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**Web Survey Bias: Sample or
Mode Effect?**

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Web surveys are the most successful form of Internet research and, particularly in the US, are becoming a mainstream market research tool. However, there is relatively little research on the effect of the web mode compared with more traditional administration methods. We review the literature on web surveys and sources of error, and investigate the impact of the web administration mode.

Web and paper surveys were conducted simultaneously using near-identical self-completion questionnaires. A detailed comparison of responses included analysis of the means, skewness, kurtosis, and variance. After identifying a number of significant differences, chi-square and regression were used to analyse the administration mode effect. We argue that the differences found are attributable to sample bias rather than mode, and that the ramifications of low response rates in web surveys are more far reaching than has been recognised.

Keywords:

Introduction

Comley (2002) predicts that online research, which is currently only 1% - 2% of the UK research market, will 'take off' in 2003. In the US, online quantitative research is growing at 50% p.a. and already accounts for 20% of the market (Inside Research, cited by Comley 2002). The low cost, speed, convenience and global reach of online research make it a very attractive tool for survey research. Setting up a questionnaire on the web has become easier and the technology is accessible to many, democratising the research process (Couper 2000).

Using techniques transferred from traditional and telephone research, web surveys are proliferating. They range from instant 'entertaining'

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surveys, which are mainly a forum for exchanging opinions, to site-assessment surveys and surveys restricted to invitation-only respondents.

In this buoyant context, the quality aspects of online surveys may have been overlooked. In comparison to off-line research, there is a general lack of knowledge and experience in the design and measurement of web surveys. It is of crucial importance to determine how the Internet affects the design, administration and interpretation of research. This paper contributes to knowledge by exploring the differences between two visual survey administration modes, web and paper, with a focus on measurement and scaling effects.

Web Surveys

Web surveys have two characteristics that are familiar from conventional market research: they are self-administered and they use a visual (as opposed to aural) instrument. For self-completion surveys it is important that respondents be motivated, reassured about confidentiality, have appropriate guidance and a precisely worded questionnaire (Chisnall 2001).

As a visual mode, online research is subject to less normative bias and acquiescence than face-to-face or telephone interviewing. The lack of social cues on the Internet is thought to make people more open and friendly (Sproull and Kiesler 1991). Joinson (2001) found heightened self-disclosure during computer mediated communication; Comley (2002) suggests answers to online surveys are more honest.

Visual survey instruments may have primary effects, i.e. respondents are conditioned by the early response categories in a list; this corresponds to the recency effects found for aural instruments (Carini et al. 2001; Dillman et al. 2001).

There is considerable literature comparing traditional and online research, but most studies are limited to response characteristics (see Table 1); Sheehan (2001) has a meta-analysis of email survey response rates. Several studies have reported more distributed answers for mail and web surveys than for telephone surveys (Buchanan 1999; Miller 2001). Printed instruments afford the opportunity for fuller scale descriptions, which may account for the greater variance in responses (Dillman and Bowker 2001); they are also less reliant on respondents' short term memory.

Qualitative web research has been found to provide very detailed feedback (Mehta and Sivadas 1995; Schaefer and Dillman 1998; Dommeyer and Moriarty 2000). Responses to open-ended questions are '*richer, longer and more revealing*' than in mail surveys, (Taylor 2000, p.53 citing Harris Poll; MacElroy et al. 2002).

Table 1. Summary of Previous Comparative Studies of Online Surveys

Author(s)	Treatments	Response rate (%)	Response quality
Sproull 1986	E-mail	73	1.4 % item omission rate
	Face-to-face	87	0.02 % item omission rate
Kiesler & Sproull 1986	E-mail	67	E-mail had fewer mistakes and a higher item completion rate
	Mail	75	
Parker 1992	E-mail	68	Not reported
	Company mail	38	
Schuldt & Totten 1994	E-mail	19.3	Not reported
	Mail	56.5	
Kittleson 1995	E-mail	28.1	Not reported
	Mail	75.5	
Mehta & Sivadas 1995	E-mail	60	Similar number of item omissions, e-mail respondents wrote more
	Mail	58	
Oppermann 1995	E-mail	49	Not reported
	Two mail surveys	26/33	
Tse et al. 1995	E-mail	6	No significant difference in number of item omissions
	Mail	27	
Bachmann, Elfrink & Vazzana 1996	E-mail	52.5	E-mail respondents were more willing to answer open-ended questions
	Mail	65.6	
Weible & Wallace 1998	E-mail	30	Not reported
	Mail	35.7	
	Fax	31	
	Web form	34.4	
Schaefer & Dillman 1998	4 mail contacts	57.5	E-mail surveys had fewer item omissions and longer answers to open-ended questions
	4 e-mail contacts	58	
	mail=>e-mail	48	
	e-mail=>mail	54.4	
Tse 1998	E-mail	7	No significant difference found
	Mail	52	
Bachmann Elfrink & Vazzana 1999	E-mail	46	E-mail respondents were more to expansive, but higher item omission
	Mail	19	
Dommeyer & Moriarty 2000	E-mail (attached)	8	No significant difference found
	E-mail (embed.)	37	

Online focus groups, although devoid of non-verbal group interaction, are known to produce interesting, short and precise contributions (Curasi 2001) including the use of strong language (Miller 2001).

The advantages of web surveys should not detract from commitment to the validity of the data collected, which can be achieved through reduction of error. In the next section we discuss sources of survey error.

Sources of Errors in Web Surveys

There are four major sources of survey error that reduce research accuracy and validity, namely coverage, sampling, non-response and measurement (Groves 1989). Coverage error is defined by Groves as a mismatch between the target population and the frame population, which results in a difference on the surveyed statistic between those covered and those not covered. The frame refers to the records from which the sample is drawn, for web research this often consists of personal email addresses. The lack of standardised addresses means there is no method for generating random samples such as the random digit dialling used for telephone research, (Dillman and Bowker 2001). There is a high rate of turnover of email addresses so that reliance on proprietary site lists is unsatisfactory.

Although Internet penetration continues to grow, web reach is still much lower than mail or telephone. Efforts can be taken to prove that web surveys include respondents of similar demographic characteristics to those for other survey modes; however, the question remains of whether the two populations (e.g. web and mail) share comparable attitudes and behaviour on the substantive variables of interest (Couper 2000).

Sampling error arises in the sampling process itself (Churchill 1999) as not all members of the frame population are measured. Like coverage error, it contributes to the difference between the sample estimate and the value of the population parameter obtained through a complete count (Chisnall 2001). Traditionally, the cost of each additional respondent has led to an emphasis on sample size. Since respondent cost is not an issue on the Internet, increased sample size can be incorrectly used as an argument against sampling error (Dillman and Bowker 2001); however, a large biased sample will not compensate for sample error.

Web surveys include non-probability samples, such as self-select surveys, volunteer panels, probability-based samples such as intercept surveys, and pre-recruited panels of Internet users (Batagelj and Vehovar 1999). Panels are a good alternative to ensure a representative sample but problems of panel conditioning occur over time (Kalton, Kasprzyk and McMillen 1989). Due to coverage and sampling limitations, there are no true probability-based samples on the web for full populations unless initial non-Internet approaches are used to elicit cooperation.

Non-response error is a function of both the rate of non-response and of the differences between respondents and non-respondents, on the variables

of interest (Groves and Couper 1998). For surveys where the frame cannot be identified, the problem of non-response is difficult to estimate (Rosen, Manning and Harrell 1999). For example, if an open invitation is issued on a web portal to participate in a survey, the number of those invited to participate is typically not known, and therefore the non-response rate cannot be calculated.

Response rate has been examined in several studies, and Sheehan (2001) found that response rate is declining. Despite the newness of the medium, the over-surveying effect identified for telephone research with consequent reduction in response rate, has already been seen in online research. Motivating web survey tools (such as incentives and reminder letters) need further research. Obviously, non-response is heavily influenced by interest in the topic, privacy concerns and the technical problems experienced by respondents (e.g. navigation and incompatible software).

It is crucial with self-administered questionnaires to ensure that measurement error, i.e. deviation of the answers of respondents from their true value on the measure, is minimised. The design of the survey instrument has been recognised to influence measurement error (Sudman, Bradburn and Schwartz 1996) and traditional questionnaire design recommendations are still applicable. For instance, the use of specific rather than diffuse questions, logical progression of question topics, funnelling, etc. (Chisnall 2001)

In web surveys the screen size, settings, web browser, and colour palette used by the designer can significantly change the instrument and appearance of the measure (Couper, Traugott and Lamias 2001; Tedesco et al. 1999; Miller 2001; Batagelj and Vehovar 1998). The appearance of the survey will depend on the user's hard and software configuration; for instance, the position of questions within the screen and the distance between scale points will vary. Programmers are advised to use conservative screen measures, although these may prevent full exploitation of web graphics. Recommended web survey features include progress bars, scrollable rather than interactive questionnaires (Couper 2001; Comley 2000; Dillman Tortora and Bowker 1998), grouping related items (Fuchs, Couper and Hansen 2000), and minimising download time, (Redline and Dillman 1999; Couper 2001). Dillman and Bowker (2001), contains a comprehensive table of web survey design recommendations.

A further source of error is the cross-cultural nature of online research. Online surveys often entail international aggregation of web data. Cultural values or social traits can directly influence responses and introduce construct or scale error (Craig and Douglas 2000; Baumgartner and Steenkamp 2001).

Research Agenda

Our research agenda was to find out whether the web administration mode elicited different response styles. Our hypotheses were:

- H₁ The distribution of responses differs between the web and paper questionnaires.
- H₂ A relationship exists between mode and item responses.
- H₃ Mode explains part of the difference in item responses.

Methodology

We administered near-identical self-completion questionnaires in two modes, paper and web, and compared the results. Our population consisted of Kingston University students, all Internet users. We used a quasi-experimental design with a non-random convenience assignment of subjects to their groups (paper versus web respondents). For the paper group, students were approached on three campuses at different times and handed a paper questionnaire which they completed and returned immediately. For the web group, email invitations containing a URL to an online questionnaire were sent to 4000 student email addresses. Web respondents were given one week to complete the questionnaire; multiple responses were eliminated. Overall 123 paper and 157 web questionnaires were returned; 120 were randomly selected from each group and used in the analysis.

Table 2. Questionnaire Sources

Area	Scale	No. of items	Type of scale	Scales derived from:
Internet experience	Ease of Use	6	7-point	Hoffman and Novak (2000)
	Focused attention	3	Likert	
	Tele-presence	2		
	Exploratory experience	3		
Market Research	Role of MR	4	5-point	Bearden and Netemeyer (1999); Evans et al., (2001); Beasley and Chaplin (1998)
	Survey experience	3	Likert	
	Confidentiality concerns	3		
Information over the Internet	Personal information	7	5-point:	Cranor et al. (1999)
	Consumer information	1	Always to	
	Sensitive information	2	never feels comfortable	
Privacy issues and Spam		4	10-point: Not serious at all to extremely serious	10 th GVU survey (1998); Cranor et al. (1999).

A questionnaire was developed containing 38 items derived from the Internet and market research literature as shown in Table 2; in addition we asked about gender, length of Internet use, weekly usage of the Internet and self-rating as a beginner, intermediate or expert Internet user. All questions were non-comparative and balanced, and offered a neutral choice (with the exception of the privacy issues section). The questionnaire was converted to web and paper modes using very similar layouts with three pages in both formats. Following recommendations in the literature, the web pages were designed to fit the width of the screen, and were scrollable to minimise context and order effects. Instructions were given at each step; in the web mode drop-down boxes were used, offering either one choice from a list, or check boxes for multiple-choice questions.

Prior to analysis, the scales were checked for their validity and reliability. Principal component analysis confirmed validity, and reliability coefficients were satisfactory, (see Appendices 1 and 3).

Sample

Gender split was fairly even with men accounting for 56% of web respondents and 45% of paper respondents. Web respondents were significantly more likely to have used the Internet for longer, to use it more and to consider themselves experts; 25% of web respondents had previously participated in web surveys compared to only 7% of paper respondents.

Results

H₁ The distribution of responses differs between the web and paper questionnaires

For H1, analyses of central tendency and deviation were performed to reveal possible differences in the distribution of responses between web and paper respondents. We systematically compared means, variances, statistical mode, standardised skewness and kurtosis between administration modes; of the total 38 items, 11 items had significantly different means (independent sample test of means, see Table 3 and appendix 2)

Overall, web respondents were significantly more positive about Internet ease of use. The web group also had a significantly higher mean for the role of market research. They were more positive about survey experience in general, although this was only significant for one item -'I like helping people by providing my opinion'. Web respondents were significantly more comfortable about giving their email address and credit card details (although scores are not very high in this section), and more concerned about the tracking of web visits.

Table 3. Significantly Different Means of Items

Item	Scale	Mode	Mean	Std Dev	Sig.
Internet experience: ease of use scale					
<i>I enjoy using the web</i>	1 – 7	Web	5.95	1.46	.022*
		Paper	5.51	1.51	
<i>I feel comfortable using the web</i>	1 – 7	Web	5.97	1.511.50	.050*
		Paper	5.58		
<i>I find the web easy to use</i>	1 – 7	Web	5.83	1.40	.029*
		Paper	5.40	1.59	
<i>I am very skilful at using the web</i>	1 – 7	Web	5.55	1.58	.004**
		Paper	4.95	1.63	
Market research: role					
<i>Market research surveys give people an opportunity to feedback to manufacturers</i>	1 – 5	Web	3.98	.74	.039*
		Paper	3.77	.82	
<i>Market research is an invasion of privacy</i>	1 – 5	Web	3.63	.84	.000**
		Paper	3.18	.97	
<i>Market research helps produce better products or services</i>	1 – 5	Web	3.89	.89	.004**
		Paper	3.58	.81	
Market research: survey experience					
<i>I like helping people by providing my opinion</i>	1 – 5	Web	3.48	.92	.007**
		Paper	3.14	.99	
Information over the Internet: personal information					
<i>Providing my email over the Internet...never to always feels comfortable</i>	1 – 5	Web	3.28	1.20	.004**
		Paper	2.83	1.22	
<i>Providing my credit/debit card number over the Internet...never to always feels comfortable</i>	1 – 5	Web	1.84	1.06	.050*
		Paper	1.60	.82	
Privacy issues					
<i>Someone tracking what web sites people visit and use that information improperly... not at all serious to extremely serious</i>	1 – 10	Web	8.46	2.26	.011*
		Paper	7.68	2.49	

* Appropriate two-tailed significance reported, checked with Levene's test n=240 *p<0.05 **p<0.01

From a detailed analysis at item level, web respondents had a tendency to use end-of-scale responses. This was particularly true for Internet experience items where the statistical mode was the last category, 7 – 'strongly agree' for eight items, and for privacy items where the mode is always 10 – 'extremely serious'. Paper respondents did not show this pattern of extreme answering. We also noticed a greater variance in answers from the web sample for items relating to personal and sensitive information provided over the Internet, and for privacy issues.

H₂ A relationship exists between mode and item responses.

The non-parametric chi-square test was used to check for a relationship

between the items measured and questionnaire administration mode. We also checked for association with the Internet usage variables. No significant interaction of the items with gender was found. Table 4 reports chi-square results for a selection of items.

Significant relationships with mode, and the Internet usage variables were observed for most of the 'ease of use' items, but the other Internet experience items were not significantly related to mode. Web respondents were significantly more positive about the role of market research and less concerned (but not significantly) about market research confidentiality. There was no apparent interaction between any of the market research items and Internet usage. Web respondents were significantly more comfortable about giving their email address and credit card details.

Both web and paper respondents considered spam a serious issue, but web respondents were more concerned about '*web sites collecting email addresses of visitors without their consent, to compile lists*' and about '*web sites reselling information about their site users to other companies*'. Those who defined themselves as beginners or intermediate Internet users were significantly less likely to consider spam a serious issue (significant at 5% but the low sample size suggests caution).

Table 4. Chi-Square Test of Selected Items and Mode

Item	Sig.
Internet Experience: ease of use scale	
<i>I enjoy using the web</i>	0.027*
<i>I feel comfortable using the Web</i>	0.003**
<i>I find the Web easy to use</i>	0.086
<i>I am very skilful at using the Web</i>	0.006*
<i>I am in complete control when I use the Web</i>	0.056
Market research: role	
<i>Market research surveys are an invasion of privacy</i>	0.004**
<i>Market research helps produce better products and services</i>	0.008**
Market research: Confidentiality issues	
<i>Market research organisations maintain confidentiality of people's answers</i>	0.077
<i>I like helping people by providing them with my opinion about products</i>	0.091
<i>Organisations that conduct surveys can be trusted to protect my rights to privacy</i>	0.086
Information over the Internet: personal	
<i>Email address</i>	0.012*
Information over the Internet: sensitive	
<i>Annual income</i>	0.067
<i>Credit/Debit card Number</i>	0.037*
Privacy issues	
<i>People receiving unsolicited commercial e-mail, often called spam or junk e-mail</i>	0.059
<i>Web sites collecting the e-mail addresses of site visitors without their knowledge or consent, to compile e-mail marketing lists</i>	0.003**
<i>Web sites reselling information about their site users to other companies</i>	0.012
n=240	*p< 0.05 **p<0.01

H₃ Mode explains part of the difference in item responses.

Ordinary least squares regression was used where administration mode appeared to have a significant impact on item responses. This technique was appropriate as our goal was identification of mode effects rather than prediction; a similar approach was taken by Wright, Aquilino and Supple (1998) and Carini et al. (2001).

Gender was not included in the regression since no significant relationship with the items had been found. The regression included: mode as a dummy variable, weekly Internet usage and length of Internet use. Regression was run for all the items where means were significantly different for each mode, or where chi-square analysis showed an association of item with mode. Results were not conclusive and overall R² was very low suggesting that mode and Internet usage did not explain item response variation (see Table 5).

Table 5. Regression of Selected Items against Mode and Internet Usage Variables

Dependent Variable/ Item	Unstandardised Coefficients				Significance					
	R	Adj. R2	Anova F	Sig. F	Mode	Weekly usage	Length of usage	Mode	Weekly usage	Length of usage
<i>I enjoy using the web</i>	0.39	0.14	13.97	0.00	0.15	0.37	0.27	0.41	0.00**	0.15
<i>I feel comfortable using the web</i>	0.34	0.10	9.92	0.00	0.11	0.27	0.44	0.56	0.00**	0.02*
<i>I find the web easy to use</i>	0.40	0.15	15.06	0.00	0.10	0.33	0.51	0.59	0.00**	0.01**
<i>I am very skilful at using the web</i>	0.45	0.19	20.06	0.00	0.21	0.38	0.67	0.28	0.00**	0.00**
<i>Market research surveys are an invasion of privacy</i>	0.25	0.05	5.06	0.00	0.12	0.05	0.12	0.00**	0.61	0.73
<i>Market research helps produce better products and services</i>	0.19	0.02	2.93	0.03	0.29	0.02	0.05	0.01**	0.70	0.64
<i>Market research helps produce better products and services</i>	0.19	0.02	2.93	0.03	0.33	0.05	-0.11	0.01**	0.30	0.40
<i>Providing my email address</i>	0.19	0.02	2.88	0.04	0.43	0.04	-0.02	0.01**	0.55	0.90
<i>Providing my credit/debit card number</i>	0.15	0.01	1.70	0.17	0.25	0.03	-0.13	0.05*	0.58	0.29
<i>Web sites collecting visitors' emails to compile lists</i>	0.17	0.02	2.31	0.08	0.30	-0.24	0.55	0.34	0.04*	0.08
<i>Web sites reselling information</i>	0.19	0.02	2.96	0.03	0.21	-0.32	0.51	0.51	0.01**	0.09

n=240 † Anova test not significant here. *p< 0.05 **p<0.01

In the regression analysis, mode had no explanatory impact on Internet ease of use items when Internet usage and length were included in the model. However, for items relating to market research and providing personal

details (as shown in Table 5), mode was the only contributor, albeit with a poor goodness of fit. For items relating to website privacy, weekly web usage was the only contributing variable.

Discussion

For the majority of the 38 items there was no difference between the two modes of questionnaire administration. However, there were significant differences for some items, partially supporting H₁, *The distribution of responses differs between the web and paper questionnaires*. Differences noted included item means, increased skewness and kurtosis, greater variance and more extreme responses. Skewness is often stronger for the web sample, especially for ease of use items and privacy issues; kurtosis varies between the modes but there is no clear pattern and the variances are not significantly different except for a few market research, privacy and information items, (see appendix 2).

In the same areas there was also some support for H₂, *A relationship exists between mode and item responses*. Internet ease of use was, unsurprisingly, also related to all the Internet usage variables, so that the relationship observed may be a sample rather than a mode effect. Similarly, Internet confidence (self-rating as beginner, intermediate or expert) was significantly related to attitude to spam. However, although mode was related to some of the attitudes to market research and privacy, there was no interaction between these items and any of the Internet usage variables. This suggests that if this is a sample rather than a mode effect it is not simply a matter of Internet demographics.

In the regression analysis we were able to control for Internet usage, and this clarified the role of mode. Mode did not contribute to the variance except for five items relating to market research and the provision of information over the Internet, so that there is little support for H₃.

A detailed inspection of the items which have different response patterns suggests that web respondents have a fundamentally different attitude both to market research and privacy. They are more positive about the use of market research, they like helping by providing their opinions, and are less likely to see market research as an invasion of privacy. Due to their greater Internet experience they feel more comfortable about providing email addresses and credit card details over the Internet, however, they feel more strongly about Internet privacy issues.

In this research the response rate to the web survey was very low (4%). The response rates shown in Table 1 vary from 73% to 6%; Sheehan (2001) found that response rates were related to year and were declining, so that, in 2002 a rate of 4% may not be unusual. However, the self-selection of this

small percentage is likely to introduce bias. Dillman et al. (2001, p.18), state that "...any differences observed might be accounted for by the fact that people with different characteristics were more likely to respond to one mode as opposed to another mode". In that they choose to complete a web survey, web respondents can be expected to have different attitudes to market research. Their attitude to privacy is less clear. Web respondents have greater Internet experience and, as evidenced by their participation in the questionnaire, are perhaps more adventurous in their Internet use. Their web experience makes them both less cautious about giving their details and more vehement about web privacy issues. The privacy questions are also related to Internet use, web respondents have more Internet experience and are therefore likely to have formed stronger opinions in these areas. Possibly those who are willing to complete online surveys have stronger feelings which they wish to register - this could also explain the pattern of extreme answering and harder attitudes in the privacy questions. Alternatively, these findings could be explained by personality type; there is some evidence that introverts prefer web communication (Murtagh et al. 2002) while Birnie and Horvath (2002) found shyness directly correlated with Internet socializing intimacy.

The differences in responses seem to be a function of the sample rather than the mode. Contrary to the literature (Dillman et al. 2001; Miller 2001) we did not find greater variance in the web sample for most items; where there is greater variance it seems to be a function of the sample rather than a mode effect. There may also be an interaction between the constructs measured and the medium (Buchanan 1999), e.g. respondents' attitudes to market research may be affected by the mode of the market research they are experiencing while answering the question.

The findings of this research suggest that although, web surveys may elicit different responses, this is due to sample bias and not administration mode. What, at first sight, appears to be a mode effect is due to the self-selection of the web sample, producing a group of respondents with more Internet experience and different attitudes to market research and to the Internet.

The limitations of this research include the use of a convenience student sample, the limited range and type of questions tested, and minor differences between administration modes.

Conclusions

Although we have not found any evidence for web administration mode bias, the research indicates that effects of sample bias in web surveys may be more far reaching than anticipated.

It has been recognised (Churchill 1999; Chisnall 2001) that web samples

are biased, including only Internet users and biased towards those with more experience of the Internet, but web surveys may not be representative even of experienced Internet users. Web samples tend to have low response rates, and in many cases it is impossible to calculate these response rates because invitations to participate are placed on websites rather than emailed.

In this study we found that attitudes to privacy and market research were different, but the small percentage of self-selected respondents could be atypical in other ways. They may have more time, have un-metered Internet access, have greater Internet proficiency, be exploratory rather than goal-seeking users (Hoffman, 2000), be more proficient typists, be more helpful or more socially aware or just more vociferous. It is difficult, if not impossible, to predict the effect of a non-response rate such as 96%. Unfortunately, it is relatively easy and cheap to obtain large web samples, but the size of the sample should not distract from a low response rate. Frequently web recruited surveys are used to research attitudes to the Internet or attitudes to web sites. The self-selected minority who choose to answer these surveys are unlikely to be representative; their behaviour, as evidenced by their completion of the web survey, is atypical, and they are likely to be atypical in other important areas.

Fortunately, there are alternatives: web surveys can be conducted on properly recruited panels, or can be recruited using good quality email lists with significant rewards to ensure good response rates. These research methods are more expensive and more time consuming, but they will produce a more representative sample and therefore more reliable results.

References

- Bachmann, Duane, Elfrink, John and Vazzana, Gary (1996), "Tracing the Progress of E-Mail Vs. Snail-Mail", *Marketing Research: A Magazine of management and Applications*, Vol. 8, Issue 2, pp.30-35
- Bachmann, Duane, Elfrink, John and Vazzana, Gary (1999), "E-mail and snail mail face off in rematch", *Marketing Research*, Vol. 11, Issue 4, pp.11-15
- Batagelj, Zenel and Vehovar, Vasja (1999), "Technical and Methodological Issues in WWW Surveys", www.websm.org
- Baumgartner, Hans and Steenkamp, Jan-Bendict (2001), "Response Styles in Marketing Research: A Cross-national Investigation", *Journal of Marketing Research*, Chicago, Vol. 38, pp.143-156
- Bearden, William O. and Netemeyer, Richard J. (1999), *Handbook of Marketing Scales: Multi-Item Measures for Marketing and Consumer Behaviour Research*, 2nd ed., Sage
- Beasley, Ron and Chaplin, Ken (1998), "Paradoxes in Cyberspace: A Qualitative Perspective on Research through the Internet", Proceedings of

- the Worldwide Internet Seminar and Exhibition, Paris, ESOMAR
- Birnie, Sarah A. and Horvath, Peter (2002), "Psychological predictors of Internet social communication", *Journal of Computer Mediated Communication*, Vol. 7, No. 4
- Buchanan, Tom (1999), "Online Personality Assessment: Equivalence of Traditional and WWW Personality Measures", *German Online Research '99*, Nuremberg, Germany, http://www.dgof.de/tband99/pdfs/a_h/buchanan.pdf
- Carini, Robert M., Hayek, John C., Kuh, George D. and Ouimet, Judith A. (2001), "College Student Responses to Web and Paper Surveys: Does Mode Matter", *Association for Institutional Research Meeting*, Long Beach, CA, <http://www.indiana.edu/~nsse/html/research.shtml>
- Chisnall, Peter (2001), *Marketing Research*, London, McGraw-Hill
- Churchill, Gilbert A. (1999), *Marketing Research: Methodological Foundations*, 7th edition, The Dryden Press, Harcourt-Brace College Publishers
- Comley, Pete (2002), Online research will take off in the UK in 2003, *Research*, October 2002
- Comley, Pete (2000), "Pop-up Surveys: What works, what doesn't work and what will work in the future", *ESOMAR Net Effects Internet Conference*, Dublin, April 2000
- Couper, Mick P. (2000), "Web Surveys: A Review of Issues and Approaches", *Public Opinion Quarterly*, Vol. 64, pp.464-494
- Couper, Mick P., Traugott, Michael W. and Lamias, Mark J. (2001), "Web Survey Design and Administration", *Public Opinion Quarterly*, Vol. 65, pp.230-253
- Craig, C. Samuel and Douglas, Susan P. (2000), *International Marketing Research*, New York, John Wiley and Sons
- Curasi, Carolyn F. (2001), "A Critical Exploration of Face-to-Face Interviewing vs. Computer-Mediated Interviewing", *International Journal of Market Research*, Vol. 43 pp.361-375
- Cranor, Lorrie F., Reagle, Joseph, and Ackerman, Mark S. (1999), "Beyond Concern: Understanding Net Users' Attitudes about Online Privacy", *AT&T Labs-Research Technical Report*, <http://www.research.att.com/library/trs/TRs/99/99.4/>
- Dillman, Don A., Tortora, Robert D. and Bowker, Dennis (1998), "Principles for Constructing Web Surveys", *SESRC Technical Report 98-50*, Pullman, Washington, <http://survey.sesrc.wsu.edu/dillman/>
- Dillman, Don A. and Bowker, Dennis K. (2001), "The Web Questionnaire Challenge to Survey Methodologists", <http://survey.sesrc.wsu.edu/dillman/>
- Dillman, Don A., Phelps, G., Tortora, R., Swift, Karen, Kohrell, J. and Berck, J. (2001), "Response Rate and Measurement Differences in Mixed Mode

- Surveys Using Mail, Telephone, Interactive Voice Response and the Internet", <http://survey.sesrc.wsu.edu/dillman/papers.htm>
- Dommeyer, Curt J. and Moriarty, Eleanor (2000), "Comparing two forms of an e-mail survey: embedded vs. attached", *International Journal of Market Research*, Vol. **42**, No. 1, pp.39-50
- Evans, Martin, Gamini, Wedande, Ralston, Lisa and Van't Hul, Selma (2001), "Consumer Interaction in the Virtual Era: Some Qualitative Insights", *Qualitative Market Research: An International Journal*, Vol. **4**, No. 3, pp.150-159
- Fuchs, Marek, Couper, Mick P. and Hansen, Sue E. (2000), "Technology Effects: Do CAPI or PAPI Interviews Take Longer?", *Journal of Official Statistics*, Vol. **16**, pp.273-86
- Groves, Robert M. and Couper, Mick P. (1998), *Nonresponse in Household Interview Surveys*, New York, John Wiley and Sons
- Groves, Robert M. (1989), *Survey Errors and Survey Costs*, New York, John Wiley and Sons
- GVU (1998), "GVU's 10th WWW User Survey", http://www.gvu.gatech.edu/user_surveys/
- Hoffman, Donna L., Novak, Thomas P. and Yung, Yiu-Fai (2000), "Modeling the Structure of the Flow Experience among Web Users", Project 2000, Vanderbilt University
- Joinson, Adam N. (2001), "Self-disclosure in computer-mediated communication: The role of self-awareness and visual anonymity", *European Journal of Social Psychology*, Vol. **31**, pp.177-192
- Kalton, Graham, Kasprzyk, Daniel and McMillen, Marilyn M. (1989), "Nonsampling Errors in Panel Surveys", In: Kasprzyk, Daniel, Duncan, Greg, Kalton, Graham and Singh, M.P. (Eds.), *Panel Surveys*, New York, John Wiley and Sons, pp.249-270
- Keisler, Sara and Sproull, Lee (1986), "Reducing social context cues: Electronic mail in organisational communication", *Management Science*, Vol. **32**, pp.1492-1512
- Kittleson, Mark J. (1995), "An assessment of the Response Rate via the Postal Service and Email", *Health Values*, Vol. **18**, pp.27-29
- MacElroy, Bill, Micucki, Jennifer and McDowell, Patty (2002), "A Comparison of Quality in Open-end Responses and Response Rates Between Web-based and Paper and Pencil Survey Modes", *www.ijor.org, IMRO Journal of Online Research*
- Mehta, Raj and Sivadas, Eugene (1995), "Direct Marketing on the Internet: An Empirical Assessment of Consumer Attitudes", *Journal of Direct Marketing*, Vol. **9**, No.3, pp.21 -31
- Miller, Thomas W. (2001), "Can We Trust Data of Online Research?", *Marketing Research*, Chicago, Vol. **13**, pp.26-32

- Murtagh, John, Lomax, Wendy, Rettie, Ruth and Mador, Martha (2002), "Personality and Internet Usage: Too Shy to Surf?", *European Academy of Marketing*, Braga 2002
- Opperman, Martin (1995), "E-Mail Surveys: Potentials and Pitfalls", *Marketing Research*, Vol. 7, pp.29-33
- Parker, Lorraine (1992), "Collecting Data the E-Mail Way", *Training and Development*, July 1992, pp.52-54
- Redline, Cleo D. and Dillman, Don A. (1999), "The Influence of Auxiliary, Symbolic, Numeric, and Verbal Languages on Navigational Compliance in Self-Administered Questionnaires", <http://survey.sesrc.wsu.edu/dillman/>
- Rosen, Richard J., Manning, Christopher D. and Harrell, Louis J. (1999), "Controlling Nonresponse in the Current Employment Statistics Survey", *International Conference on Survey Nonresponse*, Portland, OR
- Schaefer, David R. and Dillman, Don A. (1998), "Development of a Standard E-mail Methodology: Results of an Experiment", *Public Opinion Quarterly*, Vol. 62, pp.378-397
- Schuldt, Barbara A and Totten, Jeff W. (1994), "Electronic Mail versus Mail Survey Response Rates", *Marketing Research*, Vol. 6, pp.36-39
- Sheehan, Kim (2001), "E-mail Survey Response Rates", *A Review Journal of Computer Mediated*, Vol. 6, No.2, January 2001, <http://www.ascusc.org/jcmc/vol6/issue2/sheehan.html>
- Sproull, Lee (1986), "Using electronic mail for data collection in organizational research", *Academy of Management Journal*, Vol. 29, No.1, pp.156-169
- Sproull, Lee and Kiesler, Sara (1991), *Connections, New Ways of Working in the Networked Organization*, MIT Press
- Sudman, Seymour, Bradburn, Norman M. and Schwarz, Norbert (1996), *Thinking about Answers: The Application of Cognitive Processes to Survey Methodology*, San Francisco, Jossey-Bass
- Taylor, Humphrey (2000), "Does Internet Research Work? Comparing Online Survey Results with Telephone Survey", *International Journal of Market Research*, Vol. 42, pp.51-63
- Tedesco, Heather, Zuckerberg, Andrew, L. and Nichols, Elizabeth (1999), "Designing Surveys for the Next Millennium: Web-Based Questionnaire Design Issues", *Proceedings of the Third ASC International Conference*, Edinburgh, September, pp.103-12
- Tse, Alan C.B., Ka Chun Tse, Chow Hoi Yin, Choy Boon Ting, Ko Wai Yi, Kwan Pui Yee and Wing Chi Hong (1995), "Comparing two methods of sending out questionnaires: E-Mail versus mail", *Journal of the Market Research Society*, Vol. 37, pp.441-446
- Tse, Alan C.B. (1998), "Comparing the response rate, response speed and

- response quality of two methods of sending questionnaires: E-mail vs. mail", *Journal of the Market Research Society*, Vol. **40**, No.4, pp.353-361
- Weible, Rick and Wallace, John (1998), "The impact of the Internet on data collection", *Marketing Research*, Vol. **10**, No.3, pp.19-23
- Wright, Debra L., Aquilino, William S. and Supple, Andrew J. (1998), "A Comparison of Computer-Assisted and Paper-and-Pencil Self-Administered Questionnaires in a Survey on Smoking, Alcohol, and Drug Use", *Public Opinion Quarterly*, Vol. **62**, pp.331-353

About the Authors

Short author bio for here please

Appendix 1

Principal Component Analysis of Construct Validity

Initially analyses were run separately for each mode and for the modes combined but they produced similar results so we report the combined modes.

Convergent Validity

Scales	% Variance explained
1. Flow experience on the web	65
2. General attitude to market research	62
3. Comfort with providing information	63

Bartlett's statistic significant at $p < 0.001$

KMO measures ranging from 0.713 to 0.804

Reliability

Item-to-total correlations: 0.32 to 0.79

Cronbach's coefficients: 0.58 to 0.87

Appendix 2

Scales	Mode		Means		Std Skewness		Std Kurtosis		L's	Means
	W	P	W	P	W	P	W	P	Test ₁	Test ₂
	W	P	W	P	W	P	W	P	W	P
Internet Experience										
Ease of use										
Enjoy using the web	7	6	5.95	5.51	-8.85	-6.05	8.79	3.14	0.23	0.02**
Feel comfortable	7	6	5.97	5.58	-8.61	-7.12	7.53	4.52	0.74	0.05*
Find web easy to use	7	6	5.83	5.40	-6.51	-5.51	4.13	1.72	0.12	0.03**
Very skillful	7	6	5.55	4.95	-5.19	-3.71	1.85	-0.32	0.92	0.00**
In complete control	7	6	4.81	4.71	-2.19	-2.98	-1.30	-1.05	0.50	0.65
Totally absorbed	5	6	4.32	4.55	-0.42	-1.45	-1.66	-1.19	0.63	0.25
Focused attention										
Think about other things †	3	2	3.39	3.42	2.54	2.39	-1.50	-1.45	0.77	0.91
Don't like being distracted	4	4	3.95	4.20	-0.17	-0.71	-1.90	-2.04	0.64	0.27
Fully concentrate	5	6	4.14	4.40	-0.72	-0.96	-1.44	-1.89	0.91	0.20
Telepresence										
Like in virtual reality	1	1	2.72	2.89	3.02	3.07	-1.66	-0.90	0.61	0.42
More in the computer world than real	1	1	3.27	3.15	1.35	2.05	-2.22	-2.64	0.34	0.63
Exploratory behaviour										
Click on link out of curiosity	3	5	3.83	3.64	-0.30	0.43	-2.37	-2.85	0.30	0.45
Like to experiment	6	6	4.57	4.35	-1.80	-1.76	-2.33	-2.22	0.59	0.36
Rarely visit unknown sites†	7	6	4.47	4.02	-1.46	-0.14	-2.79	-3.01	0.52	0.09*
Attitudes towards Market Research										
Role of Market Research										
MR give opportunity to feedback	4	4	3.98	3.77	-5.00	-3.46	5.95	1.76	0.01**	0.04* ₂
Invasion of privacy †	4	4	3.63	3.18	-1.04	-1.63	-1.07	-0.91	0.24	0.00**
Helps produce better products	4	4	3.89	3.58	-4.02	-2.01	2.27	0.48	0.47	0.00**
MR is biased	3	3	2.79	2.86	-0.25	-0.37	0.05	-1.00	0.49	0.52

₁ Levene's Test † reverse scaled ₂ Unequal variances * sig < 0.05 ** sig < 0.01

cont...\

Scales	Mode		Means		Std Skewness		Std Kurtosis		L's	Means
	W	P	W	P	W	P	W	P	Test ₁ Sig	Test ₂ Sig
Attitudes towards Market Research										
Confidentiality										
Surveys are consumers' interest	3	3	3.10	3.17	-0.92	-2.09	-1.19	-0.33	0.74	0.59
Confidentiality maintained	3	3	2.85	2.68	-0.41	-0.74	-1.28	0.02	0.13	0.13
Privacy rights are protected	3	3	2.68	2.62	0.40	-0.54	-0.70	0.69	0.01*	0.56 ₂
Survey experience										
Surveys interesting	4	3	3.00	2.83	-0.51	-0.07	-2.33	-1.60	0.10	0.20
Like providing opinion	4	4	3.48	3.14	-3.13	-1.79	-0.62	-1.76	0.36	0.01*
Most MR is annoying †	2	2	2.83	2.80	-0.16	0.01	-2.16	-2.27	0.50	0.81
Information over the Internet										
Personal information										
Full name	3	3	3.08	3.28	-0.72	-0.96	-2.21	-1.92	0.82	0.21
Postal address	2	3	2.42	2.66	2.22	0.86	-1.67	-1.60	0.24	0.11
Email address	4	2	3.28	2.83	-2.43	0.58	-1.44	-2.30	0.68	0.00**
Phone number	1	2	1.98	2.00	4.20	4.32	-0.13	1.27	0.03	0.85
Computer hardware or software	4	4	3.35	3.24	-2.67	-1.42	-1.39	-1.38	0.26	0.48
Credit/debit card no	1	1	1.84	1.60	4.57	6.82	0.08	5.45		0.05 ₂ 0.00**
Consumer information										
Age	5	4	4.04	3.88	-5.30	-4.67	2.35	1.96	0.78	0.23
Favourite snack	5	5	4.26	4.30	-7.47	-6.13	6.30	3.06	0.95	0.73
Sensitive information										
Health medical	1	3	2.48	2.60	1.43	1.17	-2.58	-2.04	0.23	0.48
Annual income	1	2	2.44	2.28	1.94	3.06	-2.22	-0.24		0.30 ₂ 0.00**
Privacy Issues										
Receiving spam	10	7,9,10	6.67	7.06	-1.79	-4.14	-2.09	0.19	0.05*	0.26 ₂
Illegal email lists	10	9	7.72	7.44	-5.09	1.20	0.79	0.50	0.05*	0.37 ₂
Reselling site info	10	9,10	7.88	7.76	-5.06	0.98	0.50	0.50		0.68 ₂ 0.01**
Tracking site visits	10	10	8.46	7.68	-7.74	1.10	5.28	0.50	0.15	0.01*

₁ Levene's Test † reverse scaled ₂ Unequal variances * sig < 0.05 ** sig < 0.01

Appendix 3

Area	Scale anchors
Internet experience	1- Strongly disagree 7- Strongly agree
Market Research	1- Strongly disagree 5- Strongly agree
Information over the Internet	1- Never feels comfortable 5- Always feels comfortable
Privacy issues and Spam	1- Not serious at all 10-Extremely serious
