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Prenotification in Web-Based Access Panel Surveys

The Influence of Mobile Text Messaging Versus E-Mail on Response Rates and Sample Composition

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To compare the effectiveness of different prenotification and invitation procedures in a web-based three-wave access panel survey over 3 consecutive months, we experimentally varied the contact mode in a fully crossed two-factorial design with (a) three different prenotification conditions (mobile short messaging service [SMS], e-mail, no prenotice) and (b) two “invitation and reminder” conditions (SMS, e-mail). A group with nearly complete mobile phone coverage was randomly assigned to one of these six experimental conditions. As expected, SMS prenotifications outperformed e-mail prenotifications in terms of response rates across all three waves. Furthermore, e-mail invitation response rates outperformed those for SMS invitations. The combination of SMS prenotification and e-mail invitation performed best. The different experimental treatments did not have an effect on the sample composition of respondents between groups.

Keywords: *web survey; online access panel; nonresponse; prenotification; SMS*

Background, Research Questions, and Hypotheses

There is mounting empirical evidence that prenotification improves response rates in traditional self-administered surveys. As Dillman (2000) notes, “research has shown consistently that a prenotice will improve response rates to mail surveys” (p. 157). To explain this effect, a number of theoretical routes have been pursued. For instance, Dillman (1978, 2000) favors social exchange theory, hypothesizing that various features of survey design and

implementation reduce the potential respondent's cost of participating or increase the reward. In this context, prenotification can be seen as an additional "reward," a cost on the part of the survey organization that could be reciprocated by complying with, or at least attending to, the subsequent survey request. In a similar vein, ample empirical evidence in persuasion research has shown that reciprocity is one of the strongest social influence heuristics that may result in compliant behavior (e.g., Cialdini, 1993). Applied to survey requests, Groves, Cialdini, and Couper (1992) note that "one should be more willing to comply with a request to the extent that the compliance constitutes the repayment of a perceived gift, favor, or concession" (p. 480). In this context, the advance notification can be seen as a contact without an explicit request directly attached to it, in the same way that prepaid incentives not explicitly tied to completion of the survey appear to be more effective than promised incentives that are conditional upon completion (Church, 1993; Singer, 2002).

A more cognitively oriented explanation for the effect of prenotification on survey response rates has been offered by Chebat and Picard (1991) and Hembroff, Rusz, Rafferty, McGee, and Ehrlich (2005), among others. In a nutshell, it is argued that prenotification increases salience, "predisposing the respondent to complete the questionnaire when it arrives" (Chebat & Picard, 1991, p. 478). Although these authors do not shed more light on the cognitive processes mediating exposure to an initial survey request and an increased propensity to respond, ease of processing theories (e.g., Clore, 1992; Jacoby, Kelley, & Dywan, 1989; Whittlesea, Jacoby, & Girard, 1990; Winkielman, Schwarz, Fazendeiro, & Reber, 2003) are more specific. According to these theories, exposure to a stimulus leaves traces in long-term memory. If one is exposed to a similar stimulus again, the perceiver processes this stimulus more fluently, because of the preexisting memory trace facilitating top-down perceptual as well as conceptual processes. This increased ease of processing is by itself hedonically marked (i.e., subjectively experienced as positive; e.g., Winkielman et al., 2003), and this positive evaluation finally feeds into judgments about the message's attractiveness and legitimacy. Increased ease of message processing, for example, due to a previous exposure to a similar message from the same source, should therefore result in higher ratings of attractiveness and legitimacy as compared with an entirely new unsolicited message. Applied to the context of survey requests, prenotices may render the following request to participate (compared with a survey that was not previously announced) more attractive because of the request being easier to process, both perceptually and cognitively. As a result, the propensity to comply with the participation request should be increased.

Although the theoretical notions sketched above differ in terms of their depth and conceptualization of the underlying psychological mechanisms, they lead to almost identical predictions. Furthermore, the theoretical notions also share an implicit precondition, namely, that the message has to be recognized and identified as a survey request. These preconditions might explain why the empirical evidence on the effect of prenotices in the web-based survey context appears inconclusive. For instance, in their meta-analysis of factors influencing response rates encompassing 68 online surveys, Cook, Heath, and Thompson (2000) found no significant effect of prenotification on response rates. However, because all types of online surveys (e.g., surveys entirely conducted by e-mail as well as web surveys) were examined, it is unclear whether this effect applies to web surveys specifically.

Another major reason for the inconclusive findings in the Cook et al. (2000) study may be due to the common practice in most web survey implementation procedures of

using e-mail as a contact mode for prenotification. However, unsolicited mass mailings, associated with SPAM and phishing, have resulted in such e-mails being processed superficially under certain conditions (Tuten, 1997) and may sometimes have reduced the legitimacy and seriousness of the requests (Porter & Whitcomb, 2003). Given such unfavorable conditions under which unsolicited e-mails tend to be processed and evaluated, how could this situation be overcome?

In our view, one solution addressing this problem lies in the (partial) replacement of e-mail as a contact channel in web surveys in favor of a channel in which attention and legitimacy may be increased. Whereas postal mailings and contacts by telephone are costly and may not solve the problem of legitimacy due to increased telemarketing efforts, sending permission-based text messages using short messaging service (SMS) to the potential respondents' mobile phones is an alternative worth exploring, especially among those groups most comfortable with this technology, such as students.

SMS is a service available on digital cellular phones that permits receiving and sending short text messages of up to 160 characters. Because of the fact that mobile devices indicate reception of incoming SMS messages both in an auditory as well as a visual manner, these messages have, unlike e-mail, an immediacy and attention-getting value that should increase the likelihood of the SMS message being viewed. First reports on using SMS in survey research contexts seem to corroborate this assumption by illustrating that response speed for SMS surveys is increased compared with other modes (Balabanis, Mitchell, & Heinonen-Mavrovouniotis, 2005). Furthermore, if compared with e-mail, SPAM delivered via mobile text messaging is a relative scarce phenomenon, probably because of the fact that the sender of an SMS can be traced more easily, because of the costs involved in sending out SMS messages on a large-scale basis, and because of European legal regulations requiring permission-based use of SMS for commercial messages. Last but not least, the SMS usage rate is about 55% among the general population in Germany (German General Social Survey ALLBUS; data are from 2004). Among college students in Germany, this figure is consistently in the 90% to 97% range (Medienpädagogischer Forschungsverbund, 2005).

In sum, SMS coverage is almost complete among college students in Germany, and reception of SMS messages seems to be generally associated with higher attention-getting and legitimacy values compared with e-mail. Because SMS seems to have the potential to serve a similar function as e-mail in web survey contexts, namely, to notify potential respondents of an upcoming survey, our first pair of hypotheses states the following:

Hypothesis 1.1: Web surveys prenotified by SMS lead to higher response rates than web surveys prenotified via e-mail.

Hypothesis 1.2: Web surveys prenotified by e-mail lead to higher response rates than web surveys without prenotification.

Hypothesis 1.1 expresses our expectation pertaining to the higher attention-getting and legitimacy assumption for SMS compared with e-mail. Hypothesis 1.2 challenges the early meta-analytic findings reported by Cook et al. (2000), namely, that e-mail prenotifiers do not exert a positive effect on response rates. Although one single study cannot invalidate meta-analytic findings in principle, the pooling of different online survey modes may have contributed to the nondetectable effect for the combination of interest (i.e., prenotification

by e-mail for web surveys). Furthermore, e-mail messages may not have the attention-getting and legitimacy value of SMS messages in general. However, all theoretical frameworks discussed above suggest that sending a token of appreciation (social exchange theory), a sign that considerable effort was invested on the survey organization's part (reciprocity heuristics), or incidental message processing (conceptual fluency theory), increases the willingness to respond compared with conditions where no such measure preceding the survey invitation has been employed. Therefore, SMS might be superior to e-mail, but sending e-mail prenotifiers should still be better than doing nothing in advance of the request.

The previous discussion was primarily focused on prenotification strategies and did not explicitly address the contact following the prenotification (i.e., the mode of inviting potential respondents to actually participate). Common practice in list-based web surveys (Couper, 2000) is to use e-mail for the invitation, placing a URL into the body of the message to connect to the survey. Given this, should we expect to find the same positive effect on response rates for SMS invitations as we expect for SMS prenotification? One might argue that the same mechanism expected to increase attention and legitimacy to a prenotice might also facilitate the actual willingness to participate. Taking into account the steps required on the respondent's part following an invitation, predictions appear more complex. Whereas in most situations, a simple click on the URL placed in the body of the e-mail suffices to reach the survey, considerably more effort is needed in an SMS invitation situation. When receiving an SMS invitation, the respondent needs to get access to the Internet and type in the web address (URL) manually. As a result, the advantage of SMS in terms of awareness may be offset by the high burden posed on the respondent, favoring e-mail as an invitation mode:

Hypothesis 2: Web surveys using e-mail for invitation lead to higher response rates than web surveys using SMS for invitation.

By considering Hypotheses 1.1, 1.2, and 2 jointly and assuming additive effects, Table 1 summarizes our predictions concerning the rank order of response rate magnitudes for different prenotification groups (SMS, e-mail, no prenotification) and invitation modes (SMS, e-mail).

All hypotheses stated above rely on response rates as the dependent measure, serving as an indirect indicator of nonresponse bias. Because the latter is a function both of the response rate and of the differences between respondents and nonrespondents (e.g., Groves, Presser, & Dipko, 2004), we also address potential influences of experimental manipulations on sample composition.

Method

Sample, Materials, and Procedure

The study was made up of two parts. In the first part, 562 undergraduate and graduate students enrolled at a German university filled out a paper-based recruitment questionnaire. This captive audience is easily reachable by e-mail and offers almost complete mobile phone coverage. Both characteristics thus enabled us to maximize internal validity and to

Table 1
Expected Rank Order of Response Rate Magnitudes for Different
Invitation and Prenotification Modes

		Prenotification Mode		
		SMS	E-Mail	None
Invitation mode	e-mail	1	2	3
	SMS	4	5	6

Note: Descending rank order with 1 representing the highest expected response rate. SMS = short messaging service, a text message to a cellular phone.

avoid coverage error. The two-page paper questionnaire contained questions on sociodemographics, Internet and mobile phone usage habits, the extraversion and conscientiousness dimensions of a brief Big Five personality inventory, items pertaining to interests and leisure activities, and the individual's e-mail address, full name, and mobile phone number. Completion of the paper questionnaire was voluntary and conducted within class settings, following the respective instructors' consent to support the study. As in most panel-based web surveys (e.g., see Göritz & Wolff, 2007), contingent upon completion of the paper questionnaires and participation in the second part of the study encompassing three web-based surveys (see below), respondents were promised inclusion in a prize draw. The draw encompassed five gift vouchers of 20 Euros each. Of the 562 students, 61.2% were female and 38.8% male. The majority (95%) were between the ages of 19 and 26 ($M = 22.6$, $SD = 2.6$) and had primarily chosen a major in business (23.1%), sociology (28.1%), or psychology (15.1%; other = 33.6%).

The second part of the study, aimed at measuring web survey participation, encompassed three waves. Two weeks after the initial paper-based questionnaire was administered, invitations to participate in web surveys were sent out each month for 3 months. Eligible respondents who provided full contact information were randomly assigned to one of the six experimental conditions (see Table 1). Topics addressed within the three web surveys were lifestyle and leisure activities (wave 1), university life (wave 2), and online auctions (wave 3).

Experimental Design

The initial pool of 562 respondents who completed the paper questionnaires were randomly assigned to different prenotification and invitation groups. Once assigned to an experimental group, the specific combination of prenotification and invitation was held constant across the three waves in the second part of the study.

On the prenotification factor, one group was contacted by SMS, the second one by e-mail, and the third subsample served as a control group, receiving no prenotice. On the invitation factor, students were invited to participate by e-mail or by SMS. Prenotification and invitation factors were fully crossed, yielding a 3×2 experimental design, as shown in Table 1. Both prenotifiers as well as invitations, whether by SMS or e-mail, were nearly identical in terms of length and content.

One week after invitations were sent out, nonrespondents were sent a reminder in the same mode as the designated invitation.

Dependent Variables

Response rates per wave. The response rate was operationalized according to the American Association for Public Opinion Research's (AAPOR, 2005) RR6. This reflects the maximum response rate achievable, assuming that all cases are actually eligible and allowing for partial responses. Eligibility was ensured by the list-based, opt-in type character of the study, made up of a captive audience with known characteristics. Partial response was included because those who participated and answered at least a part of the survey did actually react to the experimental treatment (i.e., the prenotifier and invitation). In other words, we were interested in comparing those who acted on the invitation across conditions, regardless of the final survey outcome. Those who only viewed the survey without answering a single question were classified as nonrespondents.

Overall response rates for the three waves. Response rates across all three waves were calculated as the response rate for the last wave (wave 3) according to the AAPOR's RR6 definition (AAPOR, 2005), conditional on responding to the two preceding waves during fielding time (3 weeks following each invitation). Thus, those who participated only in one or two survey waves, those who did not participate in the designated chronological order, and those who accessed a web survey after the field period were excluded from the numerator in the response rate calculations across all waves.

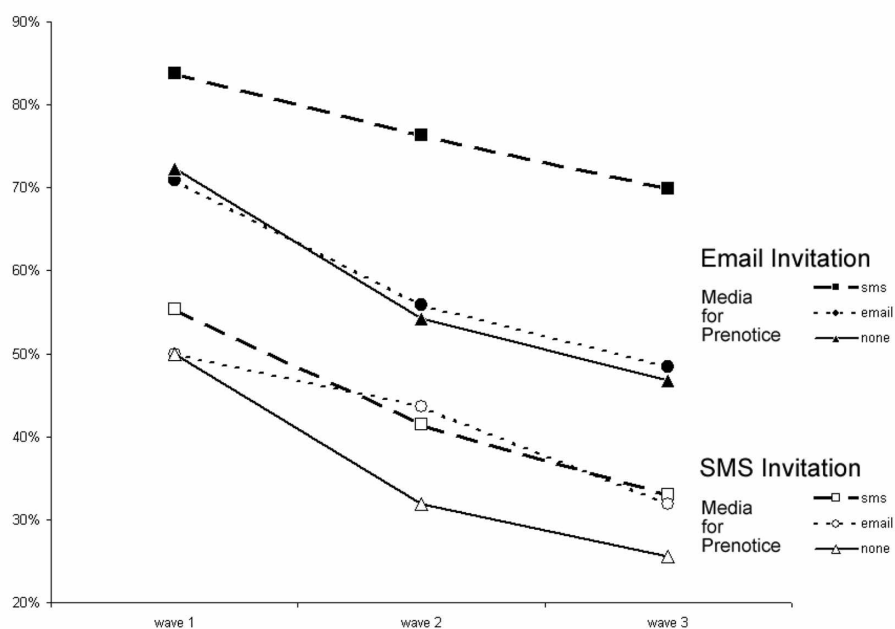
Sample composition variables. To examine possible differences between experimental groups on sample characteristics, we focused on the following parameters assessed within the initial paper-based questionnaire: demographics (age, gender), the Big Five personality dimensions extraversion and conscientiousness (assessed by a short Big Five inventory developed by Rammstedt & John, 2007), interest in a variety of topics (politics, student activities at the university, online shopping, sports, fashion, and lifestyle), participation in leisure activities (e.g., watching television, surfing the web, socializing, shopping, etc.), and intensity of media usage (e-mail and web usage, mobile phone and SMS usage, e-mail and SMS reception during a typical week).

Results

Response Rates Across Waves

Figure 1 illustrates the response rates for all experimental groups and across waves. Upon visual inspection, Figure 1 suggests differences in response rates for e-mail invitations compared with SMS invitations, in the direction hypothesized. Furthermore, within these two invitation modes, the media used for prenotification seem to influence response rates in some cases, too. For instance, the line representing the combination of SMS prenotice and e-mail invitation stands out, with higher response rates across all three waves than

Figure 1
Response Rates Across Experimental Groups and Three Survey Waves



the other prenotification and invitation combinations. In the following section, we will test to what extent these patterns illustrated in Figure 1 meet our expectations.

Effects of Prenotification and Invitation Mode on Overall Response Rates

In Hypotheses 1.1 and 1.2, we had specified our expectations concerning the main effects of the prenotification media. Web surveys prenotified by SMS should lead to higher response rates than those prenotified via e-mail (Hypothesis 1.1), and e-mail prenotifications should outperform web surveys without prenotification (Hypothesis 1.2). In Hypothesis 2, we predicted that e-mail invitations should outperform SMS invitations. These hypotheses were tested with the aid of a series of logistic regression analyses, summarized in Table 2.

As expected in Hypothesis 1.1, SMS prenotifications affected the overall response rate across waves compared with e-mail prenotifications. Whereas the overall response rate was 40.1% for the three web surveys prenotified by e-mail, the corresponding response rate for SMS prenotifications was 51.3%. In terms of odds ratios (derived from Model 1 in Table 2), the odds of participating in the three-wave web survey prenotified by SMS are 1.58 times the odds of participation when prenotified by e-mail (OR = 1.58; 95% CI = 1.05, 2.37). Furthermore, the odds of participating in the three-wave web survey prenotified by SMS are 1.86 times the odds of participation when no prenotification took place (OR = 1.86; 95% CI = 1.23, 2.81).

Table 2
Logistic Regression Analysis Predicting Response to All Three Waves:
Odds Ratios (OR) and 95% Confidence Intervals ($n = 562$)

Variable	Model 1	Model 2	Model 3
Prenotice			
SMS	1.86* (1.23, 2.81)		1.95* (1.27, 2.99)
e-mail	1.18 (0.78, 1.79)		1.20 (0.78, 1.84)
none	—		—
Invitation			
e-mail		2.83* (2.00, 4.01)	2.89* (2.04, 4.11)
SMS		—	—
Nagelkerke R^2	0.02	0.08	0.10

Note: The dependent variable, operationalized according to RR6 in *Standard Definitions* (American Association for Public Opinion Research, 2005), was coded as follows: 1 = response to all three waves, 0 = no response. SMS = short messaging service, a text message to a cellular phone.

* $p < .01$.

Contrary to our expectation in Hypothesis 1.2, the response rate for e-mail prenotification (40.1%) did not differ significantly from that for the no-prenotification group (36.2%; OR = 1.18, n.s.), paralleling the Cook et al. (2000) finding that prenotification does not increase response rates in online surveys. The model for the main effect of prenotification is presented in Model 1 in Table 2.

To test Hypothesis 2, the main effect of invitation mode (e-mail versus SMS) was tested in a logistic regression model (see Model 2 in Table 2). As expected, inviting respondents by e-mail resulted in significantly higher response rates than invitations by SMS (55.1% versus 30.1%; OR = 2.83, 95% CI = 2.00, 4.01). Model 3 in Table 2 tests the effect of both the prenotification and the invitation factor. The effects found in the bivariate model are still present. In an additional model (not shown), we tested the interaction between the two factors. This model does not improve the fit over the main effects model, and the interaction is not significant. The multivariate model (Model 3) supports the conclusions from the bivariate models: Hypotheses 1.1 and 2 are supported, but not Hypothesis 1.2.

Table 3 summarizes the results concerning the rank order of response rate magnitudes for all combinations of the 3×2 experimental design. In view of the nominal response rates reported in Table 3, our predictions (displayed in brackets) are corroborated. Given the sample size achieved, some confidence intervals overlap, indicating a slightly underpowered experimental design.

The models in Table 2 and response rates in Table 3 are based on completion of all three waves of the survey. We fit similar models for response to the first wave survey and also tested multinomial logistic regression models for the response patterns across all three waves of the survey. These results parallel those discussed above, as could be expected from the rates presented in Figure 1.

Table 3
Expected Rank Order, Response Rates, and 95% Confidence
Intervals for Response Rates for Experimental Conditions Aggregated
Over All Three Survey Waves ($N = 562$)

		Prenotification Mode		
		SMS	E-Mail	None
Invitation mode	e-mail	[1] 69.9% (55.9, 84.1)	[2] 48.4% (38.7, 58.1)	[3] 46.8% (37.4, 56.2)
	SMS	[4] 33.0% (26.4, 39.6)	[5] 31.9% (25.6, 38.3)	[6] 25.5% (20.5, 30.6)

Note: Expected rank orders are displayed in brackets. Response rates are reported in the data cells along with their respective 95% confidence intervals (in parentheses). SMS = short messaging service, a text message to a cellular phone.

Sample Composition Differences

In this part of the analysis, we focused on possible influences of different invitation strategies on the composition of the respondent groups. Therefore, we test for possible confounds, or threats to internal validity, for example, due to an unsuccessful random assignment of respondents to experimental conditions or differential sensitivities to experimental treatments. Differences in sample composition could not be detected for any of the measures assessed within the initial paper-based questionnaire. For the demographic data, the sample composition in terms of gender was not systematically different across groups ($\chi^2 = 1.21$, $df = 5$, n.s.). By the same token, the two Big Five personality dimensions of extraversion and conscientiousness, the extent of interest in a variety of topics, leisure activities, and media usage intensity were not systematically related to the experimental treatments (i.e., all interactions between sample composition variables listed and the experimental groups did not exert a significant effect on response rates in the respective regression models). In other words, the mechanism that affects the decision to respond to the web surveys appears to be unrelated to the variables we measured in the baseline classroom survey. We find no evidence that some types of students are differentially attracted to the web surveys using SMS versus e-mail for prenotification and invitation.

Discussion

We set out to explore ways to improve response rates in web surveys, focusing on alternative prenotification and invitation strategies. In terms of the former, we found that an SMS prenotice significantly boosts response rates over an e-mail prenotice or no prenotice. SMS is a permission-based medium, and the frequency of SMS messages is lower than that of e-mail. Thus, SMS has both attention-getting and legitimacy advantages over e-mail.

Contrary to our expectation, and paralleling the meta-analytic results by Cook et al. (2000), an e-mail prenotification did not improve the response rate significantly over no prenotification, although the effect is in the expected direction. It could be that the factors

that present challenges for e-mail invitations—lack of attention given the volume of e-mails received, concerns over SPAM, limited legitimizing tools—do so for prenotifications, too. One more message in the same medium may not have any advantage. If this is so, we would expect mailed prenotification letters to be more effective than prenotification by e-mail.

With regard to the survey invitations, e-mail outperformed SMS, as expected. The ease with which sample persons can get access to the survey, by clicking on the URL in the e-mail message, makes this a superior medium for web survey invitations. The most effective combination, yielding a 70% overall response rate for the three-wave survey, was an SMS prenotice combined with an e-mail invitation. The least effective, yielding a 26% cumulative response rate across the three waves, was an SMS invitation with no prenotification.

Because we wanted to control for coverage error, our study is limited in that the population we studied is one with near-universal access to mobile phones (and SMS) and e-mail. Furthermore, this was a convenience sample of volunteers who provided contact information and permission to be contacted at the outset. EU regulations require respondents to be contacted by SMS by permission only. In other words, an informed and written consent has to be given prior to contacting potential research respondents via SMS. Nonetheless, this study raises important questions for survey design in a context of rapidly changing communication media. The exploration of response-enhancing techniques has a long history in mail surveys, and this study extends this research to web-based surveys. Given the rise of unwanted e-mail messages, e-mail may have low attention-getting and legitimizing appeal, and alternative prenotification and invitation methods such as SMS show some promise in increasing response rates.

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