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Explaining the intention to participate in a web survey: a test of the theory of planned behaviour

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Even though web surveys have become increasingly popular, considerable efforts are necessary to obtain acceptable response rates. This explains the proliferation of experiments aimed at improving levels of participation in web surveys. The current study is not aimed at increasing web survey response by means of experimental research, but instead uses a general psychological theory to explain web survey response. More specifically, the theory of planned behaviour (TPB) is used to explain the intention to participate in a web survey. Previous studies have used this theory to explain survey participation in specific populations (students), but the current study extends that scope by targeting a general population. The results show that the TPB is capable of explaining people's intentions to participate in a web survey in the context of a general population.

Keywords: survey response; online survey; structural model; LISREL

Introduction

Over the past decade, web surveys have not only become exceedingly popular data collection vehicles, they have also become the centre of interest for a large number of researchers keen to investigate factors affecting web survey (non-) response. Although survey (non-) response is a broad term that can refer to unit, item and partial (non-) response (see e.g. Bosnjak & Tuten, 2001), most of the research interest has been devoted to unit (non-) response. The reason for this focus is that web surveys tend to achieve relatively low unit response rates (Cook, Heath, & Thompson, 2000), and this becomes especially apparent when web surveys are combined with other survey modes in controlled experiments (see e.g. Fricker, Galesic, Tourangeau, & Yan, 2005; Kwak & Radler, 2002). As web surveys are fully computerised, it is relatively uncomplicated to mount experimental research designs (Sniderman & Grob, 1996). The field has consequently witnessed a proliferation of experimental research on web survey response.¹

Some researchers have concentrated on technical factors influencing web survey response rates, such as login procedures (Couper, Traugott, & Lamias, 2001; Crawford, Couper, & Lamias, 2001; Heerwegh & Loosveldt, 2002). Other researchers have focused on non-technical factors such as incentives (Bosnjak & Tuten, 2003; Cobanoglu & Cobanoglu, 2003; Downes-Le Guin, Janowitz, Stone, & Khorram, 2002; Frick, Bächtiger, & Reips, 2001; O'Neil & Penrod, 2001; O'Neil, Penrod, & Bornstein, 2003; Porter & Withcomb, 2003b; Tuten, Galesic, & Bosnjak, 2004) or the timing of sending

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out reminder emails (Crawford et al., 2001). Several researchers have also paid attention to the effects of the content of the email invitation itself on web survey participation. Researchers have investigated the effect of survey length statements (Crawford et al., 2001), the effect of social status of the researcher (Guéguen & Jacob, 2002b; Porter & Withcomb, 2003a), and that of adding the researcher's photograph to the email message (Guéguen & Jacob, 2002a) on web survey response rates. Research has also been conducted exploring the effects of personalising email to participate in web surveys (Heerwegh, 2005; Heerwegh, Vanhove, Matthijs, & Loosveldt, 2005; Pearson & Levine, 2003; Porter & Withcomb, 2003a).

Experimental studies represent one way of determining the reasons for web survey (non-) response. The intrinsic appeal of conducting experiments is their high level of validity (Sniderman & Grob, 1996), but coverage problems associated with web surveying (Couper, 2000) limit the degree of external validity that can be obtained using web experiments. Experiments are often conducted in specific populations, such as among students, employees of certain organisations or customers of particular companies. Nonetheless, these experiments considerably contribute to the body of knowledge on web survey (non-) response. Still, a non-experimental approach could provide additional insights and prove to be complementary to the use of experiments. In the current study, the intention to participate in a web survey is investigated by means of a general theory in a non-experimental research design. More specifically, hypotheses derived from the theory of planned behaviour (TPB) (Ajzen, 1991) are tested, in the context of a mail survey among a general population of Internet users.

The following section gives a short description of the TPB and considers how this theory can be applied to the study of web survey response. To illustrate this point, past research is cited in which the theory has been applied to explain (web) survey response. A limitation of that previous research is that it was conducted mainly among specific (often student) populations. The current study extends that past research by applying the theory to a general population. While discussing the previous studies, the hypotheses to be tested in the current study are presented. After discussing the study design and data collection procedures, the results are presented.

Theory of planned behaviour

The TPB is a general theoretical framework useful to explain goal-oriented human behaviour. At the most basic level of explanation, the TPB postulates that behaviour is a function of salient information, or beliefs, relevant to the behaviour (Ajzen, 1991, p. 189). These beliefs combine into three distinct conceptual factors: attitude towards a behaviour, subjective norm and perceived behavioural control (PBC) (see Figure 1).

A person's attitude towards a behaviour is based upon a set of beliefs relating to the behaviour. Each behavioural belief links the behaviour to a certain outcome, or to some other attribute of the behaviour (Ajzen, 1991, p. 191). Negative attributes or outcomes are assumed to contribute negatively to the attitude towards the behaviour, leading to a decreased intention to perform that behaviour. Positive attributes or outcomes are expected to contribute positively to the attitude towards the behaviour and consequently positively affect the behavioural intention. Similarly, the subjective norm is based on normative beliefs. These beliefs reflect the person's perceptions regarding the likelihood that important referent individuals or groups approve or disapprove of performing a particular behaviour (Ajzen, 1991, p. 195). The more a person believes that significant others would also perform the behaviour, the higher

Figure 1. Theory of planned behaviour (Ajzen, 2002).

the intention to perform the behaviour. PBC is based on control beliefs. These beliefs reflect the person's perceptions about the ease or difficulty of performing the behaviour. The easier the individual believes it is to perform the behaviour, the higher the level of PBC and the greater the behavioural intention. By contrast, actual behavioural control refers to actual impediments or facilitators of the behaviour in question. Actual behavioural control influences the perceived level of behavioural control, and also exerts a direct effect on the execution of the behaviour itself (see Figure 1).

Some beliefs may be stronger than others, though. Behavioural beliefs grow stronger with an increasing subjective probability that the behaviour will produce the outcome in question, normative beliefs become stronger with an increasing subjective probability that others will approve or disapprove of performing a given behaviour, and control beliefs gain strength as the perceived power of the particular control factor to facilitate or inhibit performance of the behaviour increases (Ajzen, 1991, pp. 191–198). The overall attitude one holds towards a particular behaviour is consequently the sum of accessible behavioural beliefs weighted by the strength of these beliefs. Similarly, the subjective norm is a weighted sum of normative beliefs, and PBC a weighted sum of control beliefs. These belief sets form the basis of the formation of the behavioural intention: 'once a set of beliefs is formed and is accessible in memory, it provides the cognitive foundation from which attitudes are assumed to follow automatically in a reasonable and consistent fashion' (Ajzen & Fishbein, 2000, p. 7).

At this point, the question arises as to whether the TPB can be used to explain the decision-making process of (web) survey recipients. According to the model, web survey recipients should construct behavioural, normative and control beliefs regarding the target behaviour (filling in a web survey) when they are confronted with a web survey request. The elements present in other theoretical models of survey (non-) response, of which the most prominent was outlined by Groves and Couper (1998) (survey design features, social environment characteristics, characteristics of the survey request, etc.), can be easily accommodated within the TPB if they are thought of as considerations or beliefs, or as elements that affect the strength of beliefs. These elements can thus be reformulated to fit within the conceptual framework of the TPB. For instance, people can perceive a survey as being more or less difficult, which is a control belief that will influence the level of PBC. Similarly, offering a post-paid incentive links the behaviour of completing a survey with a positive outcome, which is a behavioural belief that should positively affect the attitude towards the behaviour.

A more problematic concern is that whereas the TPB tends to emphasise the rational nature of the decision-making process, most theoretical models designed to explain survey response assume that people do not think thoroughly about a survey request because it is not sufficiently important for most recipients to devote much cognitive energy to (cf. Groves & Couper, 1998). This leads to survey respondents relying more on heuristic instead of central, more rational, decision-making processes (cf. Petty & Cacioppo, 1986) one would expect the TPB to presuppose. However, the TPB does not assume individuals 'form attitudes in a "rational" manner in the sense of conducting an unbiased review of all relevant information and integrating it according to formal rules of logic' (Ajzen & Fishbein, 2000, p. 7). The TPB allows beliefs to be based on heuristics, but once the beliefs are formed, the attitudes should follow in a reasonable manner. Consequently, the TPB is not incompatible with other theoretical accounts of survey (non-) response that make more explicit reference to decision-making processes based on heuristics (e.g. Groves & Couper, 1998; see e.g. Cialdini, 1984; Petty & Cacioppo, 1986 for more information on heuristics and decision-making processes). Some research exists in which the TPB was used to explain response decisions to (web) surveys. The following section briefly discusses that research.

Previous studies and research hypotheses

Some researchers have used the TPB, or its predecessor, the theory of reasoned action, to explain survey unit non-response. Hox, de Leeuw, and Vorst (1995) used the theory of reasoned action to explain participation in a mail survey. They used a population of students to obtain measures on their response intentions to a mail survey. They also observed whether the participants actually participated in the target mail survey at a later point in time. It was found that predicting the behaviour itself was rather difficult, which is reflected in the rather low correlation of 0.24 between the latent variable 'behavioural intention' and the actual behaviour (Hox et al., 1995, pp. 61–63). Bosnjak, Tuten, and Wittmann (2005) used the TPB to predict response to a five-wave web survey. They also used a population of students to obtain measures on beliefs and behavioural intention. Their results showed a large effect of the factors on the behavioural intention ($R = 0.83$) and a considerable effect of the behavioural intention on participation with the five web survey waves ($R = 0.43$). Thus, previous studies provide at least some evidence of the applicability of the TPB to the case of survey unit non-response, albeit in student populations. It should be noted, however, that both studies somewhat adapted the basic theoretical model.

Hox et al. (1995) distinguished between a general attitude towards survey research and a specific attitude towards the survey sample members were being asked to respond to. They found that:

[t]he situation specific attitude towards the survey has a significant path to intention, but the general attitude not. Apparently, the intention to respond to a survey request depends on the attitude towards that specific survey and not on a global attitude towards surveys in general. (p. 61)

This is consistent with the *principle of compatibility* (Ajzen & Fishbein, 2000, p. 17), which requires that the definition of the behaviour in terms of target, action, context and time and 'all other constructs (attitude, subjective norm, perceived behavioural

control, and intention) be defined in terms of exactly the same elements' (Ajzen, 2002, p. 2). Thus, a general attitude towards survey research should not be expected to have great predictive power regarding the actual behaviour of completing a specific survey. Hox et al. (1995) also specified a number of beliefs generic to surveys that may influence the constructs of attitude and subjective norm, such as beliefs relating to privacy issues and positive experiences with previous or other surveys. Interestingly, they also included 'effort' and categorised it under the 'general attitude' construct. In the TPB, this would be termed PBC and would constitute a separate factor.

Bosnjak et al. (2005) adhered more closely to the structure of the TPB, but they also added a factor called 'moral obligation'. In some contexts, this addition appears to have merits (Ajzen, 1991, pp. 199–200), and in the analyses of Bosnjak et al. (2005), moral obligation was found to make a modest contribution to the amount of variance explained.

The present study also extends the basic TPB model by adding a moral obligation factor. Based on this, the overview of the theory and discussion of previous studies, the following hypotheses can be derived: in each case, holding a more positive attitude towards the behaviour (filling in a web survey), a more positive subjective norm, a higher sense of moral obligation and a higher level of PBC will increase the intention to perform that behaviour.

Study design and data collection

The study was designed with these hypotheses in mind. It was intended to test this model in a population as general as possible. Therefore, the TPB was not tested by means of a survey within a population of students, but in a general-population mail survey.

The mail survey was part of a larger ongoing research effort involving a multi-mode design. In this text, however, the discussion and analyses are restricted to the mail survey part which contained the TPB measures. From the National Register of Belgium, 960 mail survey sample cases were randomly selected. Only sample cases residing in the Flemish part of Belgium and aged between 18 and 80 were eligible for selection.

Because the questions on the TPB were added to a large general-population mail survey, some restrictions applied. Besides being allocated only a limited amount of space for these questions, we were not permitted to collect email addresses. Consequently, it was impossible to conduct a follow-up web survey to observe actual behaviour. This limits the test of the theory, because the effect of behavioural intention on actual behaviour cannot be assessed. Consequently, this study constitutes only a 'limited' test of the TPB. It differs in this respect with the studies presented in the previous section, which were able to include a measurement of actual behaviour.

The survey questionnaire was designed at the Centre for Survey Methodology at the Catholic University Leuven and its topic was people's attitudes towards surveys in general. At one point in the questionnaire, all respondents were asked whether they had an email address. Those confirming that they did were then presented a short (12-line) simulated email invitation text in the mail questionnaire. In that invitation, it was explained that the University of Leuven was conducting a web survey on the topic of media use. It was also explained that the legislation on privacy would be respected and that email addresses would be kept separately from the respondent's answers. After reading the simulated email invitation, respondents with an email address were

Table 1. Semantic differentials for attitude towards the behaviour.

Interesting	1	2	3	4	5	6	7	Not interesting
Not fun	1	2	3	4	5	6	7	Fun
Meaningful	1	2	3	4	5	6	7	Meaningless
Safe	1	2	3	4	5	6	7	Unsafe
Good	1	2	3	4	5	6	7	Bad
Useless	1	2	3	4	5	6	7	Useful
Disadvantageous	1	2	3	4	5	6	7	Advantageous

then asked questions that were designed to test the TPB, in accordance with the guidelines of Ajzen (2002).

To measure behavioural attitude, seven 7-point semantic differentials were used to assess the respondent's evaluation of participation in a web survey (V33_1–V33_8, excluding V33_3). The question read: 'Suppose you were to receive the email printed above. How difficult or easy, meaningful or meaningless, etc., do you think it would be to participate in that survey?'² The items presented to the respondents are shown in Table 1.

Subjective norm was measured using two questions. The first question (V34) read 'The email message printed above will be presented to each participant in the current survey. How likely do you think it is that the other participants would say they would accept the invitation and participate in that survey?' (7-point scale ranging from 'very unlikely' to 'very likely'). Second, the respondents were asked 'How likely do you think it is that your friends would say they would accept that email invitation and participate in that survey?' (V35; 7-point scale ranging from 'very unlikely' to 'very likely').

To measure moral obligation, one item (V36_1) was included that read 'I feel morally obliged to participate in this Internet survey on media use' (7-point scale ranging from 'not true at all' to 'completely true').

For PBC, four questions were asked. The first one was 'My Internet connection is too slow to participate in this Internet survey' (V36_2), the second read 'I do not have time to participate in this Internet survey' (V36_3), and the third was 'I will have difficulties answering the questions in this Internet survey' (V36_4; all measured on a 7-point scale ranging from 'not true at all' to 'completely true'). Finally, a fourth item asked respondents to estimate the ease or difficulty associated with responding to the web survey (V33_3). Responses to this item were recorded on a 7-point semantic differential with endpoints labelled 'difficult' and 'easy'. The equivalent response format allowed this item to be embedded within the question probing for the attitude towards the behaviour (see Table 1). It appeared as the third item in that item battery (not shown in Table 1). Although some of these questions could be said to refer to actual behavioural control (e.g. a slow Internet connection), it is important to note that a survey like this can only probe for perceptions and opinions, not actual control factors. Insofar as the respondent can reliably estimate actual behavioural control, PBC is veridical for actual behavioural control (Ajzen, 1991), although it cannot constitute a direct measure of actual behavioural control. These survey items are hence treated as referring to PBC.

After these questions, the behavioural intention was measured. Respondents were asked how likely it was that they would participate in this web survey on media use

were they, in a week's time, to actually receive the email invitation they had just read. Responses were recorded on a 7-point scale, ranging from 'very unlikely' to 'very likely'.³

Fieldwork for the mail survey started on the 18 October 2004. The initial mail-out contained an introduction letter presenting the research and study sponsor to the respondents, a questionnaire and a stamped return envelope. On 5 November 2004, a reminder was sent to those who had not yet returned their completed mail survey. This second contact consisted of a reminder letter that stressed the importance of the research. No questionnaire was sent along with this reminder. On 1 December 2004, a final reminder was sent. This third contact was made up of a reminder letter and an additional mail questionnaire. The survey used post-paid incentives in an effort to boost the response rate. Each respondent was promised a 5 Euro gift certificate upon completion and return of the questionnaire.

Results

Of the 960 questionnaires sent out, 523 were returned completed. This represents a response rate of 54.48% (55.40% when omitting ineligible). Table 2 shows a more detailed overview of the mail survey response.

Because the sample frame contains information regarding age and gender, a limited non-response analysis can be carried out. For each combination of age (category) and gender, the observed and expected frequencies were compared. Table 3 shows the results. Although some groups are slightly over or underrepresented in the realised sample, the Chi square test indicates that respondents and non-respondents do not differ significantly from each other with regard to age and gender. This means that the sample can be deemed representative for the target population for these two variables.⁴

Of the 523 mail respondents, 249 (47.61%) reported that they had an email address and were instructed to proceed to read the email invitation text and to answer the questions about it. The following analyses are based on these cases. Before turning to the analyses aimed at testing the TPB hypotheses, we present the univariate distribution of the variable measuring behavioural intention. Table 4 shows the response distribution for this variable (V37).

Table 2. Response to the mail survey.

	N	%
Completed questionnaires	523	54.48
Refusals	15	1.56
Sample unit moved	5	0.52
Language barrier (does not speak Dutch)	4	0.42
Health-related reason for non-response	3	0.31
Resident of an institute	2	0.21
Deceased	1	0.10
Illiterate	1	0.10
No response	406	42.29
Total	960	100.00

Table 3. Non-response analysis.

Category	Planned sample		Realised sample	
	N	%	N	%
Male				
18-24	50	5.21	32	6.12
25-34	78	8.13	34	6.50
35-44	95	9.90	45	8.60
45-54	88	9.17	47	8.99
55-64	61	6.35	30	5.74
65-80	82	8.54	39	7.46
Female				
18-24	48	5.00	33	6.31
25-34	93	9.69	52	9.94
35-44	98	10.21	60	11.47
45-54	85	8.85	49	9.37
55-64	88	9.17	59	11.28
65-80	94	9.79	43	8.22

Note: $\chi^2(11) = 11.13, p = 0.432$.

This survey item is of interest as it gives some insight into the proportion of respondents from a general-population sample that would be willing to participate in the web survey. If it were arbitrarily decided that respondents ticking response options 5, 6 or 7 are regarded as being willing to participate in the web survey, about 40% of the respondents could be classified in this way.

Development of a measurement model

The ultimate aim of the analysis is to provide a structural model indicating the effects of the various constructs and variables on the behavioural intention. This model, however, presupposes a measurement model, which requires a confirmatory factor analysis because clear theoretical indications exist regarding which survey items should load on which factors.

The confirmatory factor analysis was carried out in LISREL® for Windows version 8.71.⁵ The first measurement model tested specified five latent variables, which were allowed to correlate freely with each other. Seven manifest variables

Table 4. Response distribution for behavioural intention measure (%).

	Very unlikely						Very likely	
	1	2	3	4	5	6	7	Missing
V37. Likelihood of participating with the web survey	22.89	12.45	12.85	10.44	14.86	13.65	12.05	0.80

Note: Percentages are calculated on the basis of 249 eligible respondents.

(V33_1–V33_8 excluding V33_3) were set to load on the latent variable 'attitude towards the behaviour', two manifest variables (V34, V35) were set to load on the latent variable 'subjective norm',⁶ one manifest variable (V36_1) was set to load on the latent variable 'moral obligation', four manifest variables (V36_2–V36_4, V33_3) were set to load on the latent variable 'PBC' and one manifest variable (V37) was set to load on the latent variable 'behavioural intention'. The model excludes 'actual behavioural control' as this is a variable referring to actual external factors inhibiting or facilitating the behaviour. As noted, this variable was not measured in the survey.

This theoretically expected model was tested, but the fit indices suggested a considerable misfit with a Chi square value of 261.24 ($df = 83, n = 227$) and an RMSEA value of 0.097. Closer inspection of the model revealed that the PBC construct could be problematic. More specifically, two out of the four variables had a low R^2 value (V36_2: 0.19; V36_4: 0.19), indicating low indicator reliability.

One possible reason for this is that some of the PBC variables appear to refer to external behavioural control, while others refer to internal behavioural control. This would suggest that two perceived behavioural factors should be used (one referring to internal, the other to external behavioural control). However, the individual items did not allow for this interpretation. One of the items with low reliability referred to an external element of control (having a slow Internet connection), while the other item with low reliability referred to an internal aspect of control (having difficulties answering the questions).

In a second model, the PBC variable was deconstructed into four manifest variables (PBC1–PBC4). This model had a significantly improved fit (with a Chi square value of 148.21 on 69 degrees of freedom; RMSEA = 0.071) compared to that of the first model ($\Delta\chi^2 = 113.03$; $\Delta df = 14$; $p = 0.0000$).

Inspection of the modification indices revealed that the model fit could be improved further by allowing two error covariances, between V33_2 and V33_5 and between V33_1 and V33_8. Given the uniform response options, this was deemed acceptable. This third and final model had a significantly better fit (with a Chi square value of 121.45 on 67 degrees of freedom; RMSEA = 0.060) than the second model ($\Delta\chi^2 = 26.76$; $\Delta df = 2$; $p = 0.0000$). Further changes to the model would have resulted in a model that no longer corresponded to the theoretical model, and the small fit improvements that would have resulted from these changes were deemed incommensurate with the lower theoretical significance of the model. It was therefore decided to select the third measurement model as the final model.

Test of the research model

On the basis of the final measurement model, the research model, which is a structural model (see Figure 1), was estimated. This final structural model is displayed in Figure 2. Note that it excludes two non-significant paths (from PBC1 to INTENT and from PBC3 to INTENT). Based on Beauducel and Wittmann's (2005) recommended fit indices, model fit is deemed to be adequate (NNFI = 0.98; IFI = 0.99; CFI = 0.99; GFI = 0.99; RMSEA = 0.058; SRMR = 0.14; $\chi^2/df = 1.77$).⁷ The R^2 value for INTENT equals 0.82, which indicates that a large proportion of the variance in the behavioural intention variable is explained by the independent variables.

The model shows that, as predicted, attitude towards the behaviour has a significant effect on the behavioural intention. The negative direction of the effect is explained by the fact that the latent variable 'attitude towards the behaviour' assumes

Figure 2. Final structural model (standardised parameter estimates).

higher values as the attitude becomes more negative and the manifest variable 'behavioural intention' assumes higher values as the behavioural intention increases. Hence, the interpretation of this effect is that willingness to participate in the web survey increases as the behavioural attitude becomes more positive. This finding confirms the hypothesis.

The finding regarding the subjective norm also supports the hypothesis: the more positive the subjective norm, the higher the willingness to participate in the web survey. The model also shows that, as expected, a higher sense of moral obligation leads to a stronger intention towards the behaviour of participating in the web survey.

As explained previously, PBC was not a reliable factor. Therefore, the individual items were entered separately into the model. Having a slow Internet connection (V36_2) does not apparently influence the respondent's behavioural intention, neither does anticipating having difficulties with the questions (V36_4). The two

other variables that were designed to measure PBC do influence the behavioural intention, however. Not having time (V36_3) has a significant and negative influence on behavioural intention, while the anticipated ease of participating in the survey (V33_3) has a significant and positive influence on the behavioural intention: the easier respondents expect the web survey to be (a higher score on the semantic differential), the higher the behavioural intention.

In terms of the strength of the modelled effects, attitude towards the behaviour has the largest effect on the behavioural intention (-0.40), followed by subjective norm (0.28). The two remaining PBC variables have smaller effects (-0.23 and 0.16) on behavioural intention. The smallest effect on behavioural intention is exerted by moral obligation. This finding largely echoes results from a previous study by Bosnjak et al. (2005), although in that study PBC had the largest effect. The problematic nature of the PBC variables could explain its lower position in the rank order in the present study.

Discussion and conclusion

This study sought to explain the intention to participate in a web survey by means of the TPB. The study extended the scope of previous studies by targeting a general population of people possessing an email account by means of a mail survey. Use of a random sample in a general population allows a proper evaluation of the theoretical assumptions, as well as an evaluation of results of previous studies based on convenience samples. The findings indicate that the hypotheses derived from the TPB are corroborated by the data. More positive behavioural attitudes, more positive subjective norms, a higher sense of moral obligation and a higher degree of PBC significantly and positively influence the behavioural intention. These findings are consistent with the TPB and the results of previous studies, and hence confirm the applicability of this theory in the realm of web surveys within a general population. The observation that the current study yielded similar results to previous studies based on convenience samples suggests that the convenience samples were adequate for the purposes of testing the TPB. However, this does not imply that the current study using a random sample of the general population was redundant. A true random sample remains necessary to properly test hypotheses.⁸

Despite the fact that actual behaviour was not recorded, these findings suggest that the TPB could be useful to guide researchers in their quest for higher web survey response rates. As Bosnjak et al. (2005, p. 501) point out, the effectiveness of using response-enhancing strategies could be interpreted in terms of the TPB. For instance, a prepaid incentive could increase the behavioural intention of responding to a web survey because of a heightened sense of moral obligation induced by the incentive. Another example is that login procedures used to control survey access should be easy to understand and use – and should be perceived as such by the respondent – so as not to impair PBC. By clearly communicating the usefulness or the advantages of participating in the survey, the attitude towards the behaviour could be positively influenced, leading to higher cooperation rates, and so on. These are but a few examples of how this study's findings could be tied to specific response-increasing strategies or how such strategies can be interpreted in a more general conceptual framework such as the TPB.

The empirical tests did indicate some problems that should be remedied in future research, however. First, better survey items need to be developed to measure PBC.

Second, it would be useful to distinguish between external and internal control elements. Future research should also use more survey items to measure the subjective norm and the moral obligation concepts. Finally, future studies should use larger samples from general populations and aim to obtain a measure of actual behaviour in order to complement the measure of behavioural intention and thus provide a more complete test of the TPB.

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Notes

1. In the remainder of this article, the terms 'web survey response' and 'response rate' will refer to unit response.
2. Please note all questions have been translated from Dutch. Some of the original meaning of the questions may have been lost in the process of translation.
3. After this question, it was explained to respondents that no emails would actually be sent to them and they were not asked to provide their email address.
4. This assumes that the sample was properly drawn and that it is also representative of the target population. A separate analysis that is not reproduced here showed that this was indeed the case.
5. The asymptotic covariance matrix was calculated using PRELIS, as were the polychoric correlations. These matrices were used to estimate the measurement and structural models (these estimation procedures used the weighted least squares method), as this is the appropriate method for analysing ordinal data (Jöreskog, 2005). The polychoric correlation matrix is reproduced in Appendix 1. The appropriate tests regarding the polychoric correlations revealed no violations of the assumed underlying bivariate normality using the RMSEA > 0.1 criterion as suggested by Jöreskog (2005, p. 18).
6. Because subjective norm was measured by two variables, this part of the measurement model is statistically under-identified. Therefore, the model imposed a restriction on these loadings in that they were made to equal each other. This decreases model fit but avoids statistical under identification (cf. Byrne, 1998).
7. NNFI = non-normed fit index; IFI = incremental fit index; CFI = comparative fit index; GFI = goodness of fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual; χ^2 = Chi-squared; df = degrees of freedom. Conventional threshold values indicating model fit are >0.9 and >0.95 for NNFI, IFI, CFI, and GFI; <0.08 and <0.06 for RMSEA; <0.08 for SRMR; and χ^2/df values smaller than 2 (Beauducel & Wittmann, 2005, p. 51). Only the SRMR value suggests inadequate model fit.
8. Moreover, it should be noted that the previous studies were conducted in different countries. Therefore, the similarities between study results could be misleading. Cross-cultural differences combined with different sample types may be responsible for seemingly similar results (opposite effects may have occurred which cancel out each other). Therefore, one should not hastily conclude without further evidence that convenience samples provide an equally firm basis as random samples to test the TPB.

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Appendix 1. Polychoric correlation matrix

	V33_1	V33_2	V33_3	V33_4	V33_5	V33_6	V33_7	V33_8	V34	V35	V36_1	V36_2	V36_3	V36_4	V37
V33_1	1														
V33_2	-0.599	1													
V33_3	-0.241	0.339	1												
V33_4	0.679	-0.457	-0.298	1											
V33_5	0.489	-0.329	-0.158	0.499	1										
V33_6	0.666	-0.506	-0.273	0.704	0.554	1									
V33_7	-0.566	0.584	0.355	-0.66	-0.474	-0.673	1								
V33_8	-0.416	0.548	0.375	-0.557	-0.361	-0.579	0.7	1							
V34	-0.377	0.382	0.179	-0.484	-0.444	-0.438	0.43	0.471	1						
V35	-0.338	0.385	0.119	-0.403	-0.365	-0.422	0.411	0.411	0.762	1					
V36_1	-0.23	0.229	-0.035	-0.279	-0.273	-0.201	0.267	0.296	0.339	0.308	1				
V36_2	0.144	-0.053	-0.217	0.158	0.164	0.201	-0.082	-0.016	-0.1	-0.023	0.126	1			
V36_3	0.44	-0.448	-0.141	0.366	0.226	0.366	-0.359	-0.28	-0.303	-0.339	-0.081	0.265	1		
V36_4	0.215	-0.213	-0.386	0.197	0.04	0.091	-0.18	-0.083	-0.048	-0.069	0.105	0.313	0.304	1	
V37	-0.535	0.657	0.326	-0.543	-0.504	-0.553	0.616	0.547	0.639	0.61	0.367	-0.134	-0.539	-0.169	1

Note: The analyses conducted in this study are based on the polychoric correlation and the asymptotic covariance matrix. Estimation method was weighted least squares (WLS). The asymptotic covariance matrix is prohibitively large to be included here. Absence of the asymptotic covariance matrix rules out secondary analysis using WLS. Therefore, an alternative estimation method such as maximum likelihood (ML) has to be used. This estimation method produces slightly different results and generates a model with lower fit.