Comparison of Web and Telephone Survey Response Rates in Saudi Arabia

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Abstract: A study was conducted to compare the response rate of telephone interview and Web Survey in Saudi Arabia utilizing Internet usage statistics, as well as experimental design. Official data shows that the reason that led the majority of Saudi people to choose not to interact with Web Survey similarly to the telephone interview is not technical due to the lack of Internet coverage, but rather cultural. Furthermore, the experimental part demonstrates three main findings. First, the response rate to the Web Survey is significantly lower than to the telephone interview. Second, Saudi males participated significantly more than females especially with the Web Survey though both had the same level of Internet access. Third, the average response rate of telephone interview is significantly above 95% for both genders, whereas the average response rate of the Web Survey is about 30%.

Keywords: Web survey; telephone survey; response rate; Saudi Arabia.

1. Introduction

Survey research is one of three main research types (the other two are: experimental and historical) that are globally used in many disciplines including: education, political science, sociology, public administration, marketing, and public health. Traditionally surveys have been carried out using three main methods of data collection, face-to-face interviews, telephone interviews, and mail questionnaires (Fricker, Galesic, Tourangeau, and Yan 2005). However, over the last ten years the picture changed as the Web Survey became widely used in social science and educational research (Couper 2000). Web Surveys are proliferating at a rapid pace, especially in marketing research, and a further increase can be expected (Loosveldt, and Sonck, 2008). A study showed that in the year 2000, about 5% of all market research conducted in Western Europe and the U.S. was conducted via the Internet. This figure was expected to rise to about 8% in the year 2001, and to reach 50% by 2004 (Poynter 2001).

In Saudi Arabia, however, the picture is a bit different. Researchers still use survey research frequently in social sciences, but they utilize mostly mail questionnaires and secondary telephone interviews as data collection tools for surveying the public. The research methodology reasons behind that are the coverage bias and low response rates. The majority of researchers in Saudi Arabia believe that both conventional survey modes (mail questionnaire and telephone interview) have higher levels of coverage and response rates than any other traditional or modern modes. In addition, they think that the telephone interview is an excellent competitor to the mail questionnaire especially in marketing research. Researchers in Saudi Arabia assume that it is not an appropriate time to use Web Surveys because of the fact that significant numbers of people do not have access to Internet, or choose not to use the Internet (i.e., technical infrastructure or cultural soft factor).

The above stated concerns about utilizing Web Survey in Saudi Arabia are logical and important from research methodology perspectives. The sense and importance come from the fact that there is a significant cross-cultural difference in the Internet usage, the considerable impact of the survey mode on data cost and accuracy, and the lack of literature on such studies about Saudi Arabia and similar societies. Looking at the effect of survey modes from different cultural perspectives helps research methodologists and interested researchers to understand intensely the connection between data-collection components: researcher, respondents, and survey modes, and their effects on data cost and accuracy.

Therefore, the paper was designed to answer two research questions. First, is there an Internet coverage bias in Saudi Arabia comparing to telephone landlines?. Second, is there a significant difference between the response rate means of Web and Telephone Survey modes? Two different research methods were used to answer the questions. The Internet and telephone landlines coverage bias is negotiated using published statistics, and the comparison between web and Telephone Survey is discussed from the response rate point of view utilizing an experimental design (the two-way factorial design).

The article is organized as follows: section 2 reviews the literature relating to the research problem, section 3 demonstrates the current status of the Internet and telephone landlines coverage in Saudi Arabia, sections 4

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and 5 describe thoroughly the method used in the experimental part and goes through the results, and section 6 presents conclusions and some final advice.

2. Literature review

The increasing popularity and wide availability of World Wide Web technologies provide the researcher with vehicles for improving research methods. Nowhere is this truer than in the domain of survey research (White, Carey, and Dailey, 2000). Consequently, new types of surveying was established in the field of research methodology and called Web Survey, which uses the Internet (especially the World Wide Web) to collect data from a sample of the target population employing one of the probability or nonprobability sampling techniques. Web Surveys may be conducted by means of interactive interviews or by questionnaires designed for self-completion. Electronic one-to-one interviews can be conducted via e-mail or using chat rooms. Questionnaires can be administered by e-mail (e.g. using mailing lists), by posting to newsgroups, and on the Web using fill-in forms (Eysenbach and Wyatt; 2002). Publishing the questionnaire on the Web is our concern.

The skills required to produce a Web Survey are different from those required to construct conventional mode surveys. Web Survey design focuses more on programming ability and Web page design rather than traditional survey methodology (Couper, 2001). Because of the technology involved in developing Web Surveys, leadership has come from people with a background in technology, not the survey methodology professionals (Gunn, 2002). Thus, the effect of variables related to Web Survey on response rate and data accuracy has been of interest to research methodologists and applied statisticians and continue to receive considerable attention in the recent research methodology literature (see for example, Coomber, R. 1997; Cook, Heath, and Thompson, 2000; Couper, 2000; Dillman and Bowker, 2000; Christian, Dillman, and Smyth, 2007; Ganassali, 2008; Converse, Wolfe, Huang, and Oswald, 2008).

The literature of Web Survey has grown to the point that is not possible be covered in detail in one work. Thus, general points will be highlighted below and the details left for interested readers.

The variables, which their effect was investigated, cover mainly three general factors: technical, methodological, and social. The technical factor consists of all variables related to software and hardware needed for Web Survey programming and designing such as method of presentation (screen-by-screen or scrolling), multimedia capability, graphics, and colors. The effect of these variables on data accuracy and cost is the chief concern of the research methodology literature. For example, it has been noted that software, hardware, network speed, server timeout, password or ID confusion, and display variation from browser to browser can all influence responses to Internet tool surveys. Furthermore, it is found that incorporating advanced page layout design features to create Web Surveys would not necessarily translate into higher response rates or better quality data when compared to simply designed Web Surveys. For more details in this concern, reader is advised to review works such as Dillman, Tortora, Conradt, and Bowker, 1998; Barron and Siepmann, 1999; Schleyer, and Forrest, 2000; Couper, 2001; Couper, Traugott, and Lamias, 2001; Truell, 2003; Christian, Dillman, and Smyth, 2007.

The methodological factor covers variables like cost, coverage, Web-sampling, and validity. The key concern of the related literature is to examine the effect of such variables on Web Survey outcomes in terms of quality and efficiency, and compare them with outcomes of traditional survey modes. For instance, Schleyer and Forrest (2000) calculated the cost-effectiveness of a Web Survey as compared to an equivalent mail survey. The results of their comparison revealed that the Web Survey was 38% cheaper than an equivalent mail survey would have been. By contrast, Couper et al. (1999) noted that they did not achieve the expected cost savings in their study due to high startup costs, technical problems, and low response rates.

Additionally, Schonlau et al. (2002) reported that surveys using Internet tools have used census, non-probability, and probability approaches for selecting participants. They also noted that closed populations (such as universities, hospitals, and banks) might provide researchers with the best opportunity to select a probability sample because every member of the target population can be both identified as being a member of the target population and having access to both email and the Web. Thus, it would be possible to select a random sample from such a closed population. Other researchers have discussed various non-probability sampling techniques for use with Internet tool surveys. Recommended studies for interested readers to review are: Schillewaert, Langerak, and Duhamel, 1998; Bradley, 1999; Couper, 2000; Cobanoglu, Warae, and Morec, 2001; Dillman and Bowker, 2001; and Schaefer, 2001.

The social factor contains all the variables that are linked to social behaviors, attributes, facts, relations, and actions such as age, gender, ethnicity, socioeconomics, level of education, ethical issues, and cross-cultural Internet usage. Effects of the social factor on the quality of Web Survey results are the base of all scientific works. As an illustration, in the USA Internet users are more likely to be young, male, white, more educated, wealthy, city residents and the parents of children living at home (Lenhart et al. 2003; Vehovar et al. 1999; Taylor 2005). Moreover, Wasserman and Richmond-Abbott (2005) found that access to the web was independent of gender, but was related to education, race, income, age, and marital status. They also found that women were less likely than men to chat on the web, but were slightly more likely to use email, and they utilized different types of sites than men. Women access the web as frequently as men, but they communicate on the Internet differently to men, and are online less than men. Finally, it has been found that knowledge related to web use is an important independent variable that influences Internet use by men and women.

In addition, literature confirms that there are cross-cultural differences in Internet usage. For example, Hermeking (2005) indicates that in early 2005, the percentage of the population using the Internet was in the USA, 48%, in Canada and Australia, 46%, in Sweden, 53%, in Germany, 36%, in the UK, 38%, in France, 26%, in Spain, 22%, in Japan, 29%, and in Brazil only 6%. Moreover, he indicates that although those figures change continuously over time, there is a clear continuum of descent from high Internet usage in the (developed, western) North to low Internet usage in the (often less developed, non-western) South due to technical infrastructure, income per capita, and cultural soft factors.

For more details about the effect of social factors on dealing with Web Surveys, the reader is referred to (Bosnjak and Tuten, 2001; Lee, Lee, Kim, and Kim, 2002; Ono and Zavodny, 2003; Wasserman and Richmond-Abbott, 2005; Ono, 2005; Hermeking, 2005; Ono and Zavodny, 2005; Wasserman and Richmond-Abbott, 2005; Hargittai and Shafer, 2006).

The effects of Internet coverage, social thought towards Internet usage, and gender differences in Internet access variables on quality of Web Survey outcomes are the prime apprehension of the research methodologist and researcher in any society, and should be more apprehension in less developed societies such as Saudi Arabia. Moreover, the lack of Web Survey literature that study the effect of social and methodological factors in these societies on the quality of Web Survey results are main reasons to conduct the current study.

3. Internet coverage

In order to study the effect of the Internet coverage bias on Web Survey results in Saudi Arabia, one needs to compare the Internet usage development with landlines telephone trend among people in Saudi Arabia since the Internet was officially made available to the public. That is because Telephone Survey is the competitor research methodology to Web as well as mail survey in Saudi Arabia especially in marketing research.

Internet was first introduced to Saudi Arabia in 1994 when state academic, medical, and research institutions gained access to it. Internet was officially made available to public in 1997 by a ministerial decision, and public access finally debuted in 1999. In December 2000 there were about 200 000 Internet users, by 2005 the number had grown to 2,54 million, making the growth 1170 %. The most recent official statistics indicate that about 4.8 millions Internet users in Saudi Arabia as of December, 2006 which makes Saudi Arabia one of the fastest growing Internet markets in Middle East. This is a bit larger number than telephone lines subscribers in Saudi Arabia, which is around 4 millions as of 2006 (i.e., about 16% of the population have landlines) (see Figure 1) (Communications and Information Technology Commission annual report, 2006).

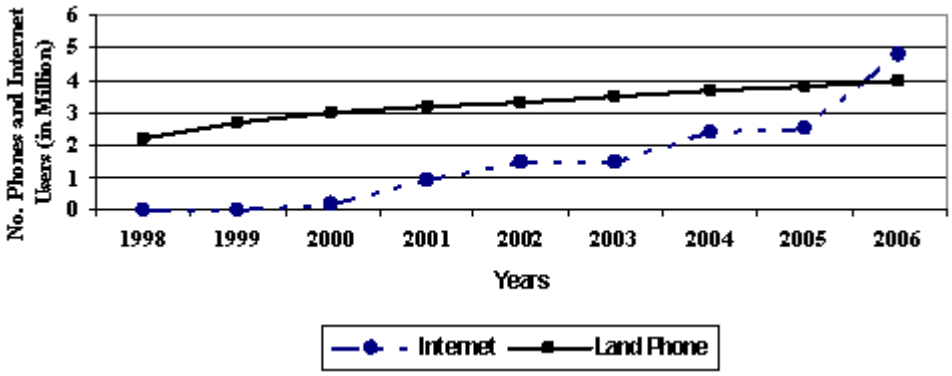

Figure 1: Land phone subscribers and Internet users in Saudi Arabia from 1998 to 2006, Source: The Communications and Information Technology Commission (CITC) in Saudi Arabia annual report 2006.

The number of Internet users in Saudi Arabia is estimated to be the largest among Arab countries, as shown in Figure 2. In terms of Internet penetration rates, however, Saudi Arabia (19.6%) ranks fourth in the Arab World (after United Arab Emirates, Kuwait and Bahrain). Saudi Arabia Internet penetration rate is higher than Arab countries average (7%), developing countries average (10%) and global average (16%), but is well below the developed countries average Internet penetration rate of around 60% (Communications and Information Technology Commission annual report, 2006).

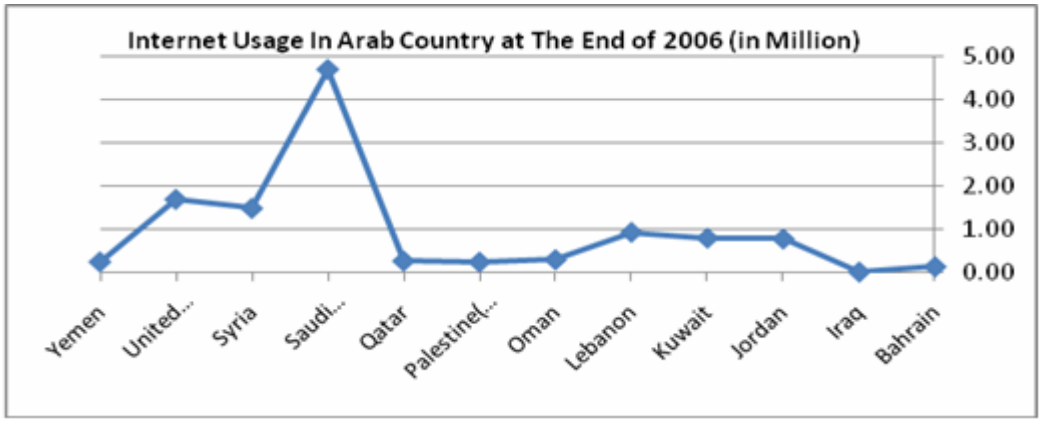

Figure 2: Internet users in Arab World as of December, 2006. Source: The Communications and Information Technology Commission in Saudi Arabia annual report 2006.

The future of Internet in Saudi Arabia is estimated to keep on growing rapidly. In addition to the new Internet structure that can reduce the prices of Internet access, there are also other factors that can speed up the growth of Internet usage in Saudi Arabia. One reason for the growth is that 60 % of the Saudi population comprises teenagers and young adults who are adapting to new technologies faster than expected (Central Department of Statistics, 2005). As the usage of Internet grows in all the Arabic countries, the amount of Arabic content on the Internet will grow as well. This in turn will attract more and more Saudis to join the Internet. Furthermore, several universities and colleges in Saudi Arabia are now adopting e-learning as a part of their curriculum, which will expand Internet usage annually over the next five years. As more banks and companies will offer more of their services online, more customers are drawn to using these services.

Linking the current Internet usage statistics and future prediction with the attitude of Saudi researchers towards Web Surveys, one can see the weakness of the coverage bias justification that says "*significant numbers of people do not have access to Internet*". Thus, from research methodology perspective, it is true to say that there is no an Internet coverage bias comparing with telephone coverage in Saudi Arabia.

However, regarding to low response rate justification, which says "*significant number of people choose not to interact with Web questionnaire*", experimental research should be conducted to investigate its appropriateness. Therefore, an experimental study was designed to compare Web Survey with a Telephone Survey in terms of response rate mean at work, where every one has direct access to Internet and use it frequently. This is done because literature indicates that men and women are equally likely to access the Internet from work. Among Internet users who work full-time or part-time, 65% of men and 66% of women use the Internet at work (Princeton Survey Research Associates, 2005).

Explicitly, the experimental part of the study attempts to answer two main research questions: Is there a significant difference between Web and Telephone Survey response rates?, and Is there a significant interaction between survey modes and respondent gender?. Next section will answer those questions.

4. Experimental design

4.1 Design

In the study, the two-group post test-only randomized experiment was applied, featuring telephone interview as well as Web Survey to collect data from a group of female and male subjects. The design is a factorial design with two independent variables (survey modes and respondent gender) and one dependent variable (response rate). This design is usually used in educational and medical settings to determine whether the two groups are different after the program. One of the benefits of this design is it is relatively inexpensive, strong against the single-group threats to internal validity (history, maturation, testing, instrumentation, and regression), and strong against all of the multiple-group threats (selection-history, selection-maturation, selection-testing, selection-instrumentation, and selection-regression) except for selection-mortality. However, in the study, the selection-mortality threat is controlled for because the treatment (survey mode) is not a noxious or negative one, or the control group condition is painful or intolerable.

4.2 Subjects

In order to answer the research questions utilizing appropriate statistical design and analysis procedures, the needed sample size was determined using the statistical formula presented in Kirk (1995, p: 399-402). The total sample size (n) required to have appropriate Type I error ($\alpha = 0.05$), good statistical power ($1-\beta = .80$) to deduct mean differences, and large effect size ($f = 0.40$) is 52 subjects.

A simple random sample of a size 52 was gotten from a list of all instructors (trainers) at the Institute of Public Administration (IPA), Riyadh, S.A.. The list was obtained from the computer department in a softcopy. Participants tended to have either Masters or Doctorate degree, be between 25-45 years old, and half of them were female. At the IPA, each trainer (faculty) has an equipped office with almost everything needed: good furniture, powerful PC, Intranet and Internet access, telephone line … etc. The key points are that each subject has his/her own telephone line, a PC with Internet access, and comparable level of computer skills.

The age range and equality of computer skills and Internet access among subjects helped to control for two of internal validity threats: maturation and statistical regression, which increases the confidence that the dependent variable's results come from the manipulation of the independent variables not some other variable(s).

4.3 Instrumentation

The telephone interview form (questionnaire) and Web Survey designed to be identical in content, wording, questions order, and instructions (i.e., the difference between the two surveys is only the mode). The data collection instrument prepared to contain 44 items in three different forms: short (one word or digit) answer, yes/no, and multiple choices questions. All questions require no specific knowledge background and cover two main factors: personal and job satisfaction. Although most of the instrument items were personal type questions, around 8% of the sample size refused to answer questions via phone about 10% of them for privacy reasons. In order to evaluate the validity of the data collection instrument, it was sent to three IPA faculty members with strong research methodology background to judge questions' sensitivity level, wording, logic, and knowledge background requirements. Few changes were made to meet judges' feedbacks.

4.4 Procedures

The first group (control group) was introduced to Telephone Survey mode. Two data collectors (one male and one female) with a bachelor degree and previous experience in data collection were hired to interview subjects via phone. Both data collectors were asked to use specific interview instructions and questionnaire to minimize respondent - data collector interaction effect. The second group of subjects (treatment group) were sent email massages inviting them to participate in field research via responding to a Web Questionnaire. The massage sent to the subjects contained an invitation and a link to the survey Website. Follow-up contacts for non-respondents in the Internet mode were made by email twice. In order to control for positive (or negative) biasness especially that of the researcher was well known to most of subjects, 2 messages (the original and the second follow-up) were signed by "The Researcher". The third follow-up

message was signed by the researcher's real name because some subjects refused to respond to unidentified researcher. The name of the researcher motivated 3 (i.e., about 11%) more respondents to participate in the study.

In Saudi Arabia, where values have strong effects on social life, male-female verbal communication is limited. Thus, and in order to control for research-respondent interaction threat, a female data collector was hired to phone (interview) female subjects only, and a male data collector was hired to phone (interview) male subjects.

5. Results

Missing data is a part of all research types (Oh, 2003). In surveys, for example, missing data occurs when a respondent does not participate in any part of the survey (unit non-response) or does not answer particular question(s) (item non-response). It occurs for several reasons: illness, language problem, privacy issues, insufficient time, no interest, or lack of availability (Fowler, 2002, p: 40; Oh, 2003).

Missing data is an issue that can cause serious problems such as: decreases the statistical power (the probability of rejecting the null hypothesis when it is false), increases the Type I error (the probability of rejecting the null hypothesis when it is true), and raises the possibility of biasness. Most statistical procedures automatically eliminate cases with missing data, which leads to have inadequate statistical power to detect the difference or no enough data to perform the analysis at all. Or, research results may be misleading if the cases analyzed are not a random sample of all cases. That is because whenever segments of the target population do not respond, they become under represented in the data.

5.1 Measure of interest

Every survey question without an answer is a missing data point, and the total sum of all missing data points is an indication of a data collection effort (McCarty, 2003). The response rate, which is also known as *completion rate* or *return rate*, is often taken as a measure of goodness (Schonlau, Fricker, and Elliott, 2001, p: 16). The response rate is the measure of interest in this study because it is likely to be much more salient in the selection of a data collection procedure than other considerations (Fowler, 2002, p: 65). That is, when other variables held constant, the data collection procedure with high response rate is preferred over other procedures available to the researcher.

Response rate has several definitions and, accordingly, different computation formulas (the reader is referred to AAPOR, 2006 for details on operational definitions and formulas). For unit nonresponse definitions that stated above, for instance, response rate refers to the ratio of number of people who answered the survey divided by the number of people in the sample. However, for item nonresponse, response rate refers to the ratio of number of answered questions divided by the total number of questions in the questionnaire. Both are usually expressed in the form of a percentage (Wikipedia, The Free Encyclopedia, 2006), the later definition is adapted in the study because the sample size is small and item nonresponse is more likely to occur than unit nonresponse in telephone interview.

Table 1 shows key descriptive statistics of Web and Telephone Survey response rates, and Figure 3 shows survey mode and respondent gender interaction. An interaction between mode and gender is said to be exist if the mean differences among survey modes are not similar for males and females.

Table 1: Descriptive statistics of Web and Telephone Survey response rates

Survey Mode		Web			Telephone			Total		
		Mean	*S.D.*	*n*	*Mean*	*S.D.*	*n*	*Mean*	*S.D.*	*n*
Gender	Male	50.51	48.78	13	98.53	2.016	13	74.52	41.76	26
	Female	15.09	35.27	13	97.68	0.803	13	56.39	48.69	26
Total		32.8	45.45	26	98.11	1.57	26	65.46	45.83	52

S.D. is the standard deviation, *n* is the sample size.

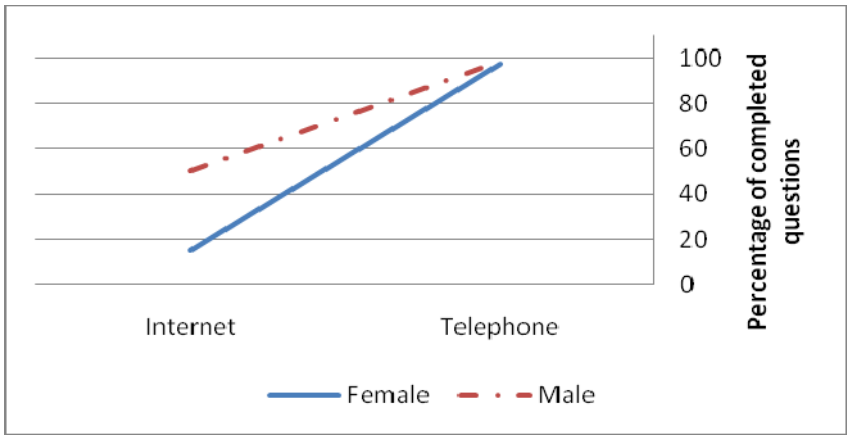

Figure 3: Interaction between gender and survey mode based on percentage of completed questions.

Table 2: Usual two-way ANOVA table that shows significance differences between survey modes (telephone vs. web) and gender, and their interaction.

Source	df	F	p-value
Mode	1	61.119	.000*
Gender	1	4.714	.035*
Mode × Gender (Interaction)	1	4.281	.044*

* Significant result at α = 0.05, Dependent variable is the No. of completed questions

5.2 Data analysis

Data collection using Web Survey and telephone interview was performed precisely as described in the previous section. Table 1 and 2 show that, in general, males have significantly higher response rate average to research questionnaire than females (F = 4.714, and p-value = 0.035), and have incomparable variation values (i.e., males have significant less variance than females; *Levene's Test* = 215.683, and p-value = 0.000). That means male respondents, in S.A., are expected to answer more survey questions (by any mode; telephone or Internet) than females, and their individual response rates is closer to their mean than female individual response rates.

Moreover, both tables display that, on average, Saudi respondents react to Telephone Survey significantly higher than Web Survey (F = 61.119, and p-value = 0.000). Which indicates that researcher is recommended to employ Telephone Survey in Saudi Arabia rather than Web questionnaire, though the second mode is significantly cheaper and faster than the first mode. Table (2) and Figure (1) demonstrate that there is a significant interaction between survey mode and gender. That is, Web Survey encourages Saudi male respondents to answer questionnaire questions more than females, though both genders have the same level of Internet access.

Table 1 illustrates the little difference in both statistics between males and females in terms of Telephone Survey response rate. Data shows that males tend to cooperate with the data collectors more than females, yet the difference is not statistically significant (t = 1.419, and p-value = 0.176). In addition, the variation within males' response rate is significantly higher than females at α = 0.01 (*Levene's Test* = 24.059, and p-value = 0.000). This indicates that females are likely to cooperate with data collection in similar levels, whereas males' collaboration probability ranges between no cooperation with data collector complete cooperation in the same study. This also means that the researcher can know the cooperation level of female subjects from the beginning of the interview, which has a positive effect on minimizing the data collection cost. Whereas knowing the level of the cooperation of male subjects from the beginning of the interview is not easy, which increases the data collection cost.

Table (1) and (2) demonstrate that the response rate of Web Survey for both genders is significantly low comparing to telephone questionnaire (F = 61.119, and p-value = 0.000) with significant difference between the two standard deviations (*Levene's Test* = 215.683, and p-value = 0.000). That is, researcher utilizing Web Survey in Saudi Arabia unnecessarily expect significantly (t = -1.929, and p-value = 0.033) high unit

nonresponse rate (missing data occurs when respondent does not participate in any part of the survey). The result tells the reason behind the current lack of employing Internet in Saudi survey research industry, supports the *hypothesis* says "it is not an appropriate time to use Web Survey in Saudi Arabia because of the fact that significant numbers of people choose not to use the Internet (i.e., low response rate)".

6. Conclusion

The study finds that in Saudi Arabia, Internet coverage is not an issue comparing it to telephone landlines. In contrast, current official statistics shows that the number of Internet users is higher than telephone landline subscribers and its future is promising. This indicates that the shortage of using Web Survey in Saudi Arabia is due to some cultural factors (i.e., thoughts among people and a cross certain gender) rather than technical infrastructure (geographical coverage).

In other words, results from the experimental part of the study show that a Web Survey achieved a significantly lower (approximately 70%) response rate than telephone interviews. Moreover, it shows that males interact significantly higher than females with Web Survey (i.e., there is a statistical significant interaction between survey mode and respondent gender). This outcome along with the number of Internet users in Saudi Arabia, confirms the assumption that the reason behind the difference between the two means is the majority of Saudis choose not to response to Web Survey *not* because of Internet coverage bias, but because they did not want to.

With respect to Telephone Interview, the study demonstrates that there is no significant difference between the mean of males and females response rates, and both means are above 95%. The result also shows that data collection cost could be minimized by interviewing females more than males due to significant differences between standard deviations of telephone interview response rates according to gender. Therefore, researchers are recommended to employ telephone interviews to survey the public in Saudi Arabia rather than Web Survey though the second mode is more accessible.

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