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Characteristics Associated with Increasing the Response Rates of Web-Based Surveys

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Having a respectable response rate is critical to generalize the results for any survey, and web surveys present their own unique set of issues. This research identified web deployment and questionnaire characteristics that were significantly associated with increasing the response rate to web-based surveys based on a systematic evaluation of ninety-nine web-based surveys. Thirteen web deployment characteristics and nine web-based questionnaire survey characteristics were subjected to correlation and regression analysis with response rate. The resultant findings prompted recommendations: [1] Increasing the total days a questionnaire is left open, with two reminders, may significantly increase response rates. It may be wise to launch in one week, remind in the next week, and then send the final reminder in the third week; [2] Potential respondents must be convinced of the potential benefit of accessing the questionnaire; and [3] Do not be overly concerned about the length or detail of the questionnaire - getting people to the web site of the questionnaire is more important to increasing response rates

One of the major sources of error in any survey is non-response. The higher the response rate, the better the survey. Non-response errors are the result of not all potential respondents completing the survey, and therefore creating non-response bias. Crawford et al (2001) believed that non-response represents the main challenge for web-based surveys.

There are several purported reasons why respondents fail to complete a web-based survey. These include open-ended questions, questions arranged in tables, fancy or graphically complex design, pull-down menus, unclear instructions, and the absence of navigation aids (Bosnjak and Tuten, 2001). Some factors that have been found to increase response rates include: personalized email cover letters, follow-up reminders, pre-notification of the intent to survey and simpler formats (Solomon, 2001 and Cook, 2000).

One reference suggested a number of practical methods have emerged to enhance the likelihood that college students will respond to a web survey based on the author's use of web surveys to complete original research, and to conduct program

evaluation and assessment, (Molasso, 2005). Yet, there was no empirical evidence provided to support those suggestions.

Perhaps lower response rates in web-based surveys are due to our lack of knowledge of how to increase response rate in this new type of data collection (Solomon, 2001). There is an abundance of other variables that need exploration in web-based surveys.

Most other research on factors that may influence the response rate for web-based surveys has focused on manipulating either deployment or questionnaire variables in single survey situations. That is, in a given survey deployment, potential respondents are assigned to the various treatment groups. For example: [1] Mail/ web; age; gender; internet usage (Kwak & Radler, 2002); [2] Degree of personalization, survey length statements, use of progress indicators, and display of survey sponsor logos (Heerwegh & Loosveldt, 2006); [3] Expected time burden, overall survey appearance, and official sponsorship (Walston, Lissitz, & Rudner, 2006)

This study sought to review the response rates over 33 months of a variety of different surveys. The Ohio State University Extension Program Development and Evaluation

Unit deployed web-based surveys since 2001 through commercial programs. From January 2004 and through September 2006 ninety-nine web-based surveys were launched to a variety of audiences associated with Extension. These audiences were local, multi-county, statewide, and nation-wide. The potential number of respondents ranged from 32 to 3494. The average response rate for the ninety-nine surveys was 48.3%. There were 29 surveys launched and included in this study in calendar year 2004, 39 surveys launched in 2005, and in the first nine months of 2006, 31 surveys were launched.

All of these web-based surveys included an individual email invitation to potential respondents. They were left open anywhere from 7 days through 26 days. In addition, reminders were sent to non-respondents in the all but two of these surveys, most (83 of 99) receiving two reminders, but six surveys included one reminder, while three or more reminders were sent in eight surveys. The total number of questions ranged from one question to 98 questions.

METHOD

Questionnaire Characteristics Studied

A variety of web deployment characteristics and questionnaire characteristics were identified as potentially having a relationship with the response rate. The complete list of variables follows:

Dependent Variable:

[X] Response rate - total completed questionnaires divided by total email originally invitations deployed

Independent Variables - Deployment Characteristics:

- [1] Total number of potential respondents (email invitations deployed)
- [2] Number of email addresses bounced
- [3] Number of people opting out
- [4] Year launched
- [5] Month launched
- [6] Date of month launched
- [7] Number of reminders
- [8] Number of days left open (e.g. if launched on the 11th of the month and closed on the 25th, it was open for 14 days)
- [9] Days between launch and reminder (e.g. if launched on the 5th and the first reminder sent on the 12th, this would be 7 days between launch and reminder)
- [10] Days between reminders (e.g. if first reminder was sent on the 18th and the second reminder was sent on the 22nd, it would be 4 days between reminders; If more

than two reminders were sent, only the days between first and second reminder were scored)

- [11] Length of subject line (# of letters)
- [12] Length of invitation (# of words)
- [13] Readability Level of Invitation – Used the Flesch-Kincaid Grade Level score (Rates text on a U.S. grade-school level; For example, a score of 8.0 meant that an eighth grader can understand the document. The formula for the Flesch-Kincaid Grade Level score is:

$$(.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59$$

where: ASL = average sentence length [the number of words divided by the number of sentences) and ASW = average number of syllables per word (the number of syllables divided by the number of words)] (Morris, 2007)

Independent Variables - Questionnaire Characteristics:

- [14] Total number of questions (if a question asked the respondent to rate five items on a rating scale matrix, this was counted as five questions)
- [15] Number of fixed response questions (rating scales; pick lists – one response; all that apply)
- [16] Number of open-ended response questions
- [17] Number of one line open-ended questions
- [18] Number of Y/ N questions
- [19] Number of demographic questions
- [20] Number of headings (a heading was any text in the questionnaire that gave instructions or introduced a section)
- [21] Length of rating scales in rating questions; (number of points on scale; if more than one length of scale was contained in a questionnaire, the longest scale was recorded)
- [22] Readability Level of Survey (Flesch-Kincaid Grade Level score – see explanation above in #13)

Clarification of Two Deployment Characteristics

Most of the deployment and questionnaire characteristics were obvious, e.g. the number of days left open or number of questions in questionnaire. However, two deployment characteristics need further explanation: Number of email addresses bounced; and Number of people opting out.

One of the most time consuming components of conducting web-based surveys to email lists of potential respondents is obtaining a “clean” list of email addresses. It was assumed that a higher number of email addresses that “bounced” (were not deliverable), indicated a lower quality

initial email list. “Bounced” email addresses, calculated as a percentage of those deployed, is also called “failure rate” in the literature. Failure rate shows the quality of the sampling frame (Manfreda and Vehovar (2003, p.11).

The Opt-Out statement in this web-based survey program is stated on every email invitation and reminder:

“OPT OUT | If you do not wish to receive further surveys from this sender, click the link below. Zoomerang will permanently remove you from this sender's mailing list.”

OPT-OUT process in Zoomerang Support:

If the recipient selects the “I do not want to receive any more surveys and emails from this sender link”, the recipient will see the following confirmation message: ‘If you do not wish to receive further surveys from this sender, click OK below.’ Zoomerang will permanently remove you from this sender’s mailing list. Are you sure that you want to permanently opt out from this sender’s mailing list?’ The survey recipient will have the option to click ‘OK’ or ‘Cancel.’ If the survey recipient clicks ‘OK,’ the Zoomerang account holder will no longer be able to send emails to this recipient’s address, including reminders.

It was assumed that a potential respondent would select this OPT-OUT option only if s/he felt that completing the questionnaire was a waste of effort. This would be an indication that the email was not inviting enough or that the survey was inappropriate for that respondent.

Data Collection and Manipulation

Data on all characteristics of interest in this study were archived in the web survey program database. An Excel spreadsheet was developed for data entry, and the data were extracted for each survey and placed in the appropriate cells in the spreadsheet. There were no missing data, as values of all the variables of interest were available. Some of the values

were not applicable, as in the case when no reminders were sent or when there were not rating scales in a questionnaire, and therefore, no data was entered for the number of points in the rating scale.

The Flesch-Kincaid Grade Level (Morris, 2007) scores were calculated by copying the text of the invitations and the questionnaires into Word, and then using the Spelling and Grammar function to calculate the reading grade level for each.

The data were imported into SPSS. Each independent variable was reviewed individually through the use of scatter plots against the dependent variable to determine if there appeared to be a non-linear relationship. Two independent variables were found to have a non-linear relationship with the dependent variable: [1] Number of potential email respondents, and [2] Number of reminders sent. Transformation to a linear relationship was achieved by using the natural logarithm of Number of potential email respondents and the square root of the Number of reminders sent. The square root was used for the latter variable since it takes a value of zero for some surveys in the database. These two transformed variables were used in subsequent data analysis along with the raw data of the remaining variables.

FINDINGS

Descriptive Statistics:

Table 1 illustrates the descriptive statistics for the response rate and of the deployment and questionnaire characteristics for six of the independent variables in the dataset. The six deployment and questionnaire characteristics with a significant correlation ($p < .05$) with response rate are included. Table 2 is the correlation and the related significance levels of the deployment and questionnaire characteristics with response rate of these same six variables.

Table 1. Descriptive Statistics of Selected Variables

Variable	N	Mean	Standard Deviation
Response Rate - i.e. Total Complete versus Total Email Invitation	99	48.313	18.784
Log of Number of Potential Respondents	99	5.053	1.189
Number Opting Out	99	1.475	3.339
Days left open	99	14.04	4.401
Days between launch & reminder	97	6.33	1.824
Days between reminders	91	4.527	2.243
Number of open ended questions	99	3.697	3.262

Table 2. Variables with significant correlations

	Response Rate	Log of Number of Potential Respondents	Number Opting Out	Days left open	Days between launch & reminder	Days between reminders
Log of Number of Potential Respondents						
Pearson Correlation	-.599*					
N	99					
Number Opting Out						
Pearson Correlation	-.360*	.564*				
N	.99	.99				
Days left open						
Pearson Correlation	.253*	-.030	-.040			
N	99	99	99			
Days between launch & reminder						
Pearson Correlation	.201*	-.089	-.122	.496*		
N	99	97	97	97		
Days between reminders						
Pearson Correlation	.262*	-.067	-.131	.710*	.096	
N	91	91	91	91	91	
Number of open ended questions						
Pearson Correlation	.210*	-.145	-.108	.181	.064	.016
N	99	99	99	99	97	91

* p<.05

From Table 2, the statistically significant correlations at the $p < .05$ level indicated:

- The larger the log of the number of potential respondents, the lower the response rate.
- The larger the number of people opting out of the web survey method of collecting data, the lower the response rate.
- As the number of days survey was left open increased, the higher the response rate.
- As the number of days between launch and first reminder increased, the higher the response rate.
- As the days between the second and third contacts (first and second reminders) increased in number, the response rate increased.
- As the number of open-ended questions increased, the higher the response rate.

Several *deployment variables* had relatively high correlations, but, given the sample size, were not significantly different from zero and not shown in the tables. Year launched was positively correlated with response rate. Number of email addresses bounced and the readability level of the invitation were negatively correlated with response rate.

The non-significant *questionnaire characteristics* with relatively high positive correlates with response rate were number of one line open ended questions and Length of rating scales. Readability of questionnaire had a large negative non-significant correlation.

The *Deployment characteristics* that had little correlation with response rate were Month launched, Date of month launched, Number of reminders (see discussion below), Length of subject line of invitation, and Length of the invitation

Questionnaire characteristics that had little correlation with response rate were Number of fixed response questions, Number of Y/N questions, Number of demographic questions, Number of headings, and Total number of questions.

Regression:

Regression analysis was conducted to build a model to best explain response rate. The six independent variables that were significantly correlated with response rate were first considered for inclusion in the model. Table 3 is the result of placing all six variables into the regression analysis using listwise deletion..

Table 3. Regression Results

<i>Predictor:</i>	<i>B</i>	<i>SE(B)</i>	<i>Standardized Coefficients Beta</i>	<i>Semi-Partial r</i>	<i>p-value</i>
Constant	75.264	10.699			.001
Log of Number of Potential Respondents	-9.060	1.560	-.581	-.535	.001
Number Opting Out	.059	.553	.011	.012	.915
Days left open	.199	.639	.041	.034	.756
Days between launch & reminder	1.250	1.062	.112	.127	.243
Days between reminders	1.540	1.038	.184	.160	.142
Number of open ended	.379	.535	.059	.077	.480

Model Summary: R = .654

In an effort to develop a simpler solution, the Pratt index (Thomas & Zumbo, 1996) was calculated for each of the six variables included in the original model. The Pratt index is a measure of the relative importance of explanatory variables in multiple regression. It is the product of the bivariate correlation and the beta weight divided by the R²,

$$\text{Pratt Index} = (r * \text{Beta}) / R^2.$$

Table 4 is the result of applying the Pratt index to the six variable solution.

Table 4: Proportion of variance accounted for by each variable

<i>Variable</i>	<i>Pratt Index</i>
Log of Number of Potential Respondents	.8130
Number Opting Out	-.0090
Days left open	.0242
Days between launch & reminder	.0526
Days between reminders	.1126
Number of open ended questions	.0289

A review of the Pratt Indices in Table 4 indicates that a simpler solution could possibly be created using the most important variable, “Log of Number of Potential Respondents”, with

one other variable. Therefore, regression was performed using the variable, “Log of Number of Potential Respondents”, with each of the remaining five variables. Table 5 illustrates the R² values generated when each of the two-predictor equations were analyzed in SPSS regression routines.

Table 5. R² Results of Two-Predictor Equations with Response Rate as the criterion

<i>Two Way Predictors of Response Rate</i>	<i>R²</i>
1. Log of Number of Potential Respondents and Days left open	.414
2. Log of Number of Potential Respondents and Days between reminders	.409
3. Log of Number of Potential Respondents and Days between launch and reminder	.389
4. Log of Number of Potential Respondents and Number of open ended	.374
5. Log of Number of Potential Respondents and Number opting out	.359

When a regression was performed on the two variables, (1) Log of the Number of Potential Respondents, and (2)

Number of Days Left Open, the highest R² was generated. The coefficients for this model is shown in Table 6. These two

variables explain 41.4% of the variability in the response rate observed in this study.

Table 6. Model Coefficients				
<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>t</i>	<i>p</i>
	<i>B</i>	<i>Std. Error</i>		
(Constant)	81.453	8.051	10.117	.001
Log Number of Potential Respondents	-9.346	1.235	-7.565	.001
Days Left Open	1.004	.344	3.007	.003

In order to determine whether this model is appropriate for the data, the residuals were examined. A residual is the result of subtracting the predicted value from the observed value. In SPSS residual exploration was accomplished in two ways: creating a histogram of the residuals, which should produce a normal distribution; and creating a normal quartile

plot of residuals, which should produce a straight line. Figures 1 and 2 indicate that the distribution of residuals is approximately normal when the model in Table 5 was examined. Since no outliers or non-normality were observed in the residuals, it was concluded that the linear model developed is appropriate.

Figure 1. Distribution of Residuals

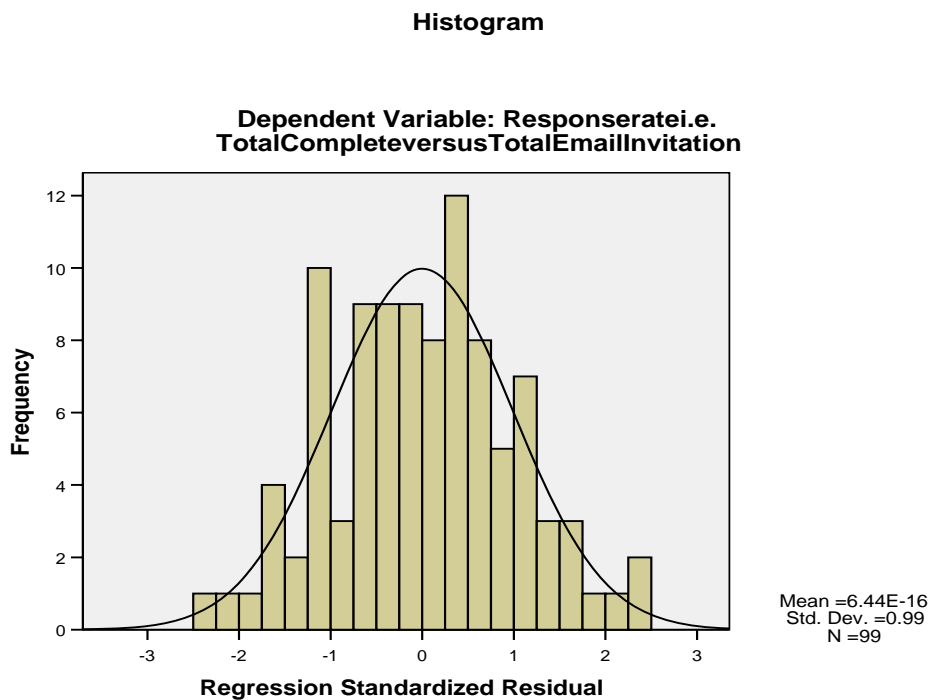
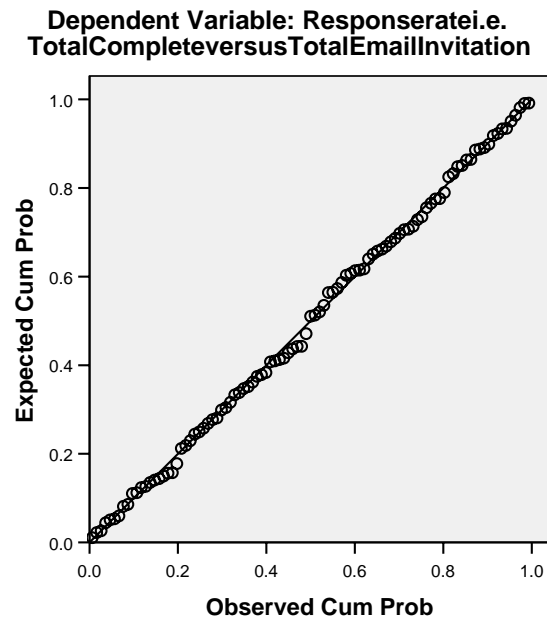


Figure 2. Plot of Residuals**Normal P-P Plot of Regression Standardized Residual****DISCUSSION**

In the ninety-nine web-based surveys included in this study, deployment characteristics were more critical to gaining a higher response rate than characteristics of the actual questionnaire. Manfreda and Vehovar (2003, p.9) had a similar finding in that almost all of the potential respondents who accessed the first page of a web-based questionnaire either completed or partially completed.

Once a potential, email-invited respondent actually accessed the web-based questionnaire, most of the characteristics of the questionnaire itself had little or no relationship with the response rate. The lack of a high relationship between response rate and number of questions on the questionnaire found in this study is contrary to “popular belief”, but similar to that statement made about the upper limits of 12 pages and 125 questions in traditional mail surveys, “... increasing length of these items does not have an adverse effect on response rates. It further suggests that the maxim of ‘the shorter the better’ may represent and over simplification or even a myth.” (Dillman 1978, p. 55). This “popular belief” was reinforced when Manfreda and Vehovar (2003, p.14) asked researchers who had deployed web-based surveys why their respondents abandoned questionnaires prematurely. Those professional researchers stressed the

length of the questionnaire as the largest problem, but were not asked to provide empirical data to support their claims.

One suspect result of this study was that as the number of open-ended questions increased, the response rate increased. This may relate to the changing mode of operation for most people who now find it more comfortable to email, text message, or participate in text-based, internet “chats” as opposed to handwriting narrative script. Kwak (2002) found that the web survey in that study had longer open-ended responses than a mail survey. However, Manfreda and Vehovar (2003, p.15) found that the higher the share of open-ended questions, the higher the drop-out rate. Drop out rates were calculated based on those who actually accessed the questionnaire. Web-based surveys may be better for higher quality narrative responses, but perhaps should be limited in total percentage of the questionnaire.

Another suspect observation in this study is that the number of reminders had little or no relationship with the response rate. Eighty-three of the 99 surveys in this study were deployed with the invitation and two reminders, which was used by this author as the standard operation procedure in survey deployment. The limited variability on this factor may have led to lower correlations. A related study by this author (Archer 2005, p. 10) randomly divided 552 potential

respondents of one survey into four groups, with groups receiving one, two, three, and four contacts over an eleven-day survey period. The conclusions drawn from the results of that study were: [1] Reminders increased the response rate of this web based survey. Reminders increased response rate in every group, every time, up through four contacts; [2] The optimum number of reminders in an eleven day web-based survey for this study was two, which is three total contacts, including the initial invitation; and [3] Reminders sent on day seven of the eleven day survey produced the largest increase in responses over the next two days.

CONCLUSIONS/ RECOMMENDATIONS

Increasing the total days a questionnaire is left open, with two reminders, may significantly increase response rates. It may be wise to launch in one week, remind in the next week, and then send the final reminder in the third week.

Invitations should be well written, at a lower grade level readability. Potential respondents must be convinced of the potential benefit of accessing the questionnaire.

Even though developing and presenting good questions for the questionnaire is important, do not be overly concerned about the length of the questionnaire or the format of the questions. Getting people to the web site of the questionnaire is more important relative to response rates.

Web surveys may be better for narrative responses. If narrative data is the goal for the data collection effort, more information may be obtained if the questionnaire is completed via the web.

Web based surveys are becoming more popular within the Extension organization and the response rate has continued to edge upwards over the last three years. This would indicate that a good method of obtaining data from within an organization is getting even better.

Other factors which may influence response rates that should be further investigated include: (a) Influence of incentives; (b) Effects of pre-notice or pre-recruitment; (c) Time of day of deployments and reminders; (d) Category topic of questionnaire; (e) Type of target population; (f) Effect of percentage of questions that require narrative response.

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