

Errors in Web Surveys

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1. Introduction

In just a few years the Web became complementary and sometimes even an alternative survey mode, playing an increasingly important role also in the supply of the survey industry. However, at the same time, we also encounter serious doubts related to the validity of the Web survey mode (Hollis 1999; Nadilo 1999). The statistical audience is thus still waiting for its basic justification.

First, however, we have to separate different types of Web surveys (Couper, in press). Unfortunately, the term “Web survey” is implicitly associated with non-professional, ad-hoc and self-selected forms on the Web, because they are the most numerous and most noticeable types of Web survey data collection. Today, the notion of “Web survey” thus already contains a flavour of low quality, what is not the case with “telephone surveys”, where we automatically assume a RDD or similar professional undertaking and not some call-in telephone survey.

Here, we restrict our discussion only to professional and probability Web surveys. Within this framework we overview the usual categories of survey errors: coverage, non-response, sampling, and measurement errors (Groves 1989). The findings in this paper are based on exhaustive overview of research literature at the *Web survey methodology site*, **WebSM** (<http://www.websm.org>), and on the *Research on Internet in Slovenia* project, **RIS** (<http://www.ris.org>), at the Faculty of Social Sciences, University of Ljubljana. At the latter, regular telephone, mail, and Web surveys of Internet users have been conducted since 1996.

2. Coverage error

The coverage error dominates in many Web surveys, particularly when targeting the general population. In the year 2001 Internet penetration surpassed 50% of the active population only in a few countries, while in the majority of others it is often below 10% (<http://www.nue.ie>). With 90% or 50% non-coverage rates the bulk of the differences between Internet users and nonusers appears in the coverage error. We may apply some elaborate selection procedures and post-survey adjustments, hoping that data are missing at random (MAR), completely at random (MCAR), or behaving in a pattern, which can be modelled. Nevertheless, the starting point for coverage error is extremely unfavourable. In addition to the Internet penetration the whole array of other accessibility problems arises, from home access to software/hardware incompatibilities (Dillman et al. 1998). Obviously, the existing coverage rates do not enable probability Web surveys of the general

population. However, this may differ in specific populations, and also with certain “well-behaved” variables (i.e. in marketing) that are robust to non-coverage problems.

3. Sampling error

In traditional survey modes, the increase in the sample size linearly inflates the costs, while with Web surveys the costs increase much more slowly. With large samples the sampling error in Web surveys may be small and can partially compensate for the inconveniences in other components (non-response, non-coverage), particularly in establishment surveys (Vehovar et al, 2000c). However, with non-probability Web survey panels and self-selected Web surveys large sample size cannot stand as an indicator of data quality (Dillman and Bowker 2000), because there is no ground for variance computation. With probability samples and expensive solicitation on the other hand, the ease of getting large samples rapidly diminishes. Similarly, there is not much sampling specifics in Web surveys, as probability Web surveys often demand conventional solicitation due to frame and non-response problem.

4. Non-response error

Response rates in Web surveys are generally low. When email addresses are obtained through telephone screening, the telephone survey non-coverage and non-response is followed with refusals to reveal their email address, with non-existent or non-valid emails addresses, and finally with non-response in the Web survey itself. Recent RIS survey experiences show the overall completion rate below 20% (Vehovar et al. 2000b).

In general, the response rates in Web surveys fall below those in mail surveys, which may not be a fair comparison, as the optimal strategies for Web survey solicitation are not yet developed. In certain Web surveys, however, with a careful solicitation the response rates can compete with mail surveys. For example, a recent RIS study of schools showed a response rate of 77% when a mail invitation letter with two follow-ups was used for a Web survey questionnaire. Similar experience was found in an establishment survey in the U.S. Census Bureau (Clayton and Werking 1998).

The non-respondents in Web surveys generally differ from respondents. Most often they are more technically oriented (Vehovar et al. 1999, in press). Again, many variables may still be robust to non-response, particularly those in marketing. Nevertheless, with high non-response, the errors can be unpredictably high.

5. Measurement error

The whole array of measurement errors has little specifics in Web surveys. Certain *respondent error* might occur due to differences in computer literacy. The *measurement instrument* effects may also appear. However, the corresponding research (Dillman 2000; Dillman and Bowker 2000, Couper et al. 2000; Vehovar et al. 2000a) often reveals only the effects of certain design aspects rather than measurement errors themselves. The RIS research, for example, showed that measuring Web site visits with logotypes create a lower item non-response and thus presents a more reliable measure of the awareness of the brand. Similarly, the survey topic and the optional modules significantly impact the respondents' satisfaction.

With respect to explicit *mode effect errors* the research (Dillman and Bowker 2000, Vehovar et al., 1999) did not reveal any mode specific errors but only the discrepancies due to other sources. In particular, the recent RIS establishment surveys showed that mode effect differences between Web vs. mail surveys are negligible (Lozar Manfreda et al. 2000). Rosovsky (1999) even suggested that

the Web survey mode should become a standard survey mode as a carefully designed Web survey can collect the most valid and neutral data.

6. Discussion

There is little evidence of mode effects or other Web-mode measurement errors. There are also not many specifics in sampling errors. The errors in Web surveys are thus dominated by non-coverage and non-response. While little can be done for non-coverage, the incentives and elaborated solicitation strategies can be helpful for non-response errors. However, in spite of this, the response rates in Web surveys generally fall behind those from mail surveys, which are often known to be relatively low. Post-survey statistical adjustment and modelling tools are beneficial for these problems, although we should be clearly aware of their limits.

With probability surveys of the general population, the non-response and non-coverage are particularly severe. This may not be the case with some specific surveys, particularly with establishment surveys where the non-coverage already diminished and the non-response could be managed to acceptable levels. In market research surveys, on the other hand, the high non-coverage and non-response rates may not necessarily result in an unacceptable bias.

In future, the technological improvements (e.g. multimedia, interactivity, convergence) will eliminate the non-coverage errors in Web surveys. However, these same developments will also decrease the accessibility of individuals over the telephone. The self-administered questionnaires on the Web may thus become the dominant survey mode. Together with improved solicitation techniques the Web surveys can be applied in the near future also for probability surveys of the general population.

Nevertheless, even within the existing limitations, the Web surveys already transformed a large part of establishment surveys. The same holds true also for the marketing research survey industry as well as for a variety of specific surveys (i.e. organisational studies, surveys of Web site visitors).

With Web surveys it is particularly important not to separate the discussion of survey errors from survey costs. It is rather surprising, that even with relatively large survey errors, the cost-error considerations often favour the Web survey mode, particularly in surveys with long questionnaires and large samples (Vehovar et al. 2000c).

Obviously, with Web surveys, the eternal quest of replacing expensive probability surveys with inexpensive non-probability ones became much more seductive. Unfortunately, there are no general rules when such replacement can be justified - the statisticians need to perform careful calculations of both, the errors and the costs, for each survey separately.

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RESUME

Etant donné le taux d'abstention et de non-recouvrement, le Web ne peut pas devenir une vraie méthode alternative de recherche. Par contre, l'échantillonnage et les erreurs de mesure ne posent pas de limitations particulières. Afin d'évaluer d'une manière adéquate les recherches menées avec le Web, il faut prendre en considération simultanément le coût et les modèles d'erreurs pour chaque recherche individuelle. Néanmoins, ce type de méthode est déjà avantageux pour certaines recherches, tandis que pour la plupart des recherches un progrès technologique supplémentaire sera nécessaire.