Is the Applicability of Web-Based Surveys for Academic Research limited to the Field of Information Technology?

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Abstract

Currently, the Internet provides researchers with the opportunity to conduct online surveys in a more efficient and effective way than was previously allowed by traditional means. While the popularity of online data collection methodology has increased, only a limited number of studies have been done related to the topic of using Web-Based Surveys specifically for academic research. The purpose of this research project-in-progress is twofold. The first objective is to explore potential differences in attitudes toward using Web-Based Surveys as a tool for academic research among Information Technology versus non-Information Technology researchers. The second goal is to investigate the relationship between participants' degree of computer literacy and their acceptance of and trust in Web-Based Surveys.

1. Introduction

One of the most common techniques for collecting primary data is survey research. For years, traditional "paper-and-pencil" surveys have been used to collect primary data in different fields, such as Business, Sociology, Psychology, Political Science, Education, and Information Technology (IT). However, this traditional format has always had the disadvantage of a limited number of potential respondents, and a slower distribution and return time [1]. To compensate for this serious inherent disadvantage of traditional "paper-and-pencil" format, researchers have always tried to apply emerging technologies to data collection. Phone, fax, and then e-mail surveys were consecutive additions to the pool of survey methodologies. Today, the Web provides another opportunity to compensate for the deficiency of slower distribution and return time.

Despite the fact that the popularity of Web-based data collection methodology has increased, only a limited number of systematic studies have been done on the methodology itself [2]. In other words, it appears that the increasing popularity of Web-Based Surveys specifically for academic research has caught survey specialists widely unprepared [3].

This paper presents the preliminary findings of a research project-in-progress, which takes on the topic of Web-based data collection methodology specifically for academic research. The results of a Web-Based Survey, which assessed researchers' perceptions about the validity of using Web-Based Surveys for academic research, are discussed. The objective of the presented data analysis was to investigate if researchers in the field of IT share the same attitude toward Web-Based Surveys with researchers from fields other than IT. In addition, the analysis investigated whether or not Web-Based Surveys find more acceptance and support in researchers and respondents who have a considerable level of computer literacy as compared to those with rather limited computer skills.

2. Literature Review

In the existing literature on the topic of Web-Based Surveys, many authors devote a great deal of their attention to discussing advantages and disadvantages of this methodology as compared to the traditional "paper-and-pencil" format. Those authors appear to agree on a particular set of advantages of Web-based data collection methodology compared to the traditional "paper-and-pencil" surveys: time efficiency, cost benefits, quality of

responses, and access to a large population in different geographic areas.

Time Efficiency

On average, the response time for Web-Based Surveys is much shorter than traditional means of data collection [4] [5] [2] [6]. It has, for example, been noted that by the time the postal service had finished delivering a mail survey, a large number of submissions had already been received through the Internet [7]. Additionally, the digital format of the responses eliminates the time associated with the data entry [6].

Cost Benefits

The software programming costs, site maintenance costs, and other costs associated with Web surveys are estimated to be lower than those incurred through traditional "paper-and-pencil" surveys [4] [5] [2] [6]. According to some authors, Web-Based Surveys can result in estimated cost reduction of as much as one-third [5].

Quality of Responses and Human-Error Reduction

Comparative studies show that the responses to Web-Based Surveys, show fewer missing entries [8] and fewer completion mistakes [9] than their traditional "paper-and-pencil" counterparts. In addition, because the data is already in digital format, the possibility of human-error during data entry is eliminated [6] [2] [4].

Access to Larger Populations in Different Geographic Areas

Web-Based Surveys have the potential to reach a high number of participants in the most remote geographic areas [4] [5] [2] .

Despite the strong advantages of Web-Based Survey methodology as compared to the traditional "paper-and-pencil" format, many authors feel that this methodology has some substantial disadvantages. In their opinion, the most significant disadvantages include a relatively short history, r*epresentativeness* and self-selection bias.

Lack of Established History

Unlike traditional "paper-and-pencil" surveys that have been in existence for a long time, Web-Based Surveys are a relatively new addition to the primary data collection methodology. For this reason, they do not have an equally established history of research [6]. In addition, the absence of extensively tested validation procedure demands from researchers higher justification skills for interpretation of on-line collected data [10].

Representativeness and Biased Responses

Even though Web-Based Surveys could reach more people than mail surveys, the respondents are primarily self-selected and that might result in a sample that would not necessarily represent the targeted population [5] [2]. This represents a challenge for traditional sampling techniques [11]. Also, it is not to be assumed that all potential respondents have reliable access to a computer and to the Web [12] [2] [6]. In addition, participants, for many reasons, could submit their responses many times, and that would affect the results of the survey unless there is a means of filtering problematic submissions [4] [5] [2].

In addition to a set of advantages and problems on which most authors appear to agree, there are a number of issues on which a wide consensus does not exist. One such problematic issue is limitation of Web-Based data collection methodology. For example, some studies recommend that researchers should consider Web-Based Surveys, preferably if the survey population is centered around IT professionals [6]. On the other hand, the applicability of Web-Based Surveys for academic research outside IT, and other technical fields, is believed to be rather limited. This claim could be attributed to the common assumption that the respondents from technical fields have traditionally had access to the Web as well as high-level computer skills and experience, and therefore a positive attitude toward computer use.

This claim served as the basis for establishing two research hypotheses:

Hypothesis 1: Researchers in the field of IT tend to prefer Web-Based Surveys as a research tool, while researchers from fields other than IT tend to prefer the traditional "paper-and-pencil" format.

Hypothesis 2: A relationship exists between participants' degree of computer literacy and their acceptance of and trust in Web-Based Surveys.

3. Methodology

To test the above hypotheses, a Web-Based Survey was used as the main research tool to collect the necessary data. The questionnaire (presented in the Appendix) contained four major sections and a text box allowing open-ended feedback. The first section contained mainly demographic questions, such as field, professional affiliation, and academic rank. In addition, this section included a question about recruitment method. The second section included questions about computer skills and Internet usage, while the third section (not discussed in detail in this paper) contained questions about the participants' previous survey experience. In section four, which consisted of nine statements to which participants were asked to respond, we applied a standard procedure for the measurement of attitudes with a five grade Likert scale [13]. The possible response options were *strongly agree*, *agree*, *neutral*, *disagree,* and *strongly disagree*.

The nine statements were selected with the goal of assessing participants' attitudes toward Web-Based Surveys as compared to the traditional "paper-and-pencil" format.

Therefore, during the process of formulating those nine statements, we attempted to include the best-known benefits and most problematic issues, based on our literature search. Statement 1 (about the quality of Web-Based Surveys) was based on different observations stating that electronically collected data is of higher quality, having fewer completion mistakes and omitted values, than data collected using paper-and-pencil surveys. Statement 2 (about the advantages of Web-Based Surveys) derives from the experiences of various researches who conducted their own Web-Based Surveys. Those advantages were already discussed in greater detail in the literature review section. Statement 3 (about a replacement of "paper-and-pencil" format by Web-Based Surveys) was derived from the fact that the increasing use of electronic surveys is leading some researchers to believe that Web-Based Surveys will ultimately replace traditional methods of data collection [14]. Statement 4 (which touched on the appropriateness of usage of Web-Based Surveys to collect data about sensitive topics) was based on the assumption that the answers to sensitive questions are more frank and complete with the help of electronic surveys. In addition, it has been mentioned that Web-Based Surveys offer the means to reach some groups which are usually very difficult to reach because of the sensitive nature of the research topic [15]. Statement 5 (about the limitation of Web-Based Surveys) was mainly derived from the statement that Web-Based Surveys are extremely useful in the field of IT, but are not necessarily appropriate for all other researchers [6]. Statement 6 (which touches on the usefulness of Web-Based Surveys for serious academic research) was based on the speculation that the Internet is on its way to becoming an alternative source of academic research [16]. Statement 7 (about the efficiency of Web-Based Surveys) was based on the various findings about the efficiencies that Web-Based Surveys offer to the researchers, which were already discussed in a greater detail in the literature review section. Statement 8 (about the anonymity issues related to Web-Based Surveys) is related to privacy, which is perhaps one of the biggest issues associated with Internet use. Some studies proved that e-mail surveys offer less anonymity than regular mail surveys [17]. Other studies stated that Web-Based Surveys offer greater anonymity than e-mail surveys [8]. The main objective of this statement was to assess participants' own opinions about privacy and anonymity issues associated with Web-Based Surveys as compared to paper-and-pencil surveys. Statement 9 (about the consideration of incentives when filling out surveys) was based on the observation that incentives were shown to have positive effects on mail survey return rates [18] and on experience that electronic commerce provides opportunities to offer incentives to potential participants in Web-Based Surveys [17], and could therefore increase the number of respondents.

Following the design phase, a questionnaire for this Web-Based Survey was built using the HyperText Markup Language (HTML). After our Web-Based Survey was tested, its Web address was submitted to four major Internet search engines and to five selected professional e-mail lists for faculty and graduate students from the fields of Business Management, Engineering and IT.

4. Results

During approximately one month of data collection, we were able to collect in total 302 responses. Three submissions contained mainly empty spaces, while one respondent neglected to provide information about IT or non-IT affiliation. In addition, eleven respondents submitted incomplete answers to statements. Therefore, in total, fifteen responses were discounted. The remaining 287 responses were used in the analysis. First, they were examined for the demographic profile as summarized in Table 1.

Table 1. Demographic Profile

Primary Professional Field:	
Business/Management	155
Education	52
Engineering	42
Computer Science	13
Psychology	7
Other	18
No response	0
Information Technology Expert:	
No	172
Yes	115
Primary Role in Academia:	
Faculty	189
Graduate Student	53
Researcher	32
No Academic Position	5
Other	8
Not specified	0
Primary Professional Organization:	
Research University	171
Teaching University/College	91
Private Company	8
Self-employed	4
Other	11
Not specified	2
Recruitment Method:	
Received an E-mail / E-Group Posting	280
Word of Mouth	3
Search Engine	0
Other	2
Not specified	2

The results suggest that we were able to reach a rather representative sample of faculty and students affiliated with both research- and teaching-oriented institutions. This is not surprising, as in our attempt to reduce self-selection bias and to achieve a representative sample of respondents, we specifically targeted professional lists for faculty and graduate students. The majority of our respondents indicated that they are affiliated with a research institution. The examination of submissions from respondents who declare a primary teaching institution affiliation indicated that most of them appear to be actively involved in research activities. For example, many of them noted (in the Survey Experience section as well as in the open-end question text box) that they have conducted their own surveys with the intention of collecting data for academic research.

Further, the responses used were examined for computer skills and Internet usage, as summarized in Table 2.

Table 2. Computer Skills and Internet Access

Computer Use:	
Very Often	285
Often	1
No response	1
Computer Skills:	
Expert	97
Above Average	160
Average	30
Below Average	0
Illiterate	0
Internet Use:	
Very Often	269
Often	17
Sometimes	1
Years Using the Internet:	
More than 7 Years	165
5 to 7 Years	87
3 to 5 Years	29
1 to 3 Years	6

The results suggested that the majority of our respondents have good and very good computer skills and use computers to access the Internet and other applications on daily basis. Once again, this is not surprising, as we specifically targeted professional e-mail lists most of whose members could be assumed to have good computer skills. Moreover, this fact rather seems to suggest that we were indeed able to reach a representative sample of academic researchers.

Following the more qualitative examination of the submissions, statistical analysis was performed to test the two hypotheses, which guided our research. As a preparation for the statistical analysis, all responses to the statements included in the fourth section were coded by numbers from 5 (Strongly agree) to 1 (Strongly disagree). Then, to test Hypothesis 1, a t-test was used to check whether or not the mean of the two populations ("IT" and "non-IT") was different. An F-test was used to validate that the variances of both populations could be assumed to be equal. Since the results of the F-test suggested that there is not enough statistical evidence for unequal variances, a pooled t-test assuming equal variances was performed. The results of t-test are summarized in Table 3. (The chosen level of significance for this analysis was equal to 5%, or $\alpha = 0.05$.)

Table 3. Attitudes toward Web-Based Surveys: IT vs. Non-IT

Statement	Mean IT	Mean Non-IT	Mean Diff.	t-value	p-value
Overall, the quality of responses for Web-Based Surveys is at least as high as it is with traditional "paper-and-pencil" surveys.	3.86	3.98	(0.12)	0.944	0.346
Web-Based Surveys have more advantages than disadvantages.	3.92	3.74	0.18	(1.537)	0.125
Web-Based Surveys will eventually replace traditional "paper-and-pencil" surveys as means of academic research.	3.27	3.16	0.11	(0.764)	0.446
Web-Based Surveys are more appropriate than "paper-and-pencil" surveys, when collecting data in highly sensitive topics.	2.78	2.91	(0.13)	1.073	0.284
Web-Based Surveys are only appropriate for research in a highly limited number of fields.	2.39	2.63	(0.24)	1.949	0.052
Overall, Web-based data collection is not useful for serious academic research.	1.70	1.82	(0.12)	1.102	0.271
Overall, Web-Based Surveys are more efficient than "paper-and pencil" surveys.	4.11	4.02	0.10	(0.886)	0.376
Web-Based Surveys ensure more anonymity than "paper-and-pencil" surveys.	2.59	2.70	(0.11)	0.930	0.353
Participants consider the presence of rewards and incentives when answering any types of survey.	3.61	3.70	(0.09)	0.802	0.423

According to the results, we can see that there are no obvious differences between the two groups' (IT and non-IT professionals) responses to our nine statements. As the table shows, for all nine statements, the p-value is greater than α. Thereafter, none of the null hypotheses is to be rejected. (Even given the fact that the p-value of 0.052 for the statement about the perceived limitation of the Web-Based Survey method was very close to $\alpha = 0.05$). In other words, based on the collected data, we do not have enough evidence to assume that IT professionals in general have different attitudes regarding Web-Based Surveys than non-IT professionals.

To test Hypothesis 2, a Chi-square test was used to verify whether the participants' perceived degree of computer literacy influences their attitudes toward Web-Based Surveys. A contingency table for the responses to the first statement and the results of Chi-square Test are depicted in Table 4 and Table 5 respectively.

Table 4. Computer Skills vs. Perceived Quality of Web-Based Surveys

Observed Frequencies						
	Column variable					
Row variable	S.A	A	N	D	S.D	Total
Expert	36	31	17	9	4	97
Above Average	54	65	29	10	2	160
Average	8	9	11	1	1	30
Total	98	105	57	20	7	287

Table 5. Chi-Square Test: Computer Skills vs. Perceived Quality of Web-Based Surveys

Results	
Critical Value*	15.5073
chi-square Test Statistic	10.7457
p-Value	0.21653
Do not reject the null hypothesis	
* 5% level of significance	

Then, as we had done for the first statement, we performed the same analysis for the remaining eight statements.

Table 6 summarizes the findings of the Chi-square test.

Table 6. Computer Skills vs. Support of Web-Based Surveys

Statement	χ^2 Value	p-Value
Overall, the quality of responses for Web-Based Surveys is at least as high as it is with traditional "paper-and-pencil" surveys.	10.745	0.216
Web-Based Surveys have more advantages than disadvantages.	10.862	0.209
Web-Based Surveys will eventually replace traditional "paper-and-pencil" surveys as means of academic research.	7.544	0.479
Web-Based Surveys are more appropriate than "paper-and-pencil" surveys, when collecting data in highly sensitive topics.	11.357	0.182
Web-Based Surveys are only appropriate for research in a highly limited number of fields.	14.528	0.068
Overall, Web-based data collection is not useful for serious academic research.	15.391	0.052
Overall, Web-Based Surveys are more efficient than "paper-and pencil" surveys.	10.945	0.204
Web-Based Surveys ensure more anonymity than "paper-and-pencil" surveys.	5.566	0.695
Participants consider the presence of rewards and incentives when answering any types of survey.	11.202	0.190
Critical value = 15.507 (5% level of significance)		

For all nine statements, the attitude toward Web-Based Surveys was not significantly different for the three different levels of computer literacy. (The p-value was greater than $\alpha = 0.05$ in all nine cases. Even given the fact that the p-values of 0.052 and 0.068 for the statements about the usefulness of Web-Based Surveys for serious academic research and their limitation were respectively close to $\alpha = 0.05$). These results show that we do not have enough evidence to reject the null hypothesis, which means that no relationship exists between perceived level of computer literacy and preference of Web-Based Surveys as the predominant academic research methodology. Therefore, based on the collected data, it could be concluded that attitudes toward Web-Based Surveys appear to be independent from participants' perceived computer skills.

5. Conclusion

The results of the statistical analysis suggest that attitudes toward using Web-Based Surveys for academic research are comparable among researchers from IT and

non-IT related fields. Furthermore, these attitudes appear also to be independent of the level of computer literacy an academic researcher possesses, at least for those who have passable computer skills. This finding could have been different if participants from the two other levels of computer literacy (Below Average and Illiterate) were available. Therefore, for future research, we suggest applying a more detailed scale.

Our findings are, however, preliminary in nature and need to be treated as such. The intent of the next step of this research project-in-progress is to validate these preliminary findings. To conclude, since the need for efficient data collection is not limited to IT or other technical fields, our findings suggest that Web-Based Surveys could be considered a serious alternative to the traditional "paper-and-pencil" format, regardless of field.

6. References

[1] Roztocki, N., "Using Internet-Based Surveys for Academic Research: Opportunities and Problems", *Proceedings of the 2001 American Society for Engineering Management (ASEM) National Conference*, 2001, pp. 290-295.

[2] Zhang, Y., "Using the Internet for Survey Research: A Case Study", *Journal of the American Society for Information Science, 51*(1), 2000, pp. 57-68.

[3] Cook, C., Heath, F., and Thompson, R. L., " A Meta-Analysis of Response Rates in Web- or Internet-Based Surveys", *Education and Psychological Measurement, 60*(6), 2000, December, pp. 821-836.

[4] Schmidt, W. C., "World-Wide Web Survey Research: Benefits, Potential Problems, and Solutions" *Behavior Research Methods, Instruments, & Computers,* 29(2), 1997, pp. 274-279.

[5] Sackmary, B., "Internet Survey Research: Practices, Problems, and Prospects", *Proceedings of the American Marketing Association Summer Conference*, 1998, pp. 41-49.

[6] McCoy, S., and Marks Jr, P. V., "Using Electronic Surveys to Collect Data: Experiences from the Field", *Proceedings of the Americas Conference on Information Systems (AMCIS) 2001 Conference*, 2001, pp.1502-1505.

[7] Mehta, R., and Sivadas, E., "Comparing responses rates and response content in mail versus electronic mail surveys", *Journal of the Market Research Society,* 37(4), 1995, October, pp. 429-439.

[8] Stanton, J. M., "An Empirical Assessment of Data Collection Using the Internet", *Personnel Psychology,* 51, 1998, pp. 709-725.

[9] Kiesler, S., and Sproull, L. S., "Responses Effects in the Electronic Survey", *Public Opinion Quarterly,* 50, 1986, pp. 402-413.

[10] Pitkow, J. E., and Kehoe, C. M., "Emerging Trends in the WWW User Population", *Communications of the ACM,* 39(6), 1996, June, pp. 106-108.

[11] Bradley, N., "Sampling for Internet surveys. An examination of respondent selection for Internet research", *Journal of the Market Research Society,* 41(4), 1999, October, pp. 387-395.

[12] Bertot, J. C., and McClure, C. R., "Electronic Surveys: Methodological Implications For Using the World Wide Web to Collect Survey Data". *Proceedings of the American Society for Information Science (ASIS) Annual Meeting*, 1996, pp. 173-185.

[13] Likert, R., "A Technique for the Measurement of Attitudes", *Archives of Psychology,* (140), 1932, pp. 1-55.

[14] Couper, M. P., "Web Surveys A Review of Issues and Approaches", *Public Opinion Quarterly,* 64, 2000, pp. 464-494.

[15] Coomber, R., "Sociological Research Online*",* 2(2), 1997, <http://www.socresonline.org.uk/socresonline/2/2/2.html>.

[16] Schmith, M. A., and Leight, B., "Virtual Subjects: Using the Internet as an Alternative Source of Subjects and Research Environment", *Behavior Research Methods, Instruments, & Computers*, 29(4), 1997, pp. 496-505.

[17] Cho, H., and LaRose, R., "Privacy Issues in Internet Surveys", *Social Science Computer Review,* 17(4), 1999, Winter, pp. 421-434.

[18] Church, A. H., "Estimating the Effects of Incentives on Mail Survey Response Rates: A Meta-Analysis", *Public Opinion Quarterly,* 57, 1995, 62-79.

7. Appendix

Demographic Profile Questions
Q1: Which field most describes your primary professional affiliation?
Q2: Is IT (Information Technology) your primary area of study or work?
Q3: What is your primary role in academia?
Q4: Where is your primary professional affiliation?
Q5: How did you find out about this survey?

Computer Skills and Internet Access
Q1: How often do you use a computer?
Q2: How do you rate your overall level of computer literacy and knowledge?
Q3: How often do you use the Internet?
Q4: Overall number of years using the Internet?
Q5: In general, are you at ease with the current pace of technological development?

Survey Experience

Q1: Have you ever participated in a Web-Based Survey before?

Q2: Have you ever conducted a survey for academic purposes?

Q3: If yes, what type(s) of survey methodology have you used?

Q4: If you have not yet employed Web-Based Surveys for academic research, would you consider using them sometimes in the near future?

Statements to Measure the Attitudes toward Web-Based Surveys

S1: Overall, the quality of responses for Web-Based Surveys is at least as high as it is with traditional "paper-and-pencil" surveys.

S2: Web-Based Surveys have more advantages than disadvantages.

S3: Web-Based Surveys will eventually replace traditional "paper-and-pencil" surveys as a means of academic research.

S4: Web-Based Surveys are more appropriate than "paper-and-pencil" surveys, when collecting data on highly sensitive topics.

S5: Web-Based Surveys are only appropriate for research in a highly limited number of fields.

S6: Overall, Web-Based data collection is not useful for serious academic research.

S7: Overall, Web-Based Surveys are more efficient than "paper-and-pencil" surveys.

S8: Web-Based Surveys ensure more anonymity than "paper-and-pencil" surveys.

S9: Participants consider the presence of rewards and incentives when answering any type of survey.