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Open-ended vs. Close-ended Questions in Web Questionnaires

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Abstract

Two quite different reasons for using open-ended as opposed to close-ended questions can be distinguished. One is to discover the responses that individuals give spontaneously; the other is to avoid the bias that may result from suggesting responses to individuals. However, open-ended questions also have disadvantages in comparison to close-ended, such as the need for extensive coding and larger item non-response. While this issue has already been well researched for traditional survey questionnaires, not much research has been devoted to it in recently used Web questionnaires. We therefore examine the differences between the open-ended and the close-ended question form in Web questionnaires by means of experiments within the large-scale RIS 2001 Web survey.

The question "*What is the most important, critical problem the Internet is facing today?*" was asked in an open-ended and two close-ended question forms in a split-ballot experiment. The results show that there were differences between question forms in univariate distributions, though no significant differences were found in the ranking of values. Close-ended questions in general yield higher percentages than open-ended question for answers that are identical in both question forms. It seems that respondents restricted themselves with apparent ease to the alternatives offered on the close-ended forms, whereas on the open-ended question they produced a much more diverse set of answers. In addition, our results suggest that open-ended questions produce more missing data than close-ended. Moreover, there were more inadequate answers for open-ended question. This suggests that open-ended questions should be more explicit in their wording (at least for Web surveys, as a self administered mode of data collection) than close-ended questions, which are more specified with given response alternatives.

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1 Introduction

As in other survey modes, the questionnaire has an extremely important role in the success of a Web survey. It influences several aspects of data quality, varying from non-response, sampling, and coverage errors, to measurement errors. Badly worded questions or poor visual design may deter respondents from carefully answering individual questions, therefore increasing *item non-response*. An exaggerated use of multimedia and other advances in Web questionnaire technology (for example, quality-check reminders) may result in long waits for downloading or put additional burden on respondents which could, in turn, cause frustrations that result in respondents' abandoning the questionnaire prematurely, therefore increasing *partial non-response* (see for example, Comley, 2000: 331; Dillman et al., 1998a; Lozar Manfreda et al., 2002). In addition, inadequate design (e.g. uninteresting, looking too complicated, etc.) may also prevent respondents from starting to answer the questionnaire at all, therefore increasing *unit non-response*. Some technical aspects of questionnaire design may also prevent certain respondents from accessing the Web site with the survey questionnaire, therefore increasing *coverage error*[2](Andrews and Feinberg, 1999; Brennan et al., 1999: 86; Dillman et al., 1998a; Nichols and Sedivi, 1998). This may occur owing to problems with the compatibility of the equipment used by respondents, their graphics resolutions and/or required download time. This happens especially if extraneous features, such as multimedia, are included in the questionnaire. In addition, inadequate questionnaire design may increase *instrument error* as a type of measurement error. This occurs when, because of inappropriate questionnaire design (due to question wording or visual representation), the respondent cannot provide answers in the appropriate manner (see for example, Couper, 2001b; Lozar Manfreda et al., 2002; Reips, 2000b).

Because of the self-administration, questionnaire design in Web surveys may be even more important for data quality than it is in other survey modes. The questionnaire is one of the most important features (in addition to invitations to the survey and the questionnaire introductory page) that the researcher has for communicating with respondents. There is no interviewer to intervene in the case of any misunderstanding in the communication exchange between the researcher and the respondent. Therefore, several problems can occur. For example, severe selection bias may be present: respondents may not be motivated enough to complete a whole questionnaire without interaction with another person, and thus

[2] Reasons for coverage error in Web surveys are, of course, much broader. In particular the problem of not having access to the Internet is the main reason for non-coverage in Web surveys. However, here we concentrate on the coverage error that occurs because of questionnaire design. In this case, the questionnaire design itself may p revent respondents – who otherwise have access to the Internet - from accessing the Web page with a particular survey questionnaire.

may abandon the questionnaire. In addition, probing is not possible; this may be particularly problematic for questions with multiple response format and for open-ended questions. Because of the unobserved process of data collection, it is also not known whether respondents understand and follow the given instructions. The Web questionnaire is therefore the only tool that the researcher has available, and its careful design is very important for obtaining survey data of the desired quality.

Besides self-administration, there are also several other reasons for Web questionnaires' tendency to produce larger survey errors than other survey modes. For example, Web questionnaires are often designed by people who lack methodological skills (Couper, 2000: 465). This results in bad questionnaire design from the visual (see for example Bowker, 1999) or verbal (see for example Gräf, 2001: 74-75) points of view. In addition, Internet users tend to read more quickly, to be more impatient and more fastidious than off-line readers (Internet Rogator, 1998); they scan written material on the site with their fingers on the mouse ready to click on through to the next thing (Bauman et al., 2000). This suggests that mistakes in questionnaire design, which would be considered of minor importance in other survey modes, may be very significant in Web surveys.

Based on the importance of questionnaire design in Web surveys, this paper deals with one of the techniques used for designing Web survey questionnaires, namely the differences between open-ended and close-ended question forms. This may give us insight into the validity of individual questions and offer suggestions for response alternatives in the close-ended question, if the survey is to be repeated. This technique will be outlined and its specifics for Web questionnaire design will be discussed. Additionally, an empirical example will be presented and its benefits for the design will be discussed.

2 Open-ended vs. close-ended questions

Open-ended and close-ended questions differ in several characteristics, especially as regards the role of respondents when answering such questions. Close-ended questions limit the respondent to the set of alternatives being offered, while open-ended questions allow the respondent to express an opinion without being influenced by the researcher (Foddy, 1993: 127). This has several consequences for the quality of survey data. The advantages of the open-ended questions include the possibility of discovering the responses that individuals give spontaneously, and thus avoiding the bias that may result from suggesting responses to individuals, a bias which may occur in the case of close-ended questions. However, open-ended questions also have disadvantages in comparison to close-ended, such as the need for extensive coding and larger item non-response.

Usually a compromise as regards the use of open- and close-ended questions is reached. Decades ago, Lazarsfeld (1944: 38-60) already suggested using open-ended questions at the initial stage of questionnaire design in order to identify

adequate answer categories for the close-ended questions. In the later stages of the questionnaire design, open-ended questions can be used to explore deviant responses to the close-ended questions.

While the issue of open- versus close-ended questions has already been well researched in the case of traditional survey questionnaires[3] (some well known experiments are described by Dohrenwend, 1965; Schuman and Presser, 1979; Schuman and Scott, 1987; Schuman et al., 1986; Sudman and Bradburn, 1974), not much research has been done in recently used Web questionnaires. Nevertheless, some discussion and empirical research regarding this issue do exist. As is apparent below, these concentrate almost exclusively on the richness of responses to open-ended questions in Web surveys and rarely on the comparison of data quality between open- and close-ended questions.

2.1 Previous research

Because of the self-administered nature of Web questionnaires, the interviewer's probing is not possible. This may cause problems in the case of open-ended questions which require more effort from respondents. On the other hand, the relative ease of typing a longer response, as compared to handwriting, made researchers believe that Web (and email) surveys would generate richer open-ended responses (Schaefer and Dillman, 1998). However, results regarding the answers to open-ended questions in Web (and email) surveys are mixed. Comley (1996), Gonier (1999), Kwak and Radler (1999), Mehta and Sivadas (1995), Schaeffer and Dillman (1998), Sturgeon and Winter (1999), and Willke et al. (1999) showed that answers to open-ended questions in email and Web surveys are much richer than in other survey modes. Lozar Manfreda et al. (2001) showed no difference in item response to open-ended questions between a Web and a mail questionnaire. Aoki and Elasmar (2000), on the other hand, showed that a Web survey compared to a mail survey resulted in significantly fewer answers to open-ended questions.

An explanation for the above-described mixed results can be found in Bosnjak's (2001) study of planned behaviour influencing item non-response. He measured attitudes towards planned behaviour, i.e. towards responding to Web questionnaire items, before actual completion of the Web questionnaire. These attitudes were found to influence the number of open-ended questions answered, but not the number of close-ended questions answered. This indicates that answering close-ended questions is considered to be 'low cost' behavior, as opposed to answering open-ended questions, when answering the Web

[3] By traditional survey questionnaires, we mean mostly questionnaires in paper-and-pencil mail, telephone, and face-to-face surveys and questionnaires in computer-assisted telephone and face-to-face surveys, which are the varieties most often used in the survey industry today.

questionnaire. A summary of several Web surveys by Knapp and Heidingsfelder (2001) actually shows increased drop-out rates when using open-ended questions.

A special issue regarding survey questions in self-administered Web questionnaires is the visual design of questions. Some researchers have thus focused on the size of the text box provided for open-ended questions (e.g., Couper 2001; Kwak and Radler, 1999). They found that in a Web questionnaire a longer text box results in a significantly higher number of characters being typed in. On the other hand, long text boxes also resulted in more invalid entries than did short text boxes when numerical answers were requested (Couper et al. 2001).

The above examples concentrate only on the richness of responses to open-ended questions in Web surveys, while they do not address the difference between open- and close-ended questions. The only known example focusing on this later issue is described by Couper et al. (2001). They compared a close-ended question (using a radio button format) with an open-ended question regarding the number of friends respondents have (numerical information was asked for). No significant differences were found in the time needed for completing the two question forms. However, the open-ended question resulted in significantly larger item non-response (including 'Don't know', 'Prefer not to answer' and blanks). On the other hand, the measurement error was significantly smaller in the open-ended question owing to the specifics of the visual design in this case (Couper et al., 2001: 238).

In this paper we are going to present another experiment regarding the difference between open- and close-ended questions in Web questionnaires when a text response (in contrast to the numerical one in Couper et al. (2001) example) is required.

3 Case study: The most important problem the Internet is facing today

3.1 Data description

The experiment on open- vs. close-ended question forms was implemented within the RIS 2001 annual national Web survey, conducted at the Faculty of Social Sciences, University of Ljubljana, within the project RIS (Research on Internet in Slovenia, www.ris.org) which has been dealing with the methodology of Web surveys since 1996 (see also www.websm.org). This survey is a self-selected Web survey of Internet users in Slovenia. It is advertised on all major Web sites in Slovenia (over 200 major sites placed the banner ad for our 2001 survey on their site). Email invitations to the survey are also sent to addresses from the public email directories in Slovenia (20,000 email invitations were sent for the 2001 survey). Over 14,000 responses to the survey were obtained in the period from July to October 2001.

This survey falls within the category of Web surveys with general invitations where no list of units is prepared prior to the questionnaire completion. Therefore it is a non-probability Web survey (Couper, 2000b). Such Web surveys do not offer generalization of results. However, because of careful design and the presence of the respectable scientific institution that supports it (Faculty of Social Sciences, University of Ljubljana) the RIS Web Survey can claim legitimization for certain purposes, such as questionnaire testing in this case[4].

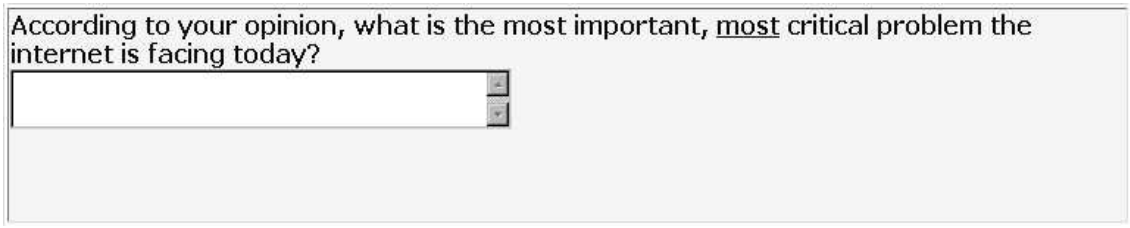
In this survey a survey question about the most important problem the Internet is facing today was administered in an open- and two close-ended question forms[5] in a split-ballot experiment to randomly chosen respondents. The close-ended form had two versions: a version with only one possible answer and another version with several possible answers (see Figure 1). Since the open-ended version of the question asked for only one answer, only the first version of the close-ended question (the one allowing for only one answer) is comparable. In this paper the emphasis is on the difference between the open- and the close-ended question; therefore we actually compare the open-ended question to the close-ended question asking for one answer. Additional methodological discussion could be focused on the difference between the two versions of the close-ended questions however, this is not our intension here. We do nevertheless present some results from the second version of the close-ended question (the one asking for more than one answer), where they additionally illustrate the issue of the open- vs. close-ended question form.

The survey question included in the experiment was administered within the module Privacy and Data Protection which was one of 13 additional modules (besides a basic compulsory one) in the RIS 2001 Web questionnaire. The additional modules were administered to respondents either by chance or by self-selection. A respondent who was administered the Privacy and Data Protection module was then presented with one of the three following question forms (see Figure 1):

1. An open-ended question: an open-ended question asking respondents to name the most important problem the Internet is facing today (asking for one answer);
2. A close-ended question asking for one answer: a close-ended question asking respondents to select the most important problem the Internet is facing today from a list of problems (by checking in one of the radio buttons). The answer categories on the list were randomly rotated in order to avoid the order effect. In addition to the closed list of categories there

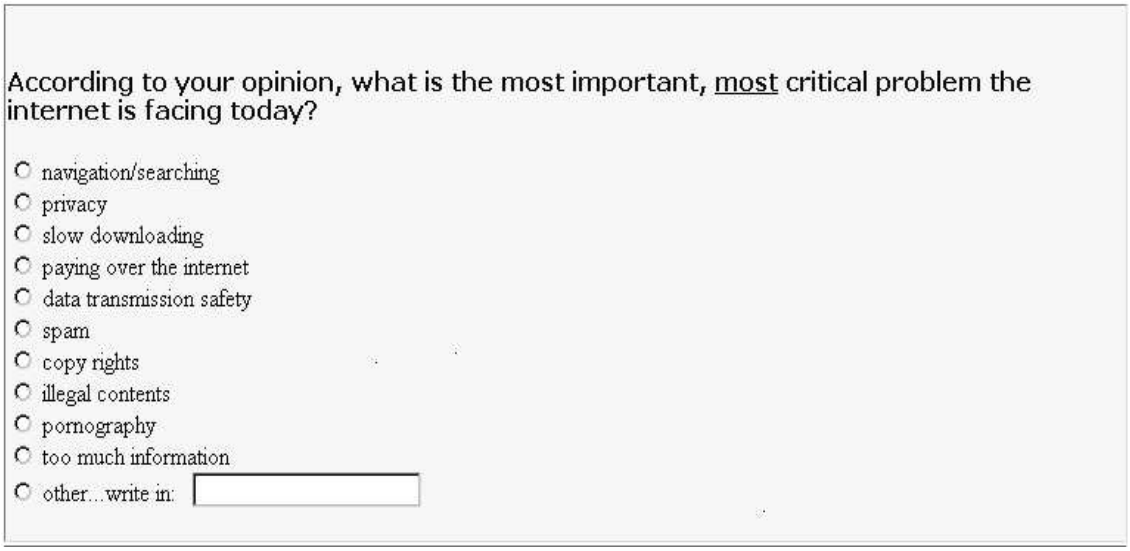
[4] Despite their limitation in representativeness, non-probability, unrestricted, self-selected Web surveys can have (limited) value for scientific purposes. For example, questionnaire design, questionnaire pre-testing, or psychological experiments and tests are often implemented within such surveys (Lozar Manfreda, 2001: 32-34).

[5] Actually, two other survey questions were also administered using two question forms (see Reja et al., 2002); however in this paper we limit our study to one example.



OPEN-ENDED QUESTION

CLOSE-ENDED QUESTION WITH ONE POSSIBLE ANSWER



CLOSE-ENDED QUESTION WITH MORE POSSIBLE ANSWERS

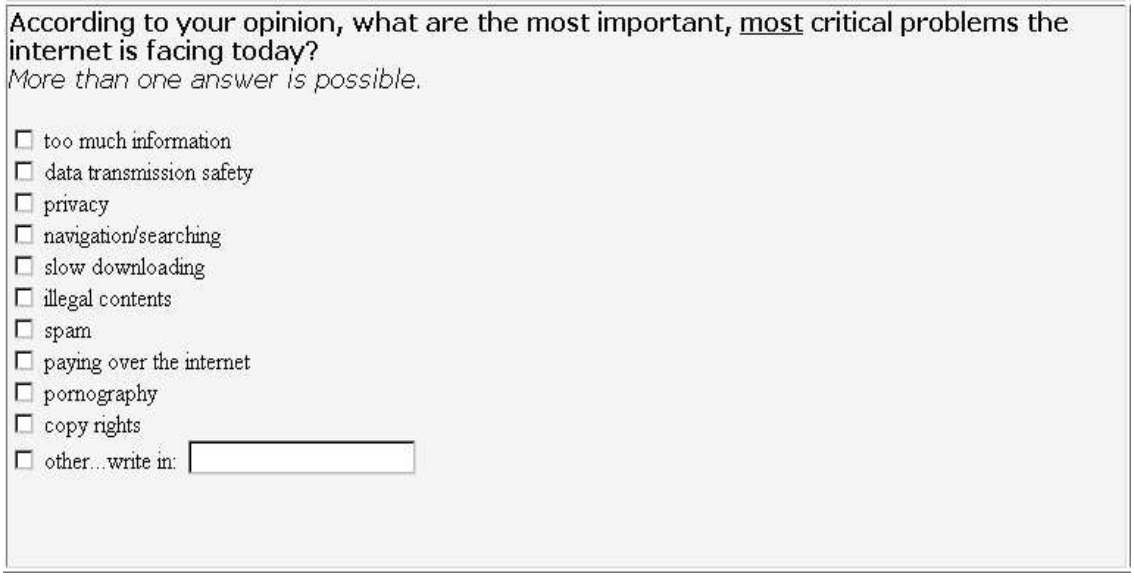


Figure 1: The three question forms about the most important problem the Internet is facing today.

was also an option "Other" (not rotated) with a short text entry box for respondents to enter in their own answers;

3. A close-ended question asking for more than one answer: a close-ended question asking respondents to select the most important problems the Internet is facing today from a list of problems (by checking in one or several check boxes). As in the previous case, the answer categories on the list were randomly rotated and an option "Other" (not rotated) was offered.

The different question forms were randomly assigned to respondents. Out of 365 respondents administered the *Privacy and Data Protection* module, 126 respondents received the open-ended form, 125 the close-ended form asking for one answer, and 114 the close-ended form asking for more than one answer.

The coding of answers to the open-ended question was done by several analysts and under expert review. The list of answers from the close-ended question was used as an initial coding scheme. During the coding procedure the analysts were asked to add additional categories to the coding scheme if necessary.

3.2 Hypotheses

We assess the difference in data quality between the open- and the close-ended question form in a Web questionnaire. In formulating hypotheses we refer to theoretical discussions and empirical evidence originating from three sources: a) differences between open- vs. close-ended questions in traditional, mostly paper-and-pencil survey questionnaires (for example Schuman and Presser, 1979; Bailey, 1987; Schuman and Scott, 1987b; Schuman in Presser, 1996); b) differences in open- vs. close-ended questions and especially in richness of answers in computer-assisted telephone interviewing (for example Groves, 1987; Catlin and Ingram, 1988; Baker, 1992; de Leeuw, 1992; de Leeuw and Nichols II, 1996); and c) usability studies of people's behavior while answering a Web questionnaire (for example, Internet Rogator, 1998; Bauman et al., 2000; Gräf, 2001).

H1: Richness of responses

For interviewer-administered paper-and-pencil questionnaires it was shown that respondents to the open-ended question produce a much more diversified set of answers than respondents to the close-ended form. In the latter case, respondents restrict themselves to the alternatives offered (Schuman and Presser, 1979; Schuman and Scott, 1987). Further methodological developments focused on the performance of different forms in different survey modes. It was assumed that face-to-face interviews result in longer open responses containing more units of information than telephone interviews, and that both perform better than self-administered mail surveys (de Leeuw, 1992: 51). However, de Leeuw (1992: 51) found no consistent differences between these three traditional modes. Groves

(1987) points out that for some open-ended questions the differences found between face-to-face and telephone interviews are negligible, while rather large for other types of questions, such as abstract or generic open-ended questions. In addition, the effect of computerization of survey questionnaires on the data quality of open- and close-ended question was also tested. However, for interviewer-administered questionnaires, no significant difference was found in the amount of open-ended information collected between paper-and-pencil and computer-assisted questionnaires (Catling and Ingram, 1988; Baker, 1992: 152). With the use of Internet survey (email and Web) the issue of the richness of responses to open-ended question again became significant. The relative ease of typing a longer response, as compared to handwriting, made researchers believe that Web (and email) surveys would generate richer open-ended responses a hypothesis which has also been empirically proven (Comley, 1996; Gonier, 1999; Kwak and Radler, 1999; Mehta and Sivadas, 1995; Schaeffer and Dillman, 1998; Sturgeon and Winter, 1999; Willke et al., 1999).

Based on these findings - that self-administration and computerization of questionnaires introduce no drawbacks as regards open-ended questions - we expect to confirm the findings of the pioneer researchers on the open- vs. close-ended topic. We therefore assume that the open-ended question will produce a more diversified set of answers than the close-ended form in Web questionnaires too.

H2: Coding problem

The most often mentioned disadvantage of open-ended questions is the extensive coding needed before the actual analysis can take place (Payne, 1980: 32-35; Sheatsley, 1983; Sudman and Bradburn: 1991: 149-156). In this way the close-ended questions are expected to be better since they separate responses that are often indistinguishable in the open coding. At the same time they merge responses that the open coding tends to separate, because of non-substantive verbal differences in expression. This is even more stressed in the case of attitude questions. In addition, people tend to write text on the Internet faster, resulting in greater use of short words and more typing errors, factors which make the reading and coding of the written material even more difficult. For the Web questionnaire, we therefore expect that *when the open-ended question is asked, there will occur some broad, general categories that cannot be matched with any specific category from the close-ended question*.

H3: Univariate distributions and rankings

Previous research on traditional questionnaires has shown that open- and close-ended question forms usually produce differences in frequency distributions and ranking of the answers, even if answers to the open-ended question were used to formulate answers on the close-ended form (Schumman and Presser, 1979, 1996). Nevertheless, the most often mentioned category was the same in both

question forms. In this respect we do not expect any specifics for the Web questionnaire. We therefore assume *that differences in univariate distributions and in relative ranking of categories will occur between the two forms of questions*, especially since the close-ended list was not formulated based on any previous testing using an open-ended question. Nevertheless, we expect *the most often and the most rarely mentioned categories to be the same in both question forms*.

H4: Missing data

Previous research with traditional questionnaires showed that open-ended questions produce more invalid answers than close-ended ones (Schuman in Presser, 1979, 1996). This may be even more the case for Web questionnaires, since in the close-ended form respondents have no other choice than to select one of the offered alternatives (they cannot write additional answers since no additional space is provided). Invalid responses are thus theoretically eliminated. In addition, for traditional questionnaires larger item non-response was also found for open- in comparison to close-ended questions, owing to the larger response burden in the first case (Bailey, 1987: 117-122). Also for the Web questionnaire a larger number of respondents skipping the open-ended question can be expected, owing to the greater burden placed on them in this case. Namely, there is no interviewer to encourage them to answer the open-ended question, which is cognitively more demanding than the close-ended one. In addition, answering an open-ended question requires typing in the response using a mouse and a keyboard, while answering a close-ended question asks only for clicking a radio button or a check box. For the Web questionnaire we therefore expect *that the open-ended question will result in more missing data originating from more invalid responses and larger item non-response*.

H5: Impact of background characteristics

Previous research regarding traditional questionnaires showed that less educated respondents give a greater number of inappropriate answers on the open-ended question, while they somehow distribute across the categories of the close-ended question. This results in larger differences between the two question forms for less educated respondents (Schuman in Presser, 1979, 1996). This happens because education may be associated with concepts which are somehow more self-developed and stable. In Web surveys familiarity with the Internet could also play an important role. *We expect respondents less familiar with the Internet to have more difficulties in answering both question forms; however somewhat larger difficulties are expected in answering the open-ended form (since more typing skills are needed).*

3.3 Results

H1: Richness of responses

Based on the results (see Table 1), we can confirm the hypothesis that the open-ended question results in a more diversified set of answers. The two close-ended question forms both had 10 pre-coded categories and the majority of respondents restricted themselves to those responses already offered. Only 5% of respondents on the close-ended form asking for one answer and 3% on the close-ended form asking for more than one answer filled in their own answer under the category "Other". Based on these answers, only one additional category could be formulated. The set of answers obtained on the open-ended question, on the other hand, is much more diverse. In addition to the 10 pre-coded categories, an additional 8 categories were obtained after coding the answers. 63% of respondents to the open-ended question offered these 8 additional categories. The two questions thus show extensive differences in the answers they elicit.

H2: Coding problem

As expected, the problem of coding the answers to the open-ended question occurred. Three categories, *Internet abuse, Safety,* and *Viruses* are not mutually exclusive. These answers could refer to any of the pre-coded categories *Data transmission safety* and *Privacy*, and also *Paying over the Internet*. However, these were too broad to know what exactly respondents meant. For example, the open category *Safety* fails to distinguish between *Data transmission safety* and *Privacy.* The close-ended form of the question, one the other hand, allows respondents to clarify their views, since it makes the *Data transmission safety / Privacy* distinction explicit.

H3: Univariate distributions and ranking

The hypothesis on the differences in univariate distributions and rankings can be partially confirmed: substantive differences occurred in the frequency distributions; however smaller differences occurred in the ranking of the categories. Here we compare only the ten categories that were common to both question forms. In addition, the univariate distributions can be compared only for the open-ended and the close-ended question asking for one answer. However, the ranking can be compared for all three forms.

Table 1: Frequency distributions across question forms.

	Close-ended question				Open-ended question	
	One possible answer		More possible answers[6]		One possible answer[7]	
Pre-coded categories						
Slow downloading	17	13,7%	46	40,0%	1	1,0%
Illegal contents	5	4,0%	28	24,3%	1	1,0%
Pornography	9	7,3%	29	25,2%	1	1,0%
Data transmission safety	29	23,4%	69	60,0%	12	12,1%
Navigation, searching	4	3,2%	22	19,1%	0	0,0%
Too much information	12	9,7%	37	32,2%	6	6,1%
Paying over the Internet	11	8,9%	51	44,3%	2	2,0%
Privacy	20	16,1%	57	49,6%	9	9,1%
Copy rights	5	4,0%	38	33,0%	1	1,0%
Spam	6	4,8%	58	50,4%	4	4,0%
Additional categories						
Internet abuse	1	0,8%			13	13,1%
Safety					7	7,1%
Viruses			1	0,9%	5	5,1%
Costs of access to Internet					4	4,0%
Limitation on content					4	4,0%
Connection problems					2	2,0%
Absence of Internet in underdeveloped countries					1	1,0%
Not enough knowledge					1	1,0%
Other	5	4,0%	3	2,6%		
More than one answer*					**13**	**13,1%**
Not understandable*					**12**	**12,1%**
Number of all answers	**124**	**100,0%**	**115**		**99**	**100,0%**

** treated as missing data*

In Table 2, we can see that *Data transmission safety*, *Privacy*, *Too much information*, and *SPAM* have the largest percentages on the open-ended question. The first three categories also have the largest percentages on the close-ended form asking for one answer, although these percentages are lower; therefore these

[6] Because the question with several possible answers is being considered, percentages for each category were obtained by multiple response analysis. Cell percentages were calculated based on the number of cases. In this way they tell us how many respondents mentioned a certain problem. Since several answers were possible, the sum of all percentages is more than 100. Respondents gave on average 4 (mean=3,8) answers to this question, but 3 (mode, median) responses were given by most of the respondents. Statistically significant differences in the number of answers given were found for demographic variables such as age and sex. The youngest respondents (age 18 or less) gave more answers on average than the other age segments. In addition, women gave more answers than men.

[7] If a respondent filled in more than one answer, his/her response was treated as invalid (i.e., missing data) since only one problem was asked for.

categories have been selected by fewer respondents than those who spontaneously mentioned them in the open-ended form. On the other hand, there are the categories *Slow downloading* and *Paying over the Internet,* which were also chosen by a somewhat larger number of respondents in the close-ended form asking for one answer, but mentioned less often spontaneously on the open-ended form. *Data transmission safety*, *Privacy*, *Too much information*, and *SPAM,* therefore, seem to be problems that are most obvious to all people since they were mostly mentioned spontaneously. On the other hand, *Slow downloading* and *Paying over the Internet* were selected more often when offered on the list.

Table 2: Comparison of univariate distributions and ranking across question forms.

	Closed question						**Open question**		
	One possible answer			More possible answers			One possible answer		
	Frequency		Rank	Frequency		Rank	Frequency		Rank
Data transmission safety	29	24,6%	**1**	69	60,0%	**1**	12	32,4%	**1**
Privacy	20	16,9%	**2**	57	49,6%	**3**	9	24,3%	**2**
Too much information	12	10,2%	**4**	37	32,2%	**7**	6	16,2%	**3**
SPAM	6	5,1%	**7**	58	50,4%	**2**	4	10,8%	**4**
Paying over Internet	11	9,3%	**5**	51	44,3%	**4**	2	5,4%	**5**
Slow downloading	17	14,4%	**3**	46	40,0%	**5**	1	2,7%	**6**
Copy rights	5	4,2%	**9**	38	33,0%	**6**	1	2,7%	**7**
Pornography	9	7,6%	**6**	29	25,2%	**8**	1	2,7%	**8**
Illegal contents	5	4,2%	**8**	28	24,3%	**9**	1	2,7%	**9**
Navigation, Searching	4	3,4%	**10**	22	19,1%	**10**	0	0,0%	**10**
	118	**100,0%**		**115**			**37**	**100,0%**	

Differences in the two distributions were statistically significant (χ^2=59.61, df=9, p<0.005). *Data transmission safety*, *Privacy*, *Too much information*, and *SPAM* have larger percentages on the open-ended than on the close-ended form, while the other categories have larger percentages on the close-ended than on the open-ended form.

An alternative way of comparing the answers to different question forms is the comparison of the relative rankings obtained using the Spearman correlation coefficient[8]. The coefficients for the three pairs of compared rankings are presented in Table 3. They are all positive and relatively high. Regardless of the question form, almost the same categories obtained higher frequencies and almost the same lower frequencies in all three forms. We can conclude that *Data transmission safety* is the most important problem the Internet is facing today and

[8] In this case the categories are the units, and their rank is the variable of the analysis. The ranks obtained vary from 1 – the most often mentioned problem, i.e. the most important one – to 10 – the least often mentioned problem, i.e. the least important one. The test of the statistical significance of the coefficients is not appropriate here since the listed categories cannot be seen as a random sample of a larger set of problems the Internet is facing today.

Navigation, searching the least important one, regardless of how the question is asked. There is slight variation in ranking among other categories. Our results are thus comparable to the results of Schuman et al. (1986), who showed that the most often selected or mentioned category usually remains the same after open- and close-ended question forms.

Table 3: Spearman correlation coefficients for ranking comparison across three forms.

	Spearman correlation coefficients	
	Close-ended more answers	Open-ended one answer
One-choice question	0,673	0,830
Multiple-choice question		0,855

H4: Missing data

In our case, the missing data can be classified in several groups:

1. If more than one answer was given on the open-ended question, we treated this response as an invalid response, therefore contributing to missing data[9]. Such answers were given by 10% of respondents despite the request for only one answer and despite the fact that the space was visually limited[10] to two half rows of the screen (see Figure 1), a space which was obviously too much for some respondents.
2. Another 9% of respondents gave answers that could not be coded (for example, it is not clear what the respondent meant by the answer "sure these are not cookies").

In sum, one fifth of the answers to the open-ended question were treated as non-valid, therefore missing. This implies that the form of the open-ended question needs to be somehow more specific than the form of the close-ended question. In particular, if one wants to find out which is the most important problem and not problems, he/she needs to be more explicit in trying to get only one answer. This presents a challenge for researchers in this field: namely, how to obtain the most important or salient answer – and only one answer - from respondents on an open-ended question in the case of Web surveys where there is no interviewer present to probe. This includes decisions about the wording of the question (e.g., explicit text, such as "Please, mention only one problem") and the layout of the question (e.g., a limited space offered for writing down the answer).

[9] In such cases we could also have coded only the first response mentioned. However, we decided not to because of the findings of Schuman and Presser (1996: 88) that the first answer given does not necessarily refer to the most important answer.

[10] The space was actually only visually limited. It was possible for respondents to write longer answers.

In addition, one has to be more explicit in trying to get more specific answers, especially when questions about attitudes are asked.

3. The third type of missing data is no data at all, the result of respondents skipping the question (i.e., item non-response). In our experiment too more respondents responded to both versions of the close-ended question than to the open-ended question. In fact, almost all respondents who were administered the close-ended question also answered it (99% for the form asking for one answer and 100% for the form asking for more answers), while only 79% of respondents administered the open-ended question also answered it (with either a valid or non-valid answer).

In sum, we can confirm the hypothesis that the open-ended question produced more missing data. Overall, 41% of respondents to the open-ended question either skipped the question or gave an invalid answer, while this percentage in the two close-ended forms was negligible (see Table 4).

Table 4: Missing data across question forms.

	Close-ended question				**Open-ended question**	
	One possible answer		More possible answers		One possible answer	
More than one answer	0	0%	/		13	10,3%
Not understandable	0	0%	0	0%	12	9,5%
No answer	1	0,8%	0	0%	27	21,4%
All missing data	**1**	**0,8%**	**0**	**0%**	**52**	**41,3%**
Number of all respondents	125	100%	115	100%	126	100%

H5: Impact of background variables

Testing the hypothesis regarding the association of background variables and the effect of the question forms is limited in our case because of the small sample size. The test of the association between the univariate distributions and rankings for different question forms across different categories of respondents cannot be performed.

However, we can test the association between the share of non-valid answers in the open-ended question and some background variables[11]. In this case we did not find any statistically significant differences in giving inappropriate answers according to the reported background variables, such as educational level, gender, occupational status, age, and frequency of Internet usage (as an indicator of familiarity with the Internet). This may be partially due also to the small sample

[11] This test is not performed for the two close-ended question since there were almost no non-valid answers.

size that we had in this experiment. In fact, another of our experiments regarding the difference between the open-ended and the close-ended questions showed that different segments of the population are differently affected by the question form. When measuring the frequency of visitation of Web sites, we discovered that a larger number of inappropriate answers to the open-ended question were given by the less educated, by women, and by the youngest (under 18 years old) and oldest (above 35 years old) respondents. Whereas a connection between the less educated and inappropriate answering was also established in other surveys (see for example, Schuman and Presser, 1979, 1996), women, respondents under 18 and respondents above 35 years are categories somehow specific for Web survey. These are respondents who are usually less familiar with the Internet. Familiarity with the Internet (measured by frequency of usage and by how many years one has been using the Internet) thus seems to have an important connection with inappropriate answering.

4 Discussion

In this experiment exploring the difference between open-ended and close-ended questions in Web questionnaires, we have shown that responses to the open-ended question spread substantially beyond the categories that are common to both forms (which were determined for the close-ended question). Nevertheless, if only the categories common to both forms are taken into account, the ranking of categories (despite different frequency distributions) is similar in both forms. These results are consistent with results from other survey modes.

In our case some problems with the open-ended question occurred because some answers were not sufficiently specific to code them. Especially in the case of attitudinal questions, the researcher has to be very explicit in trying to get more specific answers, since many respondents answer in very broad terms. This is a particular problem in all self-administered questionnaires where there is no interviewer who could probe and motivate respondents to give more specific answers.

Another problem with the open-ended question occurred in relation to missing data: the amount of missing data (either non-valid responses or skipping of the question) was larger for the open-ended question. Again, this is a problem particular to self-administered questionnaires with no interviewer sensitive to inappropriate answering and question skipping questions. This is the most significant argument against using open-ended questions in web surveys except for purposes that require open-ended question form. Another feature specific to Web questionnaires is that there are special segments of respondents who are more sensitive to the question form. Thus respondents less familiar with the Internet (women, the youngest and the oldest, the less educated) more often gave non-valid

answers to the open-ended questions than did respondents more familiar with the Internet.

In general, with the present study we have confirmed the results regarding the differences in data quality between open- and close-ended questions that were found for other survey modes. Web surveys do not offer many anomalies in this respect, except for the fact that some more specific background variables (those characterizing Internet users as a special segment of the population) differentially affect the differences between the two forms. Whether differences between the open- and the close-ended form are smaller or larger in Web questionnaires than in other survey modes this study cannot explore. A different experimental design would be needed involving asking an identical survey question in an open- and a close-ended form in Web questionnaire and in some other survey mode. This would give us insight into the marginal difference in data quality that is attributable to the specifics of the Web questionnaire in comparison to other types of questionnaires.

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