10

Overview: Online Surveys

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ABSTRACT

Online (Internet) surveys are becoming an essential research tool for a variety of research fields, including marketing, social and official statistics research. In this chapter we overview the key methodological aspects of these surveys and observe them within the broader context of computer-assisted survey information collection, which continuously evolves with rapid development of the information–communication technologies. We also overview application areas, related issues (management, ethics) and outline the emerging trends.

INTRODUCTION

Survey data collection – based on standardized questionnaires, delivered to a sample (or the whole) of the target population – is an important data collection tool in a variety of contemporary research fields. Its beginnings can be found several centuries ago (de Leeuw, 2005; Groves et al., 2004), although the real breakthrough occurred only in the 1930s with the application of probability sampling. Since then surveys have become a standard tool for empirical research in social sciences, marketing, and official statistics.

Survey research has always been open to new technological advancements, starting with telephone surveys in the 1960s and computer-assisted surveys in the 1980s. One of the recent influential changes emerged with the Internet in the mid-1990s. Today, Internet surveys are becoming an increasingly important industry. According to CASRO (Council of American Survey Research Organizations), 76 percent of American survey research organizations participating in the Data Collection Trends Survey in 2006, already perform Internet surveys and for 32 percent of them the Internet is the primary mode of data collection in terms of revenue (DeAngelis, 2006). ESOMAR (the global association of research professionals) reports that online survey research actually accounted for 20 percent of global data collection expenditure in 2006 (E-consultancy, 2007). However, while Internet-based surveying offers significant advancements, it simultaneously raises new methodological issues and questions.

COMPUTER-ASSISTED SURVEY INFORMATION COLLECTION

Internet surveys within CASIC context

The introduction of computer technology enabled a variety of survey modes, which are covered under the general term of 'computer-assisted survey information collection' (CASIC). Initial CASIC modes were interviewer-administered, with an interviewer reading and completing the survey questionnaire either remotely (through the telephone) or in a face-to-face situation (at respondent's home, office, etc.). Later on, computerized self-administered questionnaires (CSAQ) – where respondents themselves completed the survey questionnaire – appeared. The most common CASIC modes according to the nature of interviewer involvement are briefly described in Table 10.1.

Internet surveys are positioned at the intercept of computerization and absence of an interviewer. The computer technology enables significant improvements over traditional paper-and-pencil modes. Answers collected from the respondents are immediately stored in a computer database and ready for further processing. This reduces time, costs, and errors arising from the transcription of paper questionnaires. Furthermore, computerized questionnaires using the graphical interface of the World Wide Web (WWW) offer advanced designing features, like question skips and

Table 10.1 CASIC modes according to interviewer involvement

CASIC mode	*Interviewer involvement*	*Brief description*
CATI – *Computer-assisted telephone interviewing*	Remotely present	The first CASIC mode. An interviewer calls respondents by phone and enters answers into the computerized questionnaire.
CAPI – *Computer-assisted personal interviewing*	Physically present	The mode enabled by introduction of portable computers. An interviewer brings a portable computer with the questionnaire to respondents and enters answers into it.
CASI – *Computer-assisted self-interviewing,* Audio-CASI, Video-CASI	Physically present	Similar to CAPI but respondents answer the questionnaire on an interviewer's computer by themselves. Variations are audio-CASI and video-CASI, where questions are presented using audio or video clips.
CAVI – *Computer-assisted video interviewing*	Remotely present	Similar to CATI but the communication between an interviewer and respondents is established using video calls or similar technology.
Disk-by-mail	Not present (CSAQ)	Respondents answer – using their own computer – the questionnaire on a floppy disk sent by the researcher.
TDE – *Touch-tone data entry*	Not present (CSAQ)	Respondents input their answers by pressing appropriate numeric keys on a telephone handset.
IVR – *Interactive voice response*	Not present (CSAQ)	A wide range of approaches for voice communication with a computer system using the telephone. Modern IVR systems, supported by speech-recognition technologies, already enable respondents to provide complex answers through the telephone that are automatically recorded as text.
Internet surveys	Not present (CSAQ)	A variety of survey modes in which questionnaires are delivered and answered using Internet technology (e.g. e-mail or web). The most widely used are web surveys and less used e-mail surveys.
Virtual interviewer surveys	Not present (CSAQ)	Questions are presented to respondents using some kind of virtual interviewer, usually through the Internet. Future technological development will enable increased virtualization of the surveying process, where interviewers will probably become completely computerized virtual characters.

filters, randomization of answers, control of answer validity, inclusion of multimedia elements, and many others (see Best and Krueger, this volume). Self-administration is beneficial for both researchers and respondents. Respondents can complete a questionnaire at the time, place, and pace of their own preference and with an increased sense of privacy. Absence of interviewers greatly reduces costs of research. In addition, increased sense of privacy and absence of interviewer-related biases can importantly contribute to higher data quality.

Internet surveys were enabled by technological advancements in transmission procedures, evolution of standardized web browsers, development of e-mail clients, and integrated technologies (Lozar Manfreda, 2001). At the beginning, Internet surveys were often performed only via e-mail (Sheehan and Hoy, 1999; Bachmann et al., 1996). However, today they almost always involve some type of web interaction. We thus talk about web surveys (Pitkow and Recker, 1994) where respondents access and answer the survey questionnaire using some standard web browser on their personal computer or other Internet-enabled device. Questionnaires based on modern web technologies also encompass virtually all advanced and interactive features of computerized questionnaires.

The Internet CSAQ can use different options with respect to input and output interfaces. For example, video questionnaires can be used to convey survey questions to respondents and the answers can also be video recorded and decoded with speech recognition. However, here we predominantly limit our discussion to the currently prevailing Internet survey option based on written questions presented on the screen of a device, which are answered manually by respondents, using mouse, keyboard, or touch screen. Graphical and multimedia elements can be used to enhance the content of the questionnaire.

Internet surveys can be regarded as part of the larger online survey family. While these terms are often used synonymously, the term 'online' is somewhat broader but still within the context of CASIC (Figure 10.1). Online surveys may use any type of ICT network to support and mediate the survey process. Besides the Internet protocol this

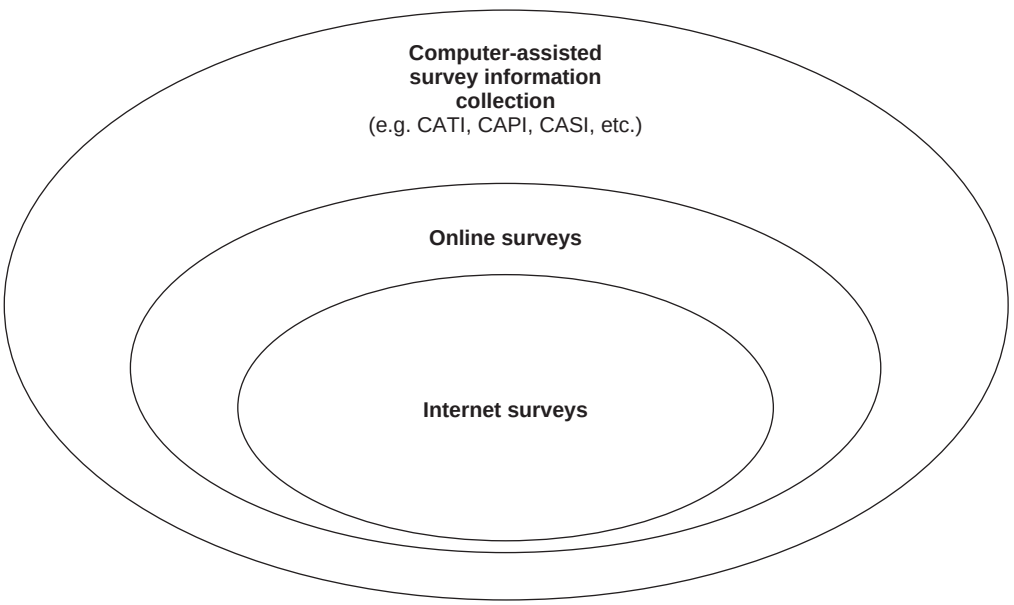

Figure 10.1 The relations between Internet surveys, online surveys, and computer-assisted survey information collection (CASIC)

may also include, for example, local area networks within an organization, or SMS surveys over mobile phones. However, as the principles of Internet and online surveys are largely the same, we primarily focus on the former. In addition, as already mentioned, we could further nest the notion of web survey as a subset of Internet surveys, which also incorporate e-mail surveys where there is no web interaction.

Technological aspects of Internet surveys

Internet surveys are based on developments in modern communication technologies, as well as on a wide availability of these technologies. Early web surveys were presented as plain HTML forms and did not offer much interactivity. Today, technologically, interaction can be provided at server-side or at client-side. The former are usually based on HTML forms and CGI (Common Gateway Interface) scripts, while the latter enable execution of questionnaire features on the respondent's computer using technologies like Java, Javascript, or ActiveX. Client-side surveys are in principle more powerful and flexible, since they can perform advanced features (like skips and answer validity checks) in real time and without continuous interaction with the web server. However, there are also some practical disadvantages connected to this option. Further comparison of these technologies is given in Best and Krueger's chapter on Internet survey design (this volume).

Web surveys with a larger number of advanced features and multimedia elements are usually demanding in bandwidth requirements. However, multimedia elements can present very beneficial additions to questionnaire text, increase respondents' motivation, and foster the understanding of questions (Couper et al., 2004; Lozar Manfreda et al., 2002). A wider availability of broadband access is thus a very important factor that enables the advantage of interactive and multimedia-supported web surveys among wider segments of the general population. In 2006, broadband Internet connections (e.g., DSL, cable) covered roughly half of the households in developed countries.

One of the promising benefits of Internet surveys is the possibility of their distribution across various devices. Mobile phones and PDAs are particularly expected to become an important interface for survey research. However, problems with small screens, continuous delays with third-generation mobile phones, and lack of standardization (Tjøstheim et al., 2005) still limit their usage for mobile CSAQ (Kuusela et al., 2006). Another device with extremely promising potential is interactive TV (e.g., WebTV), which integrates traditional TV technology and access to Internet services. While this technology could bring surveys closer to respondents' daily activities (e.g., TV watching), it still remains relatively undeveloped (digitalization, interface). Nevertheless, further developments in these devices will substantially broaden the potentials of Internet surveys.

Technologically, in the early years of Internet surveys, preparing and conducting web surveys required programming knowledge and understanding of computer networks. Nowadays this task is manageable by virtually anyone with general computer literacy. This is enabled by specialized software tools with friendly interfaces, which offer various features of questionnaire design, respondent recruiting, survey project administration, and data analysis. According to the WebSM (http://www.websm.org) online database (Lozar Manfreda and Vehovar, 2006), there were more than 300 of these products in the English language on the market in 2006. Many of them were also free or Open Source. For a comprehensive overview of software tools for web surveys see the chapter by Kaczmirek (this volume).

KEY METHODOLOGICAL ISSUES

Sampling

One of the initial steps in conducting survey research is the decision about target

population from which we choose a sample. Here, the differences between probability samples – where we know the (positive) inclusion probabilities for all units of the target population in advance – and non-probability samples, is crucial. These issues are comprehensively presented in the chapter by Fricker (this volume), and placed in the broader context of data quality in the chapter by Rasmussen.

Probability samples in Internet surveys are highly affected by the problem of non-coverage and sampling frame problems. The first problem arises from the fact that not all members of the general population have access to the Internet. Data for 2006 show that few EU member states have more than 70 percent of the adult population with Internet access (Eurostat, 2006), while in the USA access was 73 percent (Madden, 2006). Nevertheless, similarly to fixed telephone and TV penetration, we may soon expect relatively complete Internet coverage of all households. Indeed the coverage of organizations in the EU (e.g. schools, companies) is already almost complete (Eurostat, 2006). Of course, when we observe the Internet globally, there are numerous countries where the penetration among households or organizations is dramatically lower.

Invitations to Internet surveys are most conveniently distributed using e-mail, but that causes severe frame problems. There are no e-mail directories of the general population of Internet users that might be used as a sampling frame. This again limits the use of probability Internet surveys to specific populations for which such directories exist, for example, members of an organization. Both coverage and frame problems can significantly impact data quality and should be adequately reported when disseminating the results of the research (AAPOR, 2006).

The problems of probability samples largely contribute to the overall status of Internet surveys as inherently related to non-probability samples (Terhanian and Bremer, 2005). Cost-reduction trends have fostered wide utilization of non-probability (access) panels of Internet users. As these panels become the major recruitment channel, professional standards are rapidly developing to cover the problems of panel recruitment, management, monitoring and maintenance (EFAMRO, 2006; ESOMAR, 2005). In addition, a corresponding ISO standard is under development.

When discussing sampling issues, it should be stressed that mode of data collection and sampling design are completely separate issues and are not a priori related. As is evident from Figure 10.2, survey management, survey mode and ICT are closely interrelated, but none of these components is inherently linked to the issue of non-probability samples. There are only spurious links arising from the practice of (cheap) Internet surveys using non-probability sampling. The problem of inference from non-probability samples should thus be considered as a purely statistical issue, which also applies to other survey modes.

Invitations to Internet surveys

Owing to the lack of sampling frames, many contemporary Internet surveys are based on general invitations where an URL link to a survey is published on websites or (less commonly) in other media. This clearly leads to sample selection bias, which is out of researcher control, and to non-probability samples. Probability sampling is possible, for example, when e-mail addresses of all eligible participants are available and individual invitations can be sent by e-mail. Inviting randomly selected visitors to a specific website (i.e., intercept recruiting) is another approach to web survey solicitation. This is usually implemented using pop-up windows, layers, or flash elements containing a general invitation to the web survey seen only by the selected visitors. It should be noted that unsolicited e-mail invitations and intercept surveys that interrupt users' tasks might breach professional standards (e.g. ESOMAR, 2005; MRA, 2000; MRS, 2006). Fricker's chapter provides additional information on different solicitation approaches for different types of Internet surveys. E-mail invitations and different modes of survey

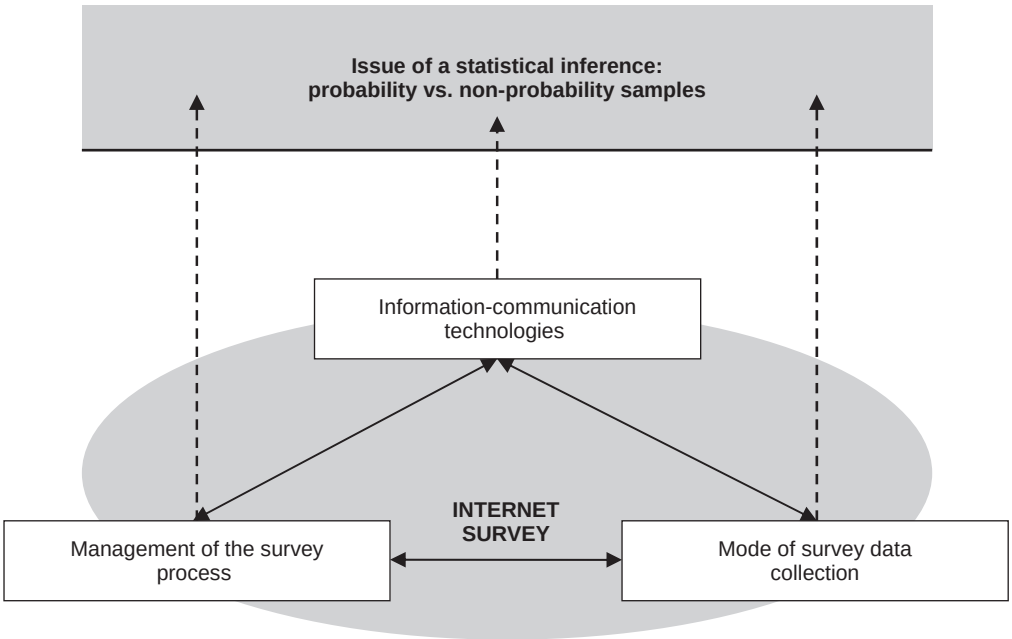

Figure 10.2 Spurious links between statistical inference and the components of Internet surveys: survey management, survey mode, and ICT

access control are addressed by Best and Krueger (this volume).

Furthermore, traditional solicitation modes (like telephone or mail invitations to web surveys) may help overcome the issues of probability samples in Internet surveys, but impose dramatically higher costs and their effectiveness is questionable (Pratesi et al., 2004). Telephone recruiting seldom provides an overall response rate above 10 percent among Internet users and much the same is true for mail recruiting. Nevertheless, exceptions exist, such as the general cancer preservation study (Bälter, 2005), where mail invitation to a web survey achieved an around 50 percent overall response rate. Interactions of solicitation and sampling methods are presented in Fricker's chapter (this volume).

Non-response problem

Several forms of non-response may occur in Internet surveys (Bosnjak, 2001; Vehovar et al., 2002). Invited survey participants can refuse participation altogether, terminate participation during the process, or answer questions selectively. In Internet surveys there are several other non-response patterns that can be observed, thanks to paradata information (e.g. lurking respondents, combination of partial and item non-response, etc). A non-response error thus arises because measurement is not performed on all units from a sample (Groves, 1989). This is especially prominent if non-respondents and respondents significantly differ in characteristics that are in the scope of a specific project. Response rates in web surveys are generally low and also vary considerably – from less than 1 percent for enterprise surveys with e-mail invitations, to almost 100 percent in specific membership surveys. This is also due to the complexity of the web-survey response process, which is especially apparent when e-mail invitations are used. The invitation might, for example, not be delivered owing to an error in the e-mail address. Moreover, the invitation is easily overlooked by intended respondents, or treated as spam. Noticing the e-mail invitation still does not mean

being aware of it. Finally, the respondent needs to make a decision to follow the link to a survey and complete the questionnaire (Vehovar et al., 2002).

In order to increase response rates, respondents can be offered monetary or some other form of award (e.g. lottery ticket) as an incentive (Göritz, 2004). Additionally, multiple follow-up contacts might be made and difficulty of the questionnaire kept as low as possible (Lozar Manfreda and Vehovar, 2002). The issues arising from non-response in Internet surveys and the strategies of increasing response rates are further addressed by Fricker (this volume).

Questionnaire design

The wording, visual design, and other elements of a survey questionnaire present the main communication channel between researcher and respondents. An appropriately prepared questionnaire is thus of key importance for high-quality data collection. Questionnaires on the web differ importantly from the questionnaires in traditional survey modes. They are navigated using a mouse and a keyboard, which causes the loss of eye–hand centralization (Bowker and Dillman, 2000). Human–computer interaction research also shows that, compared to paper-and-pencil modes, individuals pay less attention to the text on web pages and more attention to graphical elements (Spool et al., 1999).

Modern web questionnaires offer a range of design features, like different question types, advanced questionnaire features, images, and multimedia. Nevertheless, such elements can significantly impact on respondents' answers and cause a variety of potentially unpredicted effects, resulting in lower validity and reliability of data. See the chapter by Best and Krueger (this volume) for an extensive evaluation of questionnaire design possibilities and problems in Internet surveys.

Internet (web) surveys show enormous potential for advanced questionnaire design and offer the possibilities for innovative approaches to surveying. Bälter (2005), for example, suggested using computer games design to increase response rates to web surveys. However, all designing features need to be subjected to prior methodological evaluation in order to minimize the possibilities of the unpredicted effects. Inappropriate questionnaire design can result in measurement error, which is the observational gap between the ideal measurement and the actual response (Groves et al., 2004). Usage of graphics and multimedia elements in a web questionnaire should thus be limited to the extent necessary for respondents to understand questions or to stimulate the response, but should not affect their responses.

It should be mentioned that measurement error in Internet surveys can arise not only because of the questionnaire design, but also because of the respondents or the survey mode itself (Groves et al., 2004). Respondents' motivation, computer literacy, abilities, privacy concerns and many other factors influence their answers. Proper questionnaire design can help lower the measurement error by offering a user-friendly survey experience, raising the motivation of respondents and providing for precise responses (Peytchev and Petrova, 2002).

Post-survey adjustments

In survey sampling practice, post-survey adjustments often become one of the central issues. Practitioners have developed various robust procedures for situations where sampling deviates from probability selection, or when we face non-coverage and non-response problems. With weighting, the data are usually adjusted to some population socio-demographic controls. Various weighting procedures exist; however, differences in final results are usually very small. Very often, the weighting corrections do not remove the bulk of the biases (Vehovar et al., 1999).

We have to be clearly aware that the standard statistical inference procedures (e.g., confidence interval calculations and hypothesis testing) still require a probability sample. Real-world survey practice, particularly in marketing research and in public opinion polling, which massively neglects the

principles of probability samples, increasingly requires statisticians to elaborate this problem and specify the conditions where non-probability samples may work. Issues of statistical inference from non-probability samples are thus amongst the most challenging in contemporary survey methodology and statistics. Nevertheless, we should emphasise that AAPOR (2006) requires that sampling errors can be calculated only with probability sample surveys.

Besides large commercial pressures to validate Internet non-probability samples, there seems to be nothing really new with respect to post-survey adjustments. The rare exception might be propensity score weighting, initiated in the 1980s (Rubin and Rosenbaum, 1984) for the analysis of observational studies and adapted in the 1990s by methodologists from the marketing industry. For example, the company Harris Interactive has often reported successful applications of this method (e.g., Terhanian and Bremer, 2005). With any type of weighting, however, the situation is very unfavorable in terms of the lack of some explicit missing-data mechanism beyond the usual 'missing at random' (MAR) assumptions, where the population estimates can be painfully and unpredictably wrong.

RELATED ISSUES

Errors, costs and management

The process of overall survey implementation is essentially a managerial one, which is especially apparent in commercial research projects. Numerous current and emerging quality standards (Biemer and Lyberg, 2003) for general and ICT-supported survey data collection are aimed at providing the managerial principles for successful survey research. In addition to data quality, the survey management should scrutinize and optimize the costs of research. Such optimizations are reflected in the trends toward paperless (computerized) and people-less (self-administered) surveying. Internet surveys, encompassing both beneficial characteristics, thus seem very promising from the managerial point of view.

Costs and errors (data quality) are very closely related. Lower costs are often regarded as one of the key advantages of Internet surveys in comparison to other survey modes. In practice it turns out that this advantage is not that straightforward, and is often questionable. For example, costs might substantially increase when traditional solicitation methods are employed to achieve a higher response rate (Pratesi et al., 2004). The same applies to incentives or probability panels of the general population, which are very demanding in terms of maintenance costs. Cost-effectiveness of Internet surveys should thus be evaluated with respect to errors. Few such evaluations are available to date. One of them (Vehovar et al., 2001) discussed the mean square error (MSE) approach (Groves, 1989), which integrated sampling error and non-response bias. This study found that web surveys with mail invitation perform better than telephone surveys in the case of longer questionnaires, because in web surveys the gain from smaller sampling outweighs the non-response bias. It is therefore crucial that quality standards, together with managerial practices, take into account costs and errors of survey research.

Web versus other survey modes

Internet surveys are relatively new and pose several unresolved methodological questions; yet web surveys are regarded as the mode that could largely replace telephone and traditional mail surveys. It is thus not surprising that they are often compared to other, traditional modes. Two aspects of web surveys are particularly prominent in such comparisons: response rate and data quality.

Response rate comparisons are usually not favorable for web surveys. A recent meta-analytical study showed that on average web surveys gain lower response rates (from 6 percent to 15 percent lower) than other survey modes when comparable implementation procedures are used (Lozar Manfreda et al.,

2008). The issue still awaiting exploration by survey methodologists is the comparison of response rates with mode-related costs taken into account.

Data quality is typically measured on the basis of indirect indicators, including item (question) non-response, acquiescence, non-differentiation, and length of answers to open-ended responses. Several studies found web surveys performing better on these indicators in comparison to telephone and mail surveys (Fricker et al., 2005; Kwak and Radler, 2002). Chang and Krosnick (2002) also confirmed generally lower measurement errors in Internet surveys.

Mixing survey modes

Survey researchers often use more than one survey mode for a specific objective. The implementation of multiple modes (mixed modes) offers opportunities for compensating the weaknesses of individual modes, for example, increasing response rates and thus eliminating non-response biases (de Leeuw, 2005). Mixed mode approaches can be used at different stages of a survey project, in general at the level of solicitation or data collection. In the first case, a specific mode is used for recruitment and another for data collection. In the second case, data collection itself is performed through different modes for different respondents, parts of questionnaires, or time points. Further combinations of these basic forms of mixed-mode research are also possible (de Leeuw, 2005).

The coverage, sampling frame and non-response problems of Internet surveys were the key factors fostering the interest in mixing Internet surveys with other survey approaches. With the development of the Internet and related communication technologies, solicitation can be decomposed into various contact attempts in different modes. For example, in order to increase response rates the first contact attempt is made by e-mail, while the non-respondents are later contacted by telephone. Telephone respondents might be also screened and asked for their e-mail addresses, to which the invitation to do a web survey is later sent. Also surveying (data collection) can be performed at diverse times, with different modes for various population segments and with increasing avoidance of technology. In some cases, the decision on the mode of surveying might be left to respondents in order to overcome coverage and sampling frame issues. Those who do not possess Internet access or do not want to answer the web survey for any other reason can thus choose a traditional mode, usually telephone or mail survey. An alternative is that mail or telephone survey (and not only another solicitation attempt) is performed on those who did not respond. Several other more or less common options also exist (de Leeuw, 2005; Dillman, 2007).

For effective survey project management it is always very beneficial when this variety of mode combinations is administered through some form of centralized data management (Figure 10.3).

When mixed modes are employed at the surveying stage, mode–effect problems can arise. The practices of the presentation of questions vary significantly across different modes and can affect respondents' answers. We already pointed out that in web surveys the differences in question presentation can cause unforeseen effects on respondents' answers, and the problem is even more severe when several modes are combined. For example, a recent study found that check-all-that-apply (commonly used in web and paper surveys) and forced-choice format (common in telephone surveys) perform significantly differently when utilized for the same question (Smyth et al., 2006). Respondents endorsed more answers and needed longer to provide answers in the latter format. There might also be a conflict because of questionnaire-designing possibilities offered by web surveys, but not by traditional modes, like question skips, use of graphical elements, and even multimedia and so on (Dillman, 2007). It is therefore necessary to take appropriate measures for reducing such effects.

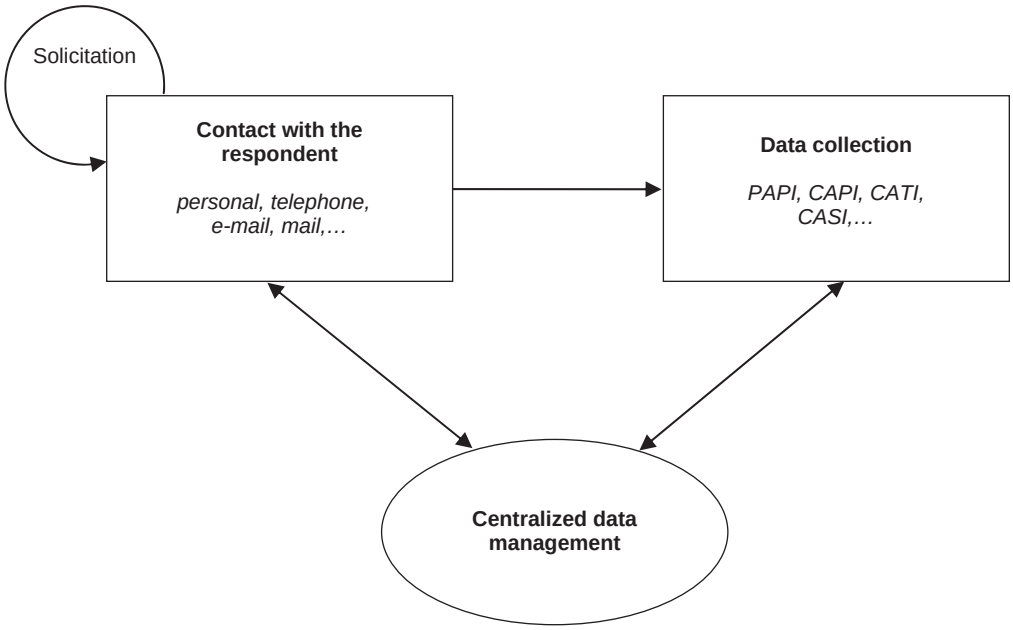

Figure 10.3 Solicitation and data collection modes through centralized data management

There is, however, no uniform answer to how to successfully address mode–effects issues. Dillman (2007) discusses the dilemma of using unimode versus mode-specific design. In the first case, the questions are presented in the way of minimizing differences in construction of the questionnaire across different modes. On the other hand, the mode-specific design suggests using different designing approaches for different modes, in line with their specifics and capabilities. According to this approach, unique features of Internet surveys (e.g., images or multimedia) should be deployed if they can contribute to higher data quality. This might be done even if other modes in the research design do not offer such possibilities (Dillman, 2007).

Introducing another mode in any stage of an initially Internet-based survey is very likely to substantially increase the costs of research. However, as we stressed above, costs and errors should be regarded as strongly interconnected. As de Leeuw (2005) points out, there is always an explicit trade-off between costs and errors in mixed-mode designs. The mixed-mode approaches are effective when the selected modes offer a higher data quality at the level which outweighs the increased costs.

Mixing research methods

We have to sharply separate mixing of the survey modes from mixing surveys with qualitative approaches in social sciences, i.e., mixing methods. There has been a long historical discussion about quantitative and qualitative methods in social science methodology.

With quantitative research we usually employ standardized surveys or an observational form of data collection on larger samples of the target population. Another key characteristic is that in quantitative research we basically deal – after coding – with numbers. Qualitative methods, on the other hand, are characterized by exploring concepts and by the absence of standardization; most typical examples include in-depth interviews, focus groups, and ethnography, but specific analytic approaches are continually expanding. While quantitative and qualitative approaches were historically separate and

even in confrontation, they increasingly cohabit in so-called mixed methods, or combined-method approaches. Today, most substantive research fields draw on both approaches. Morgan (1998) identifies four basic designs of mixed method based on the decision about the principal approach in research (the priority decision) and the order of using qualitative and quantitative data (the sequence decision). The combinations of qualitative and quantitative methods derived from this priority-sequence model are: qualitative preliminary, quantitative preliminary, qualitative follow-ups and quantitative follow-up (Morgan, 1998). For example, qualitative methods are used to formulate and test a survey questionnaire (qualitative preliminary), or focus groups are employed to pursue findings from a survey (qualitative follow-up).

With the Internet these combinations fruitfully expand, because the mixing of methods can be performed easily and cheaply (Lobe and Vehovar, in press). Flexible combinations of quantitative and qualitative approaches, like combinations of web surveys and in-depth interviews, can be very effective in providing higher validity and explanatory power of collected data. When we have permanently at our disposal a large database of potential respondents (either from access panels or from studying a specific on line community), we can, for example, start with qualitative research (e.g. in-depth interview), which is followed with one week (or less) of web surveying. After analyzing results we can simply continue with the same survey, we may modify it, or we may perform some more qualitative research (e.g., focus group). Of course, many methodological issues arise here, from the allocation of resources to these methods, and the attention given to results from each method, to the problem of combining (sometimes contradictory) findings. Nevertheless, the Internet enables us to integrate surveys into a very powerful circle of mixed research methods. This can be further extended by the emerging concepts of e-Social Science, where the entire process of research is conducted on the Internet, from conceptualization and questionnaire design to data collection, analysis, dissemination, and archiving.

Ethics, guides and standards

Survey research, as well as virtually every other professional research field, includes a variety of standards and best practice guides to ensure that research is conducted in line with ethical and quality principles (like AAPOR, 2005; ESOMAR and WAPOR, 2003). General survey standards, which are already highly developed and widely available, can largely be applied to Internet surveys. However, with the introduction of Internet surveys new ethical issues emerge. The most prominent among them include the problem of unsolicited e-mail invitations, privacy and security threats, obtaining of informed consent online, combining data from different sources, and surveying children and minorities, among others. Such specifics of Internet surveys need to be addressed by an extension of the current standards or development of completely new ones. For further discussion of these and other general aspects of Internet research ethics see the chapter by Eynon et al. within this volume.

Several specialized standards and codes for Internet surveys are already available (e.g. ESOMAR, 2005; MRA, 2000; MRS, 2006). In general, they cover the basic principles of Internet survey data collection, including the main issues stated above. A few organizations have incorporated guidelines and codes for Internet-based research into their existing documents (CASRO, 2004). Some specific documents relate to a special type or usage of Internet surveys, such as online access panels, which are addressed by *Quality Standards for Access Panels* (EFAMRO, 2006) and by ESOMAR (2005), or psychological research addressed by the American Psychological Association (Kraut et al., 2004).

There are several ethical problems that Internet surveys have to overcome in order to achieve wider public confidence. Internet security threats and privacy intrusions often receive disproportionately high levels of public attention. Increasing numbers of spam

e-mail messages may have a negative impact on response rate in Internet surveys, as happened to telephone surveys with the spread of telemarketing, which negatively influenced willingness for survey participation (Couper, 2005). Because of easy implementation, many Internet surveys are conducted by non-professionals lacking methodological skills. This lowers the legitimacy of even professionally conducted surveys for serious research purposes. Finally, several questions regarding online privacy protection and Internet (survey) research ethics are still not adequately answered. For example, it is not always clear how to obtain adequate online, informed consent for surveying children and minorities, how to ensure that e-mail invitations will not be regarded as spam, or how to set the border between acceptable and unacceptable combining of data from different sources. Further development of standards and guidelines for Internet surveys is thus crucial for their successful implementation and increased data quality. Consult the chapter by Eynon et al. for additional clarification of ongoing ethical issues in Internet research.

THE CURRENT AND FUTURE APPLICATIONS

Application areas

Internet surveys provide a vast application potential for a variety of research topics. On the one hand we can observe this most visibly with the expansion of entertainment web surveys and online voting. These have become tremendously popular, mostly in the form of quick daily polls posted on various web sites, or as participation in interactive shows or events.

On the other hand, Internet surveys are increasingly replacing other survey modes where clients (i.e., companies, research institutions, statistical offices, public and government bodies) actually pay for survey data collection. This replacement process is very complex and its speed is determined by numerous interrelated factors, from technology, economy, culture, and legislation, to politics. The most visible areas are, of course, the commercial surveys, where the US marketing industry is a clear leader. In 2007 the segment of large marketing corporations, which represents the majority of global market research, will have online survey revenues approaching two billion US dollars (Baker and Downes-Le Guin, 2007). This is roughly three times the corresponding revenues in the EU, despite the fact that the EU is a larger market and has higher market research expenditures per capita. However, even in the US the process is not as fast as expected (Black, 1998), and CASRO (DeAngelis, 2006) figures project that online data collection will not become a major mode in terms of revenues for several years. The 2005 ESOMAR survey (ESOMAR, 2006), which also includes smaller companies, shows that – with respect to the proportion of the turnover across research methods – only in Australia has online data collection already achieved the leading role among quantitative methods. Closely behind are Japan, US, the Netherlands, and Sweden, while globally, online data collection revenue lags considerably behind those from telephone (13 percent versus 21 percent) and face-to-face data collection (24 percent). Some sources, however, report much more favourable trends for online methods, e.g. Infosurv (2007). The factors that impact this replacement process are discussed in detail by Vonk and Willems (2006), with specific reference to the Netherlands.

Academic, public, and government (particularly statistical offices) bodies are much slower in this replacement process. In part this is because they are bound by strict regulations with respect to quality standards, particularly sampling and response rates (e.g., US Office of Management and Budget). This is also due to much more rigid management structures and decision processes, which prevent more widespread introduction of online methods as they involve considerable risks. Some early adopters (e.g., Statistics Norway), which made the web survey option compulsory for all business surveys, have faced numerous practical difficulties. In addition, public surveys are often very complex and involve long-term integrated

data collection. Nevertheless, the experience with 2001 decennial censuses was generally very positive in all countries which offered web options.

Of course, when we talk about application areas, we should be aware that some are more convenient for Internet surveys, such as organizational surveys, customer-satisfaction surveys, and membership surveys (including faculty and student surveys). This is also sometimes true for establishment surveys.

We should add that the revolutionizing potential of Internet surveys is not limited to survey research in a narrow sense. A web survey questionnaire is technically an electronic form which can be used to provide different kinds of information. Several software solutions for implementation of web surveys are, for example, similar to (or even part of) those for online business-data collection (like Microsoft InfoPath). Similarly, the border between Internet surveys and online experiments is becoming more and more blurred (Reips, 2002). Further, there are increasing numbers of areas where Internet surveys are becoming a component in a larger integrated process, such as public administration (i.e. e-government). Internet questionnaires are increasingly used in e-learning, particularly to evaluate distance education programs (Stachota et al., 2005), or in online tests and quizzes as an assessment tool. We should also mention psychological research (Buchanan and Smith, 1999), including neuropsychological testing, industrial and organizational psychological research, educational testing, psychodiagnostics, and more (Naglieri et al., 2004). An important area of application is also organizational research, where so-called 360-degree feedback questionnaires provide comprehensive information on effectiveness of employees by receiving feedback from their supervisors, peers, customers, other related persons, and also by self-assessment. The results from Internet surveys are then automatically processed further with HRM (Human Resource Management) tools. Finally, various forms of HCI (human–computer interaction) and communication research, including usability studies, especially those focused on website design (e.g. Comley and Lang, 2004), are increasingly integrating the Internet survey as an important element of their research or evaluation process.

Another stream of integration relates to additional data, apart from the respondents' answers, which can be easily collected during surveying, i.e. paradata – data about the process of data collection (Couper, 2005), such as time of starting and ending the surveying, time elapsed for answering a certain page of the questionnaire, location in the questionnaire where a respondent abandoned participation, and many others. These data can present a valuable source of information for preparation and monitoring of a survey project. They might, for example, be used to study effects of different question types, evaluate question wording or measure the strength of attitudes (Heerwegh, 2004).

Technological trends

The Internet and related communication technologies are dramatically changing modern survey research. In future we can expect nothing but further expansion and turbulences. New technologies are likely to foster the extension of the current CASIC modes. For example, text-to-speech technologies will make the implementation of IVR surveys more efficient, without requiring separate recordings to be done by live interviewers. Voices will be customized to match the respondent's characteristics when appropriate (Couper, 2005). New CASIC modes will expand, in particular those related to virtual interviewers and to the integration of other technologies (e.g. GIS) into the data collection process.

Fast development can also be expected in the expansion of CASIC modes to interactive TV and mobile phones. This is especially true if new generations of mobile phones, like iPhone and similar smartphones, reach the predicted popularity among users. These advancements, along with possibilities for location-based research grounded on Geographic Information Systems (GIS) and new input methods (like speech recognition and

touch screens), are probably the key emerging platforms for future survey-data collection.

Another trend of contemporary survey research is the move toward continuous measurement (Couper, 2005). Self-administered surveys distributed through mobile devices will enable surveying of individuals virtually anywhere at any time. Such continuous measurement is, however, not limited to surveys. It can be expected that research will be increasingly based on observation. For example, collecting information on TV watching, credit card transactions and phone-call patterns can tell a lot about individuals' lives. While technical implementation might be easy, it is much harder to overcome methodological, ethical, and legal issues arising from such measurement.

Because of their benefits, further development of mixed-mode approaches can be expected. Some contemporary software solutions already enable one-off specification of a questionnaire with automatic adaptation for different modes, such as printed, CATI, or web versions (Macer, 2003). However, this can be dramatically expanded with new technologies: audio, video, TTS, MCSAQ, and others. Future software solutions will thus on the one hand follow the above-mentioned fragmentation and new technological options, while on the other hand they will expand to support and integrate mixed-mode surveys. New technologies, like mobile phones, have the potential of extending ethnographic and other qualitative-based research (Townsend, 2005). This will also further foster mixed methods research approaches, as well as the integration of the data collection process into a wholly web-supported research process.

Research challenges

Technological changes often emerge too quickly to be able to predict their consequences. However, all innovations typically impose further demands for methodological and practical evaluations of survey research to ensure its quality and effectiveness.

Currently, the hottest research question is probably whether the probability selected panels – with equipment offered for non-Internet households and with careful strategies (incentives) to prevent attrition – can provide results that meet academic and governmental standards for data quality. Can such a panel provide response rates around or above 50 percent? If yes, at what cost? Is such a response rate enough? Large research projects have recently been launched in various developed countries to address these issues (e.g. the Netherlands, the US, and Germany).

Similar challenges also face market research. There, Internet (access) panels very rarely recruit members with probability methods (e.g. KnowledgeNetworks in US). Can probability sample selection with response rates around 10 percent still provide additional data quality to justify higher costs?

Many research challenges are also related to the development of solutions and standards for visual layout of the screen. What is the effect of sliders, reminders, colours, graphical elements, and different layout options for the screen? Other important streams of future research will be targeted towards the integration of multimedia, development of virtual interviewer and, in particular, towards mixed-mode studies, where both costs and data quality will be further assessed.

CONCLUSION

Technological advancements opened new possibilities for survey research, and Internet surveys are probably the most revolutionizing contemporary innovation in this field. They have already become an important tool for a variety of survey research practices, including marketing and social research as well as official statistics. Conveniences of self-administration, computerization, and Internet-based data transfer significantly broaden the potentials of survey research. This is especially highlighted with the possibilities of advanced questionnaire features, inclusion of multimedia elements, remote survey management, and lowering of the research costs. The benefits and logic of Internet

surveys are also increasingly being adopted in other research areas, including psychological research, e-learning, e-government, and other developing and emerging fields.

Nevertheless, the further expansion and development of technologies is needed to enable the utilization of the whole range of Internet survey potentials. As Internet and related communication technologies become available across the general population as a whole, problems of coverage and sampling will be easier to overcome. Future development of mobile devices will allow a higher degree of their use for survey research, probably leading to continuous measurement, completely freed from time and place boundaries. As for now, several serious methodological issues of Internet surveys still persist. In addition to coverage and sampling problems, these also arise from the lack of comprehensive knowledge on the most appropriate (especially advanced) Internet survey design and implementation. As methodological research on these topics continues, it is likely that new standards for Internet surveying will emerge. Sufficient and complete standards will also need to further address specific privacy and ethical dilemmas, including new solicitation approaches, data matching, and other ethical concepts redefined by the emergence of Internet research.

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FURTHER READING

Survey Methodology by Robert M. Groves et al. (2004) is a comprehensive book covering the most important aspects of general survey methodology. It focuses on basic and advanced principles of survey design, implementation, and management. As such, it presents a valuable reference for successful survey research.

Technology Trends in Survey Data Collection by Mick P. Couper (2005) discusses a broad range of contemporary and emerging technological innovations in survey research. The article critically evaluates the most important trends in survey data collection, influenced by the developments of Internet and related communication technologies.

Web surveys: A review of issues and approaches by Mick P. Couper (2000) is one of the fundamental articles covering general aspects of web surveys, addressing main advantages and drawbacks of Internet surveys and providing several examples of their practical employment for different purposes. Couper also provides a typology of Internet surveys and discussion of error sources that might affect data quality.

Conducting Research Surveys via E-mail and the Web by Matthias Schonlau, Ronald D. Fricker and Marc N. Elliott (2002) offers a complete overview of Internet surveys, specifically e-mail and web modes. The book

discusses all of the most important methodological aspects of e-mail and web surveys, provides guidance for their practical implementation, and presents some case studies of researches based on Internet surveys. It also describes relevant fundamental principles of survey research that are crucial for conducting high-quality Internet surveys.

Nonresponse in Web Surveys by Vasja Vehovar, Katja Lozar Manfreda and Metka Zaletel (2002) extensively discusses the non-response problem of web surveys. It presents the response process in web surveys and various factors influencing participation, including social and technological environment, respondents' characteristics, and design of a survey project at different stages. These aspects are supported by a comprehensive literature review and examples from research practice.

The Web Survey Methodology Site (WebSM, 2006) is a comprehensive online portal dedicated to the methodology of web surveys and related fields. Its extensive bibliographical database offers information on almost 3000 references covering topics related to Internet surveys. It also provides information on more than 300 software tools for web surveys, several conferences and other events in the field, relevant companies and more.