cheaply and easily administer survey questions is only part of the challenge. Unless ways are also developed to identify potential respondents and solicit their participation, such approaches are likely to have only limited success. Once the initial excitement of being invited to a survey in a new medium wears off, or once other researchers or marketers jump on the bandwagon, any initial benefits derived from the new approach are likely to be short-lived.

This brings us back to the basic viewpoint that respondents—and the information we want from them—are precious. Survey participation has long been viewed as an act of social reciprocation, not purely an act of selfless civic duty on the one hand, or of economic exchange on the other. Focusing solely on the benefits that may accrue to us as survey researchers has meant that we have increasingly ignored the things that may be important to respondents. The very act of taking the time and effort to convince potential respondents to participate in surveys helps communicate to them the value of such surveys, in ways that automated methods do not.

What does the future hold for automated telephone interviews (IVR)? There are several flavors of IVR (see Tourangeau, Steiger, and Wilson 2002). Inbound IVR, in which respondents are invited using other methods (e.g., printed receipts or mail), have been popular in customer satisfaction research and some establishment surveys with short questionnaires and repeated measurement. Recruit-and-switch IVR (or telephone audio-CASI), which involves an interviewer, is used for surveys on sensitive topics. But automated outbound IVR

based on RDD samples and involving no interviewers (so-called "robo-polls") seems to be gaining popularity in the political polling world. The recent AAPOR task force on the 2008 pre-election primary polls came to the conclusion that "The use of either computerized telephone interviewing (CATI) techniques or interactive voice response (IVR) techniques made no difference to the accuracy of estimates" (AAPOR 2009, p. 7). This conclusion is likely to further encourage robo-pollsters, but generalizing from the narrow topic of pre-election polls to other types of opinion and social surveys seems premature. Further, a recent paper in *Survey Practice* (van Lohuizen and Samohyl 2011) found differences between those who participated in robo-polls relative to live-interviewer surveys. Clearly, much more evidence needs to be assembled across a wide range of topics before we can draw conclusions about the likely future of IVR. But questions about nonresponse bias, and issues around the legality of automated calling, especially to cell phones, may limit the growth of this alternative to live telephone interviewing.

The information and communication technologies on which key modes are based continue to evolve. Two examples of particular relevance to today's more popular modes include developments in telephony and the Internet. Regarding the first, we are already in the process of adjusting to the move from landline-based telephones to cell or mobile phones, and dealing with all of the implications for sampling, coverage, nonresponse, and measurement error (see AAPOR 2010b). But there is a larger change underway in how mobile devices are being used that suggest more challenges ahead for survey researchers. Mobile phones are much more than voice-based communication devices. Various forms of short message service (SMS, instant messaging, or text messaging) are gaining ground, as are Web-based services for mobile phones. The idea of a device (telephone) implying a particular medium of communication (voice) no longer has traction. The range of modes of communication for mobile devices is rapidly expanding. Smart mobile telephones can already deal with voice (both human and automated), text (also both human- and computer-generated), visual material (both the delivery of photographs and videos to mobile devices and the capture and transmission of such images from the device), spatial position (e.g., GPS), motion (using built-in accelerometers), and a host of other input and output modes enabled through add-on hardware or software apps. Apps are already available (for example) to convert voice messages to text, and vice versa. Smart phones are true multi-modal devices, and figuring out how to use them for surveys will be the big challenge for the next few years.

I've already alluded to the versatility of the Internet, in that it permits the presentation of text as well as audio and visual material. The use of VoIP (Voice over Internet Protocol) services such as Skype make it possible to conduct "face-to-face" interviews over the Internet, realizing the promise of the early video phones. Whether and how these new ways of communicating are useful for us as survey researchers or for the respondents from whom we seek data remain to be seen. But the technical possibilities already exist. As mobile telephony and

the Internet continue to converge, the distinctions between telephone and Web modes will be harder to discern, and we will likely see a blending of these modes.

The Internet is also rapidly evolving from a text-based information medium to a multimedia tool for social networking. The rise of social media sites like Facebook and Twitter presage big changes in how the Internet is used. Researchers are already exploring how social media can be used to conduct surveys or measure key trends in society (see Poynter 2010). As users of these social media increasingly leave detailed digital traces of their lives online, opportunities may rise for passive measurement of a wide variety of phenomena. In his AAPOR presidential address in 1998, before the rise of social media, blogging, and Google trends, Beniger envisioned a world where we could "monitor the behavior of subjects on the Web, with their continually compensated consent, but of course" (Beniger 1998, p. 450). However, these approaches are not without challenges, including issues of informed consent and concerns about coverage. I suspect that we will increasingly see these sources of data supplementing the kinds of information we collect in surveys.

Survey researchers are watching the explosion in social media with keen interest. In September 2011, Facebook reported over 750 million registered users, which would make it the third largest country in the world, behind China and India. Furthermore, over 250 million of these users are reportedly accessing Facebook on mobile devices. Similarly, Twitter reported over 200 million registered users in April 2011. Such trends are hard to ignore, and researchers are easily impressed with the large number of users these sites represent.

However, using sites like Facebook (for example) for surveys offers a number of challenges—the usual inferential issues that survey researchers face. First, despite the impressive number, and the fact that Facebook users are of interest in their own right, few would suggest that those who use Facebook are representative of the entire population of any particular country (and it's often difficult to attach a country to such users or even properly identify who such users are). Second, the set of Facebook users is not available to the outside community as a sampling frame. Researchers are restricted to using a variety of nonprobability methods (such as snowball sampling) to study Facebook users (see, e.g., Bhutta 2010). Third, Facebook users are becoming increasingly aware of privacy issues, and new tools are being developed to give users control over who has access to what content. This limits the passive collection of data from users to those who are willing to publicly share the information, which is likely to be an increasingly selective subset of Facebook users. These rich data sources will add much to our understanding of public opinion, but will not replace surveys in the near future.

New technologies offer new means of communicating, and they also increasingly provide the user with the means of controlling who communicates with them, and restrict access to a limited circle of known associates. This means that the fundamental challenges of sampling persons and gaining cooperation from them, and how our choice of a mode and survey design influences that decision,

remain key issues for the survey profession. In similar fashion, if we are to make use of the vast amount of public information on the Internet, we need more work to understand how those who willingly share information with the broader public differ from those who do not, and what kinds of topics are more or less susceptible to selection biases. To make this work even more challenging, the norms surrounding the use of social media, and indeed the popularity of particular sites and tools, are constantly evolving. Again, I believe that differences between what people *can* do and what they *want* or *choose* to do are at the heart of the challenge. Our research needs to focus on why people choose to participate in surveys—or why people share their information publicly online.

Another trend that is already well underway is that communication is increasingly asynchronous—voice mail, text messages, and the like no longer require the two parties to be connected at the same time to communicate. Interviewer-administered surveys are largely based on a synchronous model, with both parties able to communicate at the same time. How this change in communication will affect the conduct of surveys remains to be seen, but it might mean that surveys are broken into smaller chunks with the respondent having greater choice in when, where, and how the questions will be answered. We have already seen developments in the use of short, frequent measures such as ecological momentary assessment (EMA; also known as "beeper studies"), the day reconstruction method (DRM), and the like (see Dockray et al. 2010; Shiffman, Stone, and Hufford 2008). The focus of these approaches has generally been on sampling time among a select group of volunteers. We're likely to see these methods applied to samples of persons, permitting broader generalization from the results of these studies.

In conclusion, modes—like all other aspects of survey design—evolve. It is my view that the variety of modes and mode combinations will continue to expand as survey researchers adapt to societal and technological changes. There is a constant tension between the need to innovate or invent new methods, whether for market share or peer recognition, and the importance of maintaining comparability across time for key longitudinal estimates and analyses. Some might rush out to try a new method of data collection, while others might wait to assemble the evidence before carefully transitioning from one approach to another. This tension is a healthy one, I believe, and both approaches are valuable for the profession. The one constant in survey research seems to be change, and we need to find ways to adapt existing methods and develop new methods, in response to both external changes and methodological research on ways to improve surveys.

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