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Stephen A. Sivo
University of Central Florida, ssivo@mail.ucf.edu

Carol Saunders
University of Central Florida, csaunders@bus.ucf.edu

Qing Chang
University of Central Florida, qching@bus.ucf.edu

James J. Jiang
University of Central Florida

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IS Research Perspective

How Low Should You Go? Low Response Rates and the Validity of Inference in IS Questionnaire Research [1]

Stephen A. Sivo
Department of Educational Research, Technology, and Leadership
University of Central Florida
ssivo@mail.ucf.edu

Carol Saunders
Department of Management Information Systems
University of Central Florida
csaunders@bus.ucf.edu

Qing Chang
Department of Management Information Systems
University of Central Florida
qching@bus.ucf.edu

James J. Jiang
Department of Management Information Systems
University of Central Florida
jjiang@bus.ucf.edu

Abstract

We believe IS researchers can and should do a better of job of improving (assuring) the validity of their findings by minimizing nonresponse error. To demonstrate that there is, in fact, a problem, we first present the response rates reported in six well-regarded IS journals and summarize how nonresponse error was estimated and handled in published IS research. To illustrate how nonresponse error may bias findings in IS research, we calculate its impact on confidence intervals. After demonstrating the impact of nonresponse on research findings, we discuss three post hoc remedies and three preventative measures for the IS researcher to consider. The paper concludes with a general discussion about nonresponse and its implications for IS research practice. In our delimitations section, we suggest directions for further exploring external validity.

[1] Detmar Straub was the accepting senior editor. This paper was submitted on August 30, 2004, and went through 5 revisions.

Keywords: response rate, nonresponse errors, external validity, statistical conclusion validity

Introduction

Research using questionnaires has been popular with Information Systems (IS) researchers for decades. From 1980 to 1990, leading IS journals evidenced a steady growth in research using questionnaires in every year except 1984 and 1987, according to Pinsonneault and Kraemer (1993), who reviewed 141 articles over that period. Furthermore, from 1993 to 1997, 22.1% of the articles published in these journals made use of questionnaires, with over three-quarters of those articles reporting the use of mail questionnaires in particular (Palvia, Mao, Salam, and Soliman, 2003). Almost half of the articles published in *MIS Quarterly, Information Systems Research* and *Journal of Management Information Systems* in the five-year period from 1999-2004 used surveys (King and He, 2005).

Research using questionnaires has been popular in IS for several reasons. Questionnaires are relatively easy to administer and efficiently gather relatively large amounts of data at a low cost. This is especially true of e-mail and web-based questionnaires that can reach a large number of people with the touch of a key. Questionnaire respondents may feel more comfortable providing private or sensitive answers than when being interviewed by phone or face-to-face. The structured, predefined questions allow respondents to provide answers about themselves or some other unit of analysis such as their work group, project, or organization. Compared with other survey strategies, mail questionnaires are not susceptible to interviewer bias or variability because they are self-administered (Boyd & Westfall, 1955; Boyd & Westfall, 1965; Case, 1971; Dillman, 1999; Hochstim, 1967). Finally, questionnaire responses can be generalized to other members of the population studied when random sampling is used (Newsted, Huff and Munro, 1998).

Given the popularity of questionnaire use in IS research, it is important to note associated errors that frequently occur. These include inadequate sample size/ nonrandom samples (sampling error), imperfect questionnaires (measurement error), and the inability to contact some people in the population (coverage error). Notwithstanding these obstacles, the most notorious problem for mail and Internet-based surveys is the failure of questionnaire recipients to respond. This failure to respond may very well result in what is known as nonresponse error.

Nonresponse error refers to the condition wherein people of a particular ilk are systematically not represented in the sample because such people are alike in their tendency not to respond. Indeed, there could be multiple groups of people who fail to respond in a study because such groups, by their very nature, are disinclined to respond (e.g., introverts, extremely busy people, people with low esteem). When persons who respond differ substantially from those who do not, it becomes difficult to say how the entire sample would have responded, and so, generalizing from the sample to the intended population becomes risky (Armstrong and Overton, 1977; Dillman, 1999; Kish, 1967). For this reason, nonresponse error in mail surveys has long concerned social science researchers (e.g., Cochran, 1977; Kish, 1967; Chen, 1996). For example, Steeh (1981) indicated that highly educated professionals (i.e., IS managers) are less likely to respond to mail questionnaires in today's modern society. Despite the popularity of mail

questionnaires for eliciting opinions in empirical IS research, little information exists in the IS literature on the adequate response rate for mail questionnaires, and further, on how to attain a higher response rate from this target population.

Beyond mail questionnaires, even less information is available about the adequacy of relatively new survey forms: e-mail and web-based surveys. Though these Internet-based surveys are similar to surveys with mail questionnaires, the former are considerably faster (Tse, 1998; Oppermann, 1999; Schaefer and Dillman, 1998; Sheehan, 1999; Ilivea, 2002), and more cost effective (Tse, 1998; Schaefer and Dillman, 1998; Sheehan, 1999; Mavis and Brocato, 1998). Some additional advantages of e-mail and web-based questionnaires over mail questionnaires are that they are environment-friendly (Tse, 1998), allow multi- media content (Best, 2002; Dommeyer, 2000), and offer easier data translation (Ilivea, 2002). On the downside, e-mail and web-based questionnaires may suffer coverage limitations, since they can only be completed by participants with access to the Internet (Oppermann, 1999). Prospective participants may be concerned about possible problems with fraud as a result of breakdowns in security (Smith and Leigh, 1997) and viruses (Dommeyer, 2000). Finally, many incentives cannot be attached directly to the questionnaire (Tse, 1998). In a review of studies comparing response rates of e-mail with mail surveys (Schaefer and Dillman, 1998), e-mail surveys displayed lower (e.g., 73% vs. 83% and, in one case, 28.1% vs. 76.5%) response rates in five of the six studies. King and He (2005) did not even calculate the response rates for all online surveys because they thought these rates might not be meaningful.

As with all other researchers who employ questionnaires, IS researchers are confronted regularly with the problem of nonresponse and its impact on the validity of inferences. In fact, Pinsonneault and Kraemer (1993) reviewed IS research using questionnaires and identified five main problems; three of which, because of their relevance to this article, are identified here: 1) low response rates, 2) unsystematic/inadequate sampling procedures, and 3) single method designs. *We believe IS researchers can and should do a better of job of improving (assuring) the validity of their inferences by minimizing nonresponse error.*

This article responds to the work of Pinsonneault and Kraemer (1993) by focusing on low response rates as a specific threat to the validity of inferences in IS studies. It also touches on the benefits of sampling procedures and multi-method designs. We extend the work of King and He (2005), who decry the problems with coverage error and nonresponse error in IS survey research, by further elaborating on validation generally and nonresponse errors specifically. To elaborate on the nonresponse problem in the IS discipline, this article is organized as follows: we discuss how nonresponse is connected to the validity of inferences made in IS research using questionnaires, and then report the incidence and post hoc treatment of nonresponse in a sample of IS journals. Next, we illustrate the potential for bias in IS research findings. We then discuss the limitations of post hoc strategies commonly used in IS research using questionnaires and recommend a priori strategies for minimizing nonresponse and its negative impact on the validity of inferences in IS research using questionnaires. We conclude with a general discussion and the implications of nonresponse for IS researchers. Our hope is to make researchers more aware of the need to enhance questionnaire response rates in the IS literature, better the validity of their inferences, and provide a guide for those who plan to undertake research using questionnaires. These are critical issues given the frequent use of questionnaires in IS empirical research domains.

With respect to the limitations of post hoc strategies, one of the chief remedies of nonresponse error advised in this article concerns the a priori determination of sample size as a first step toward minimizing nonresponse. Nonresponse is often difficult to manage because, so often, researchers send questionnaires to everyone in the population and therefore do not have the time or resources to pursue non-respondents. Our contention is that a priori sample size determination has the advantage of increasing the overall response rate by allowing the IS researcher to concentrate efforts and costs on a smaller, yet representative, group of people. A priori sample size determination allows a researcher to deploy the methods advised by Dillman (1999) addressing nonresponse under more affordable and practical conditions.

How Nonresponse Affects the Validity of Inferences

The purpose of this article is to document the problem of, and recommend the treatment for, nonresponse error in IS research using questionnaires. It is useful to tie nonresponse error to the validity typology used in Shadish, Cook and Campbell (2002), despite the fact that these authors are primarily concerned with issues pertinent to experimental and quasi-experimental research. Shadish et al. (2002) indicate that validity refers to approximating the truth of an inference. They warn against misusing it to refer to the quality of designs or methods. With this definition in mind, they identify four kinds of validity with which researchers should be concerned when conducting experimental and quasi-experimental research: statistical conclusion validity, internal validity, external validity, and construct validity. To the extent that they are relevant, we relate each of these types of validity to nonresponse error.

Nonresponse error when using questionnaires is related to experimental selection bias and attrition, which indeed are a concern of experimental and quasi-experimental research that may or may not use questionnaires. Nonresponse in surveys may be thought of as a pre-study attrition. This makes nonresponse error akin to selection bias in experiments because both are concerned with research participant recruitment prior to the start of a study. The primary concern of both selection bias and nonresponse error is sample bias, wherein survey respondents/experimental participants (or completers) are different systematically from non-respondents/experimental refusals (or dropouts) with respect to one or more known or unknown characteristics. Secondary, but unavoidable, concerns in both cases are the possible, but not inevitable, loss of power to detect effects due to a resulting inadequate sample size, and inaccurate effect size estimation.

Drawing from the validity taxonomy of Shadish et al. (2002), this article chiefly raises a concern about how nonresponse biases a sample's representation of the target population due to the fact that a finding drawn from the group of people studied (the respondents) might not hold if other kinds of people had been studied (the non-respondents). Shadish et al. (2002) refer to this as an interaction of the causal relationship with the units under study, which is classified as a threat to external validity.
External validity "examines whether or not an observed causal relationship should be generalized to and across different measures, persons, settings, and times" (Calder, Phillips, and Tybout, 1982: 240). It refers to either (1) generalizing to a well-specified population, or (2) generalizing across subpopulations. Generalizing to a well-specified population involves generalizing research findings to the larger population of interest (Ferber, 1977). Generalizing across subpopulations refers to conceptual replicability (or robustness) to the extent that a cause-effect relationship found in a study that used

particular subjects and settings would be replicated if different subjects, settings, and time intervals were used (Shadish et al. 2002). Given that response rate is only one of its many factors, high response rates do not necessarily ensure external validity. However, researcher cannot be sure that the conditions of external validity are met when response rates are low. "The poor response rate is particularly troublesome for descriptive studies because their usefulness lies in their capacity to generalize the findings to a population with high confidence. Such low response rates jeopardize any attempt to generalize findings in an adequate way" (Pinsonneault and Kraemer, 1993: 94).

Not only does nonresponse bias a sample, but it can also lead to low power and inaccurate effect size estimation, particularly when the sample size turns out to be too low. Shadish et al. (2002) classify both the condition of low power and inaccurate effect size estimation as threats to statistical conclusion validity. *Statistical conclusion validity* concerns the power to detect relationships that exist and determine with precision the magnitude of these relationships. A chief cause of insufficient power in practice involves having an inadequate sample size (Shadish et al., 2002; Baroudi and Orlikowski, 1989). In such cases, sampling error tends to be very high, and so the statistical conclusion validity of a study's inferences is weakened (Shadish et al. 2002).

So, nonresponse error threatens the external validity and statistical conclusion validity of inferences made in research using questionnaires. This assertion is not intended to suggest that nonresponse error does not affect either construct validity or internal validity. Instead, a review of the threats associated with each of the four validity types identified in Shadish et al. (2002) suggests that nonresponse error is most directly linked to external validity and statistical conclusion validity.

Given that low response rates may lead to sample bias, low power, and inaccurate effect size, IS researchers employing questionnaires should consider estimation strategies designed to minimize nonresponse. To this end, we recommend that IS researchers adopt a number of a priori and post hoc survey strategies including (1) randomly sampling from the target population only enough people to have sufficient power and accurately determine effect size and then (2) using Dillman's empirically supported Tailored Design Method (TDM) to minimize nonresponse.

How will these strategies support the validity of inferences in IS research using questionnaires? Shadish et al. (2002) indicate that, "…random sampling simplifies external validity inferences (assuming little or no attrition…) [in that it] …eliminates possible interactions between the causal relationship and the class of persons who are studied versus the class of persons who are not studied within the same population" (p 91). Random sampling not only maximizes external validity, but also supports statistical conclusion validity if enough people are randomly sampled, the power is sufficient, and the magnitude of the effect size of interest is ascertainable. Shadish et al. (2002) mention how formal probability sampling specifically benefits research using questionnaires. In fact, they suggest that nonexperimental research, such as research using questionnaires, although limited with respect to internal validity, evidences a clear advantage over experimental research in terms of generalization (external validity). They argue, "In their favor, however, the data generally used with nonexperimental causal methods often entail more representative samples of constructs than in an experiment and a broader sampling scheme that facilitates external validity. So nonexperimental methods will usually be less able to facilitate internal validity but equally or more able to promote external or construct validity" (p. 99).

The Incidence and Reported Treatment of Nonresponse Error in IS Journals

We argue that the response rate of questionnaires reported in leading IS journals tends to be too low for unbiased parameter estimation, disregarding the jointly compounding effect of sampling error, coverage error, and measurement error. Often the justification for the low response rates is that other IS studies also report low response rates.

To demonstrate that there is, in fact, a problem, we first present the response rates reported in six well-regarded IS journals and summarize how nonresponse error was estimated and dealt with in published IS research. Later, we calculate the impact of low response on the confidence interval and then describe three approaches to dealing with low response rates.

We chose: (1) Journal of AIS (JAIS), (2) Information Systems Research (ISR), (3) Management Information Systems Quarterly (MISQ), (4) European Journal of Information Systems (EJIS), (5) Management Science (MS), and (6) Journal of MIS (JMIS). We focused on the journals' recent publications from 1998 to 2002 (with an exception of JAIS, from 2001 to 2002). Our assumption was that these journals were representative of the way that nonresponse is handled in many IS research studies. Of the studies that used questionnaires as data collection method, one hundred and seven (107) used mail or Internet-based questionnaires, indicating that using questionnaires is still a popular research method. Fully a third of the articles in one journal, (JAIS), used questionnaires as the data collection approach.

Among the selected research in which data were gathered using questionnaires, the average response rate ranged from 22% to 59.4%. More specifically, for JAIS, the average was 22%, ranging from 10.2% to 37%; for ISR, the average was 42% ranging from 7% to 93.3%; for MISQ, the average was 38.5% ranging from 5.7% to 100%; for EJIS, the average was 29.3% with a wide range from 3% to 100%; for MS, the average was 59.4% with a range from 38.1% to 88%; and for JMIS, the average was 37.8%, ranging from 16% to 86%. The number of rounds that questionnaires were sent out (including post card, reminder letter), average number of questionnaires sent, average number of questionnaires returned, and the nonresponse statistical estimating methods are summarized in Table 1. In approximately a third to four-fifths of the studies across the six journals, no attempt was made to assess nonresponse error. This is consistent with the findings of King and He (2005).

Our findings about response rates are similar to those reported by Pinsonneault and Kraemer (1993). They were especially concerned about low response rates and the failure to test for nonresponse error. Ninety of the 122 different studies that they reviewed (i.e., 74 percent) "either did not report the response rate or had a rate below 51 percent, which is considered inadequate in the social sciences" (Pinsonneault and Kraemer, 1993: 94). Ninety percent of the studies in their examination neither reported nor tested sample bias. While King and He (2005) found much greater reporting of response rates (i.e., in 80% to almost 90% of the articles they studied), but they found response rates as low as 7.8%.

In the decade following the publication of the Pinsonneault and Kraemer study, we find that low response rates still persist in published IS research. Response rates in the 17%-28% range are described in a variety of ways in articles published in IS journals as: "reasonable" (Jarvenpaa and Staples, 2001; Ravichandran and Rai, 2000), above

Table 1: Summary of Mail Survey Studies in IS Journals

	JAIS	ISR	MISQ	EJIS	MS	JMIS
Overall number of articles	27	123	103	154	733	190
Number of articles with questionnaires (mail/Internet)	9 (7/2)	19 (15/4)	24 (23/1)	18 (18/0)	5 (5/0)[f]	32 (30/2)
Articles with calculated response rate	8[a]	19[b]	21[a,c]	16[d]	5	30[e]
Average usable response rate (min and max)	22% (10.15% - 37%)	42% (7% - 93.3%)	38.5% (5.7% - 100%)	29.3% (3.0%-100%)	59.4% (38.1%-88%)	37.8% (16% - 86%)
Average number of surveys sent	1876	625.3	750.8	1347.3	691.4	680.0
Average number of surveys returned	323	190	242.6	217.4	283	187.6
Number of rounds	2 rounds – 6	1 round – 12 2 rounds – 4 4 rounds –1 Not clear – 2	1 round - 19 2 rounds - 3 Not clear – 2	1 round-15 2 rounds-1 3 rounds-1 4 rounds-1	1 round-2 2 rounds -3	1 round - 25 2 rounds-6 3 rounds - 1
Approaches to assessing nonresponse error (Note: some researchers used multiple approaches)						
Comparison of early vs. late	5	3	1	3	1	8
Comparison of sample with population demographics	2	3	1	3	1	2
Other	Assumed rate was high enough that no comparison needed – 2.	Quota sampling – 1. Compare with status from previous study – 1.	Compare round 1 with round 2 non-respondents- 1. Phone call non-respondents – 1.	Compare round 1 with round 2—1; Compare respondents with non-respondents' characteristics -2.	Sponsor evaluated differences – 1	Compare respondents with non-respondents' characteristics -6. Phone call non-respondents – 2
None mentioned	3	12	20	11	3	19
Percentage of articles making no mention of response error	33% (3/9)	63% (12/19)	83% (20/24)	61% (11/18)	60%(3/5)	59.3% (19/32)

Table 1: Summary of Mail Survey Studies in IS Journals

	JAIS	ISR	MISQ	EJIS	MS	JMIS
assessment						
Approaches to improving the response rate (Note: some researchers used multiple approaches)						
Follow-up reminders	Email –2 Letter – 2 Not specified – 1	Letter – 3 Postcard - 3 Phone call (randomly-selected non-respondents – 1	Letter - 1 Phone call –2 E-mail –2 4 rounds of mailings –1	Pre Phone Call—1,	Pre phone call-1 Mailing - 2	Letter –3 Postcard - 1 Phone call -3 E-mail-1
Incentives	Phone cards offered to early responders –1. Monetary Incentive -1	Mentioned but unspecified -1. Monetary Incentive-3	Opportunity to participate in small cash drawing – 1. $1 and offer of survey results – 1.		None	$100 prize pool – 1. Sent questionnaire results and pack of coffee – 1.
Other	Those with missing data were asked to complete items –1.	Multi-round precontact – 1. One page faxed invitation – 1. Questionnaire mailed to another in following round – 2.	Invitation – 1. Organizational contact –2 . 8 follow-ups with contact Worked with organization to get 100% participation – 1.	Multi-round-4, Organization Support – 1	Sponsors Letter-1 Organization Support-1	Worked with buyer organization when contacting suppliers – 1. Organizational contacts – 3. Invitation - 1.
None mentioned	2	7	13	12	2	22
Percentage of articles making no mention of attempts to improve response	22% (2/9)	36.8% (7/19)	54% (13/24)	67% (12/18)	40%(2/5)	69% (22/32)

a – in remaining article(s), response rate not calculated, but could be calculated from data provided.
b – in two articles calculated rate could not be replicated.
c - a third article had a 100% response rate.
d – in two articles, rate not calculated.
e – includes one article using same data set as another article.
f - only IS articles were included

average for such surveys (Wright, Chaturvedi, Mookerjee and Garrod, 1998), or consistent with those obtained in similar studies (Christiaanse and Venkatramen, 2002; Ravichandran and Rai, 2000). This is consistent with the practice of justifying response rates by citing other articles with lower response rates (Roth and BeVier, 1998).

The response rate that every researcher should pursue is 100%. In reality, few researchers enjoy such a high figure. Standards for return rates abound, usually centering on 70% or 80%. For example, the Office of Management and the Budget, the department responsible for devising and submitting the President's annual budget proposals to the U.S. Congress, requires all federally financed surveys to reach a response rate of 80% (Dennis, 2003). It should be observed, however, that an 80% return suggests that 1/5th of the population failed to respond. Thus, accurate parameter estimation with an 80% return should still be a concern. Inferences made even under this otherwise auspicious condition for the applied researcher should be interpreted with due respect to the limitations. Add to that the compounding problems of sampling error, measurement error, and coverage error. If the scores from the collected questionnaires have a .80 reliability, and the response rate is .80, the researcher has a situation where the observed scores explain only 80% of the variance of the true scores for only 4/5^{ths} of the population of interest.

Babbie (1990) suggested that a response rate of 60% is good; 70% is very good. Again, these are rules of thumb that ignore the compounding effect of sampling, measurement, and coverage errors. Average mail survey response rates in marketing and human resource management/organization behavior are moderately high (48.8% and 51%, respectively) (Yu and Cooper, 1983; Roth and BeVier, 1998). In his review of 175 management studies, Baruch (1999) reported an average response rate of 55.6%. However, in his review of surveys of small business respondents, Dennis (2003) found that response rates hovered around 30%. The average response rate in four of the six journals we surveyed is below 40%. As indicated earlier, in some published IS research, response rates dip below 10%. At this point it would be helpful to illustrate the effect of nonresponse on survey results.

An Illustration of the Effect of Nonresponse Rate Error on Survey Results

Nonresponse introduces substantial error into survey estimates when the number of non-respondents is large relative to the sample size and when non-respondents differ greatly from respondents. Cochran (1977) indicated that nonresponse error, as shown in the following equation, is a function of both nonresponse and the mean difference between respondents and non-respondents with respect to the variable being estimated.

NRB = NR*($\overline{X_1}$ - $\overline{X_2}$), where
NRB = nonresponse error,
NR = nonresponse rate,
$\overline{X_1}$ = the average response of respondents to the variable in question,
$\overline{X_2}$ = the hypothetical average response of non-respondents to the variable in question.

Unfortunately, methods for estimating $\overline{X_2}$ for continuous variables are unsatisfactory. So, it is preferable, for illustrative purposes, to portray the bias evident in the estimation of proportions. Proportions are widely used in polls to show, for example, how many people support or do not support policies and political figures. The elements of this illustration are drawn from Cochran (1977), although amplified with a summary of simulated results and a minor adjustment to his equations.

Theoretically, it is not clear how much nonresponse error could be reduced if the response rate were increased from 10% to 20 % or from 60% to 70%. Cochran (1977) recommended calculating the potential maximum amount of bias in a sample of proportions given certain equations. The results of these equations provide a sense of how large the bias could be in situations where nonresponse is a problem. It is important to note that Cochran's equation assumes an infinitely large population. Because researchers using questionnaires often work with finite population sizes, we adjusted Cochran's equation using a weighting factor found in equations presented in Scheaffer, Mendelhall, and Ott's (1995) text. In particular, we adjusted Cochran's equation for the upper (Pu) and lower (P_l) limit of the 95% confidence interval around the observed sample proportion between 0 and 1, as follows:

$$P_l = W_1\left(P_1^a - 2\sqrt{\left(p_1^a(1-p_1^a)\Big/(N_1-1)\right) * \left(\frac{N-N_1}{N}\right)}\right) + W_2(0) \quad (1)$$

$$P_u = W_1\left(P_1^b + 2\sqrt{\left(p_1^b(1-p_1^b)\Big/(N_1-1)\right) * \left(\frac{N-N_1}{N}\right)}\right) + W_2(1) \quad (2)$$

where,
W_1 = response rate in the population,
W_2 = nonresponse rate in the population,
N_1 = sample size,
N = population size, and
P_1 = sample proportion being estimated (a, b superscripts indicate the Upper and Lower level).

For the purpose of this example, assume the proportion is .50. Using equations (1) and (2), we build a table (Appendix I) to demonstrate the upper limit, the lower limit, and its 95% confidence interval in the combinations of nonresponse rates (i.e., .10, .15, .20, .30, .35, .40, .45, .50, .55, .60, and .65) and sample sizes (i.e., 1000, 500, 200, and 50).

In summary, Appendix I shows that the range of the 95% confidence interval (CI) for different sample sizes and response rates. The relationships between CI and the other two variables (sample size and nonresponse rate) are further illustrated in the following figures. (These figures were developed based upon the results shown in Appendix I.)

Figures 1 and 2 are based upon our formulations to estimate the upper and lower level of the CI. Figure 1 shows the relationship between the CI and response rate when the sample size is 1000 and the sample portion is 0.1. Figure 2 shows that with any fixed nonresponse rate point, the CI increases linearly. Thus, with the same response rate, the smaller sample has a bigger CI. Combining what we learn from Figures 1 and 2, we conclude that small sample size and low response rate can be problematic. Further, the problem is compounded when both exist simultaneously.

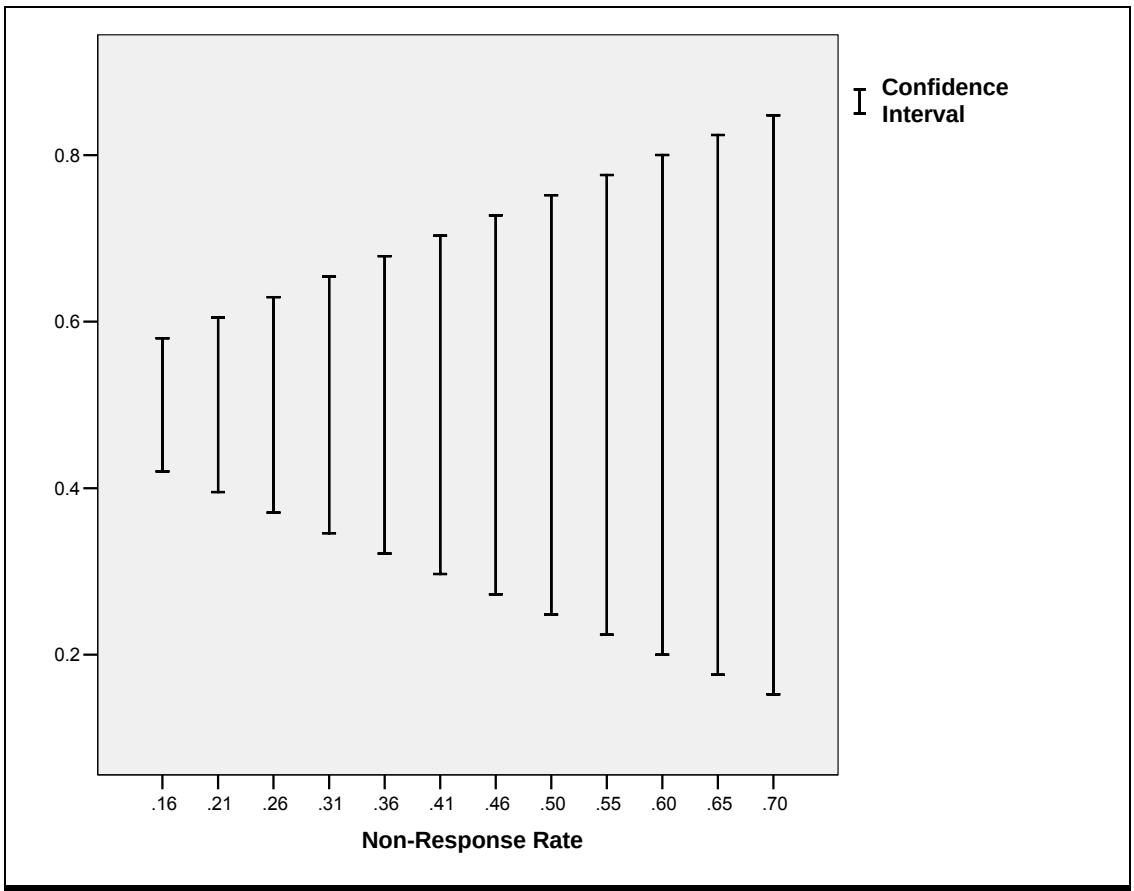

Figure1: Confidence Interval (CI) Range vs. Nonresponse Rates

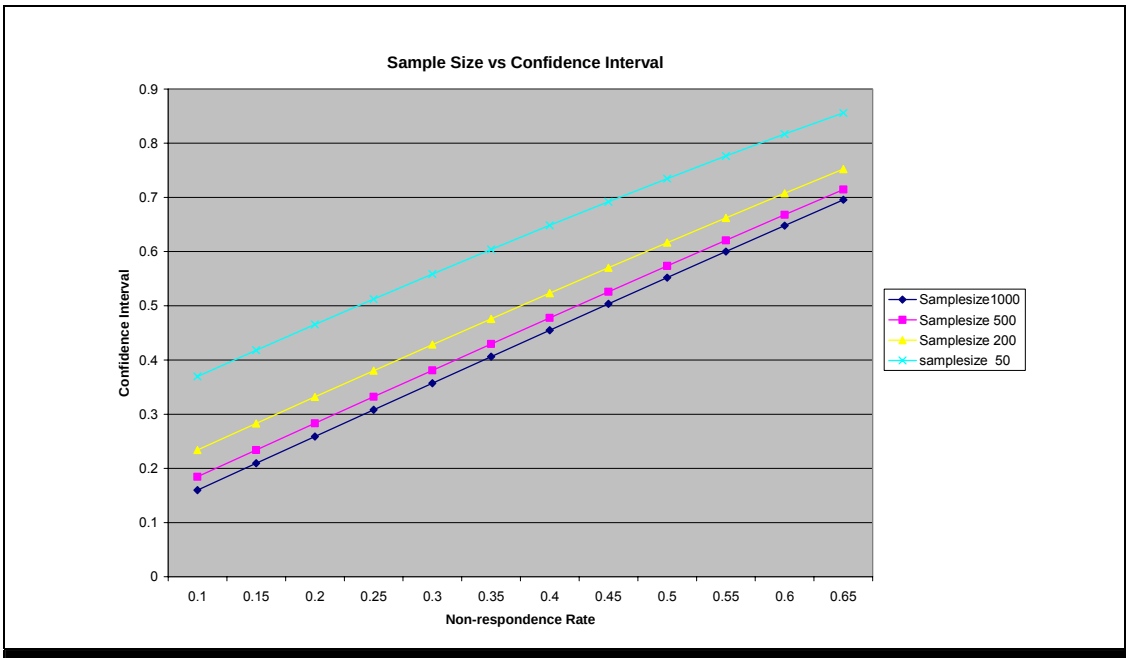

Figure 2: Nonresponse Rate vs. Confidence Interval (CI) Range

So what's an IS researcher to do in addressing the problem of nonresponse? Approaches to treating nonresponse error may be classified under two headings: post hoc and a priori. We discuss three post hoc strategies and three a priori strategies. The post hoc strategies attempt to estimate the ill effects of nonresponse error, and, if possible, statistically reduce the errors associated with nonresponse error. The a priori strategies involve working with associations and management in participating organizations, and using the empirically tested Tailored Design Method (TDM) as a means of increasing response rate (Dillman, 1999) in combination with the determination of the sample size requirements for a study.

Post Hoc Strategies Employed by IS Researchers to Estimate Nonresponse Error

Three methods are used frequently to examine nonresponse error through post-survey adjustments: (1) Comparison of demographic and socioeconomic difference (CDSD), (2) Comparison of early and late respondents difference (Linear Extrapolation) (CELRD), and (3) Weighting adjustments (WA).

Comparison Of Demographic And Socioeconomic Difference (CDSD)

This method compares the respondents' age, income, education, gender, occupation, and working experience with those of non-respondents (or target population). At an organizational level, the size, revenues, industry, and other key demographics of the non-responding organizations are compared with the responding ones. The underlying assumption is that the demographic and socioeconomic variables have the same or a similar distribution in the sample of non-respondents as those that are measured in mail and Internet-based questionnaires returned. This method is used to good advantage when the target population characteristics are known. However, some researchers argue that the demographic or socioeconomic variables of non-respondents do not necessarily match the examined variables (Filion, 1976; Frank, 1969; Lubin, 1963; Robins, 1963). Another concern about using this method is that when a difference between respondents and non-respondents is found, no method has been suggested to fix this potential bias. From Table 1, we find this method used in only 12 of the 107 IS studies that we analyzed.

Comparison of Differences between Early and Late Respondents (Linear Extrapolation) (CELRD)

The underlying assumption of CELRD is that late respondents are similar to non-respondents. There are two types of late responses: those that arrive later within in the same wave, and those that arrive in later waves. In the first situation, comparing the variances between early and late results is a way of estimating the direction of nonresponse error. In the latter situation, Filion (1976) argues that late "resistance" is linearly related and can be estimated with regression techniques. The advantage of this approach is that data from other sources is not needed, unlike the CDSD method. The risk is its underlying assumption that the later respondents are similar to non-respondents.

Nevertheless, the comparison between early and later respondents method is often used in the IS field. In our sample, 21 studies attempt to test for nonresponse error by comparing early with late respondents. However, many of these studies compare their early respondents with later respondents from the same wave (i.e., only one questionnaire round is administered), and the distinction between the early and the later respondents is arbitrary (e.g., 1 month vs. 2 months). The authors provide no clear justification to distinguish early respondents from later ones, other than citing Armstrong and Overton (1977). However, most of these studies do not appear to apply the rigor described in the Armstrong and Overton (1977) article.

Other researchers suggest that multiple rounds of mailed questionnaires are more suitable for distinguishing early and late respondents. In a multi-wave case, the underlying assumption is that later respondents demonstrate characteristics similar to non-respondents: the respondents in different waves not only reflect temporal differences but also their psychological behaviors. An alternative is to use the number of days it takes to respond in comparing early with late respondents (King and He, 2005).

Weighting Adjustment (WA)

In an ideal situation, the researcher persuades non-respondents through follow-up contacts to participate in the mail survey. However, this approach is often prohibited by cost, time, and the lack of access to non-respondents. An alternative proposed by Fuller (1974) is to access a subset of non-respondents and estimate "non-respondent" error accordingly. The advantage of this method is that it allows a statistical follow-up based on sampling non-respondents.

The problem is that engaging a non-respondent using a mode different from the original mode used with the people who *did* respond leads to the responses that cannot be compared to original responses with any certainty. It is well established that different modes of surveying elicit different answers from the same respondents (see Dillman, 1999, pp 217-244). Hochstim (1967) found that respondents regularly provided more positive health assessments to interviewers than by questionnaire. Dillman and Tarnai (1991) found that significantly more respondents said "Never" to the question of whether they ever drank alcohol and drove a vehicle when they were asked by telephone rather than by questionnaire. These findings are consistent with those found in numerous other studies (e.g., de Leeuw, Mellenbergh and Hox, 1996; Hippler and Schwartz, 1987; Schwartz, Hippler, and Noelle-Neumann, 1992; Dillman, Sangster, Tarnai, and Rockwood, 1996; Aquilino, 1994). Non-respondents effectively become respondents who have responded to a different mode, and so the modal differences make statistical corrections questionable. In summary, researchers who contact non-respondents in a way different from that of respondents, and then attempt to extrapolate from these data for the purpose of determining how similar non-respondents are to respondents, must be cautious in interpreting their results.

A further challenge related to contacting non-respondents is that researchers must have a relatively large number of responses in the "non-respondent" subset survey to maintain the validity and reliability of the subset sample. Unfortunately, it is well known that these "non-respondents" are, by definition, less likely to respond. Thus, researchers may still face the question of nonresponse error in the non-respondents survey results (King and He, 2005). The good news is that Weighting Adjustment may partially adjust the original bias.

King and He (2005) also recommend a similar "intentions approach" to assessing nonresponse error by comparing the attitudes of those not intending to respond with those who do intend to respond. In multi-organizational survey contexts, this approach approximates asking nonrespondents to give reasons for their failure to respond.
We found no published research in the six IS journals adopting the Weighting Adjustment method to estimate the potential nonresponse error. However, three studies (Ravichandran and Rai, 1999-2000; Ravichandran and Rai, 2000; Hoxmeier, 2000) did follow up with non-respondents on phone in order to compare major characteristics of respondents and non-respondents and to ascertain the reasons for not responding. If there is no significant difference between the demographics of the respondents and non-respondents, it can be argued that no response error exists. However, this is predicated upon a *randomly* selected sample of non-respondents responding.

A Priori Strategies for Minimizing Nonresponse: Shifting from "Effects" of Survey Error to the "Causes" of Survey Error

Earlier researchers focused on estimating and remedying nonresponse through post-survey adjustments such as those described above. How to prevent (or at least reduce) the potential low response rate (nonresponse) error in the first place was not addressed. More recently, researchers have adopted an approach that focuses on how people decide whether or not to take part in surveys (Tourangeau, 2003). For example, Groves, Couper, and their colleagues develop detailed theories about the sources of nonresponse (e.g., Groves, Cialdini, & Couper, 1992; Groves and Couper, 1998; Groves, Singer, & Corning, 2000). These theories focus on why nonresponse occurs – on who is likely to be hard to reach, on how to extend the interaction with potential respondents, and on how interest in the topic affects willingness to take part in a survey. Based upon these proposed theories, there are numerous reports on methods to increase survey participation – for example, monetary incentive, stamped return envelope, university sponsorship, follow up, pre-contact, questionnaire characteristics, follow-up postcard, colored paper, first class outgoing postage, anonymity, appeals, and length.

Compliance Principles

Cialdini (1988) specified six compliance principles for designing a survey study, including: (a) *Reciprocation*: people are more willing to comply with a request to the extent that it constitutes the repayment of a perceived gift, favor, or concession (Gouldner, 1960); (b) *Consistency*: after committing oneself to a position, one is more willing to comply with requests for behaviors that are consistent with that position (e.g., a respondent has verbalized those commitments before the request for participation) (Festinger, 1966); (c) *Social Validation*: people frequently use the beliefs, attitudes, and actions of similar others as standards of comparison for their own beliefs, attitudes, and actions (Festinger, 1962), that is, individuals are more willing to comply with a survey request to the degree that they believe that similar others would comply with it; (d) *Authority*: people are more likely to comply with a request if it comes from a properly constituted authority (Bickman, 1971); (e) *Scarcity*: people are more willing to comply with requests to secure opportunities that are scarce (Mazis, 1975); and (f) *Liking*: people are favorably inclined toward those individuals that they like -- they are more willing to comply with the requests of liked others, such as sponsoring organizations.

In our review of IS research, a number of IS researchers incorporate these techniques into their study. Tan and Teo (2000) promised $2 phone cards to the first 300 respondents of a web-based survey. Incentives included in mail survey packets were a dollar bill (Segars and Grover, 1998) and a pack of coffee (Ravichandran and Rai, 1999). Other researchers allowed respondents to participate in a drawing (Jarvenpaa and Staples, 2001; Bhattacherjee, 2001). With the exception of the Segars and Grover survey using dollar bills and reporting a response rate of 47.63%, these incentives yielded disappointing response rates in the 12.2% through 27% range. This is consistent with past studies that failed to find a significant increase in response rates when incentives were provided (Roth and BeVier, 1998; Yammarino, Skinners and Childers, 1991).

More consistently effective approaches include working closely with associations (Palmer and Markus, 2000) or with the major buyer of various supply firms (Hart and Saunders, 1998[2]), yielding response rates of 40% and 63%, respectively. Other researchers worked with CEOs (Sabherwal and Chan, 2001) or key managers (Jiang, Klein and Carr, 2002; Barki and Hartwick, 2001; Banerjee, Cronan and Jones, 1998; Sethi, and King 1999; Jiang and Klein, 1999) to encourage participation ranging from 60% to 93%.

Combining the Tailored Design Method (TDM) and Sample Size Determination: An Ounce of Prevention

Why not use a field-tested survey methodology that minimizes nonresponse while targeting only the number of people needed for the population in question so that the researcher can reach out to them in a more personal manner? In this section, we discuss the Tailored Design Method (TDM) and methods for determining sample size.

Tailored Design Method (TDM)

Ideally, it would be instructive to design a survey study to explore the extent to which various factors impact participation and the level of survey response. However, in a self-administered questionnaire, many conditions may not be controlled by the researchers, including the target populations' beliefs and attitudes, the sponsoring organizations, and the nature of the questionnaire. To account for these uncontrollable factors, a methodology called Tailored Design Method (TDM) has been proposed to reduce the refusal rates in surveys (Dillman, 1999). So widely recognized is the efficacy of his strategy that it is readily identified by the acronym TDM.

The backbone of Dillman's Tailored Design Method (1999) is its use of five necessary elements: (1) a respondent-friendly questionnaire, (2) a five-contact strategy, (3) a return envelope with real first class stamps, (4) personalized correspondence, and (5) token prepaid financial incentives. For IS researchers using e-mail or web-based surveys, obviously the return envelope may be disregarded. Regarding the multiple contact element, Dillman stresses the importance of contacting people each time using a

[2] Hart and Saunders (1998) also used a multi-mode approach to increase a higher response rate for their questionnaire surveys. Before they sent out the questionnaires, they conducted structured interviews and gathered sensitive information from suppliers of two major buyers. They used the interviews as an opportunity to ask for further participation in the study and to encourage interviewees to complete a questionnaire.

different tone of voice and method of delivery. Multiple contact strategies, in general, have proven very effective in minimizing nonresponse, regardless of whether administered by mail, e-mail, or the Internet (Dillman, 1991; Heberlein and Baumgartner, 1978; Linsky, 1975, Schaefer and Dillman, 1998; Scott, 1961).

Dillman (1999) adopted social exchange theory as the governing framework for TDM and questionnaire construction (for more on social exchange theory, see Goyder, 1987). In the end, his application of social exchange theory to TDM suggests that people are more likely to respond when they can trust that the perceived benefits of completing a questionnaire outweigh the costs. In TDM, Dillman identifies multiple ways to build trust with the respondent, maximize respondent benefits, and minimize respondent costs. For example, Dillman (1999) suggests that working with sponsoring organizations builds trust in that it validates those values of the individual supported by that organization (a benefit) making the time sacrificed responding to the questionnaire (a cost) worth the effort. TDM is described in more detail in Appendix II.

In the first edition of his original text (1978), Dillman listed 48 mail surveys that used TDM with response rates ranging from 58% to 92%, with an average of 74%. Of all these surveys, those that carefully followed TDM had return rates, on average, of 77%.

Using the multiple contact approach recommended in TDM, Schaefer and Dillman (1998) obtained comparable response rates for regular mail and e-mail questionnaires (57.5 percent and 58 percent, respectively). They found that adding a paper element into the mixed-mode e-mail study eliminated coverage error. Hence, they suggested three modifications to the TDM approach originally designed for mail surveys: (1) use paper contacts when e-mail contacts are not possible; (2) send replacement questionnaires with each subsequent e-mail contact; and (3) include a return mailing address in case respondents want to respond on a copy of the questionnaire that has been printed out.

Dennis (2003), in a partial test of TDM, found that the form prescribed by Dillman did not yield significantly higher response rates when compared to a form typically used by the sponsoring organization. A more effective Dillman prescription (supported by other researchers) appears to be working with sponsoring organizations, because doing so builds trust and validates those values of the individual supported by that organization (Dillman, 1999, p. 20). Moreover, certain critical factors in Dillman's TDM approach have consistently been linked to higher response rates: follow-ups/reminders/repeated contacts (Yammarino, et al., 1991; Roth and BeVier, 1998; Dennis, 2003); stamped return envelopes (Yammarino et al., 1991; Dennis, 2003); relevant questionnaires (Heberlein and Baumgartner, 1978); and the personalization of correspondence and stamped envelopes (Dillman, 1991).

Sample Size Determination

While knowing how to contact people and how to develop questionnaires is vital to a successful survey, it is also very important to minimize the number of people who are needed to respond. Though the studies in our sample did not mention conducting sample size determination prior to starting a survey, such determination has several benefits. These include saving resources (money used for paper and photocopying and personal time) as well as giving the researcher the capacity to contact non-respondents later, perhaps multiple times, in a more personal way. A scientifically drawn sample that is much smaller than the population is more accessible on a personal basis to the

researcher. Consequently, it is more likely that a researcher can give non-respondents the attention needed for a response. This is important because a 90% response from a true random sample of 100 yields more authoritative results than a 50% response from a mass mail out to a population size of 5000. Even though 90 people is far fewer than 2500, the findings for the smaller group are more authoritative assuming that it is a true random sample and that the sample size is sufficiently large to give the study sufficient power to estimate successfully.

Sample size determination for surveys depends in part on the type of research to be conducted. Traditionally, in quantitative research, sample size determination has most often followed strategies such as those advised by Scheaffer, Mendelhall and Ott (1995). However, recent developments in advanced multivariate analysis (specifically, in confirmatory factor analysis/structural equation modeling) has made it necessary for researchers to use alternative methods for sample size determination due to the complexity of the variable relationships being investigated and their problem structure. Below we discuss how to determine the appropriate sample size for traditional research and correlational research, specifically using structural equation modeling.

Sample Size Determination – Traditional Quantitative Research

Scheaffer et al. (1995) discuss several strategies for determining sample size for traditional quantitative research. It should be noted that Scheaffer et al.'s (1995) procedures are based on Neyman/Pearson estimation with confidence intervals rather than Fisherian Null Hypothesis Significance Testing (NHST). Two factors govern which sample size equation should be used: the survey sampling design (simple random, stratified random, or cluster random) and the parameter estimated (e.g., means, totals, proportions). Consider the situation in which simple random sampling is used for mean estimation for a finite population of 5000. The equation is

$n = \dfrac{N\sigma^2}{(N-1)\dfrac{B^2}{4}+\sigma^2}$, where N is the finite population size, B is the desired margin of error, and σ^2 is the population variance.

Subjective judgement is used to determine B, the desired margin of error. It is recommended that one anticipate the questionnaire responses. Estimation of item responses on a 5-point Likert scale may, one might imagine, yield a mean of, say, 2. The question here is how precise a researcher wishes to be. Say that the researcher is comfortable with a margin of error of .2. Then the confidence interval is to be (1.8, 2.2) on that scale. It is important for the researcher to understand that the margin of error chosen implies a critical value, just as the Fisherian NHST would require. For a 95% confidence interval with a sufficiently large sample size, the critical value is 1.96. So the margin of error one chooses is in part the product of this critical value and a subjectively determined standard error.

Determining a population variance to work with before a study is conducted seems illogical at first, unless one can work with a prior estimate of variance from responses from a previous mailing. However, Tchebysheff's (Scheaffer et al.,1995) theorem indicates that even with highly non-normal population distributions, one can estimate the standard deviation for a population to equal ¼ a given range. So, a worse case scenario for a 5-point Likert item can be drafted by using the widest range possible for that scale:

5-1=4. The worse case scenario according to Tchebysheff's theorem (Scheaffer et al., 1995) for a 5-point Likert item's standard deviation is the (5-1)/4 = 1, the square of which yields a variance of 1. Relating this approach to the Fisherian NHST approach to sample size determination, this variance corresponds to the size of an effect of interest in the metric of the variable under consideration. Recalling that the desired margin of error chosen was .2,

$$\text{n} = \frac{N\sigma^2}{(N-1)\frac{B^2}{4}+\sigma^2} = \frac{5000(1)}{(5000-1)\frac{.2^2}{4}+1} = 98.05 \text{ rounded up to } 99 \text{ people}$$

When determining sample size, it is important to round up.

Consider the implications of this result. A mail out of 99 questionnaires is sufficient to represent a finite population of 5000 people. For which group is a 90% response rate more attainable: a sample of 99 people or a population of 5000? Combining the strategic advantage of a random sample with the proven effectiveness of Dillman's five-contact strategy for various populations, the IS researcher is well-disposed to conduct a scientifically viable study. This is because contacting a sample of 99 people multiple times is far easier, and attaining a high response rate therefore more likely.

Sometimes IS researchers are unable to know the size of the population in advance. In these cases, the example provided above should not be used because a finite population size must be identified. This is especially true for web-based surveys, since the companies or organizations with which the researchers are working, may choose not to release information about the size of the population (Lyons, Cude, Gutter and Lawrence, 2003). Nevertheless, a random sampling method exists for situations in which no list of names is available: cluster random sampling. Cluster random sampling offers researchers a different way of, a priori, determining sample size. The researcher in this case works with the foreknowledge of how the people to be surveyed fall into natural clusters (e.g., states, businesses, organizations, schools). For a description of methods such as these, the reader is referred to Scheaffer et al.'s (1995) book.

In other cases, the researchers know the size of the population— and know that it is small. In those situations, the formulas listed above may not be useful. When the population size is small, the simplest strategy to use is to survey the entire population. This is said with the caveat that the population is truly small enough to allow a personalized approach to surveying, as noted before. Otherwise, sampling can be conducted using one of Scheaffer et al.'s (1995) approaches. Researchers can also increase α above its usually low level to increase the statistical power of the study (Baroudi and Orlikowski, 1989).

When the researchers know the size of the sample is appropriate according to its size and truly random nature, concern may arise regarding just how replicable the results are. Given that statistical significance says nothing about replicability (although it is sometimes interpreted as such), the researchers may turn to a strategy capable of suggesting the likelihood results will replicate under conditions where an immediate replication study is impossible. If the sample is a true random sample, one strategy for determining the replicability of the results is bootstrapping. Bootstrapping is a strategy wherein, say, 200 or more samples are generated from the original data and thereafter summarized to assess the likelihood that the results would replicate. To accomplish this all the cases in the sample are treated as eligible population values from which random

samples may be drawn with replacement, each sample composed being of size N, the size of the original sample. Two hundred or more samples are drawn using this strategy and then the results are averaged across samples. The standard deviation of the estimates across samples is treated as the standard error and used as an indicator of just how replicable the results are (note that more complicated calculations of standard errors are also available). Bootstrapping does not allow one to overcome an inadequate sample size, because if the statistics used lack power with the original sample, the same statistics will lack power when applied to every bootstrapped sample, and an average of the statistical results will indicate replicability under the condition of inadequate power—not much help. Likewise, bootstrapping will not overcome error in a sample (by nonresponse or some other factor) because the bootstrapped samples will be biased as well.

Sample Size Determination – Advanced Correlational Research

Sample size determination in advanced correlational research methods such as confirmatory factor analysis (CFA) or structural equation modeling (SEM) involves the use of methods different from that of Scheaffer et al.'s (1995). The purpose of sample size, again, is to ensure that the analysis in question has sufficient power to detect the intended effects.

Power analysis should be an essential facet of CFA or SEM research (Fan and Sivo, 2005; Gefen et al., 2000; Kaplan, 1990; Lei and Dunbar, 2004; Muthen and Muthen, 2002; Saris and Satorra, 1993; Sivo, Fan, Witta, and Willse, 2006). Without evaluating power, it cannot be known whether CFA or SEM model fit results are trustworthy, regardless of the outcome.

By definition, power is the probability of rejecting a false null hypothesis. Treating the specified structural model as one collective hypothesis, power in SEM may be seen as rejecting a false null model, where power is computed as the probability that, under a noncentral χ^2 distribution, the observed chi-square (χ^2_{obs}) is greater than the critical chi-square (χ^2_{crit}) at some α level (customarily .05). The noncentral distribution must be used when it is assumed that the null hypothesis is not true (i.e., the condition under which the power to reject a false null hypothesis is applicable and therefore testable). As the expected value of the central χ^2 is its degrees of freedom, the expected value of the noncentral χ^2 is the sum of its degrees of freedom and a value called the noncentrality parameter (λ). Power may be determined once the noncentrality parameter (λ) is calculated via $Pr(\chi^2_{obs} > \chi^2_{crit} \mid \chi^2_{df}, \lambda)$, the probability that the observed χ^2 is greater than the critical χ^2 given the χ^2 degrees of freedom (df) and noncentrality parameter (λ). The χ^2 difference statistic is adjusted by a noncentrality parameter to reflect that, in the population, the accompanying effect is not zero (Kline, 1998)

Although most researchers agree that it is important to report power, it is rarely even addressed in the applied CFA or SEM literature. One explanation may be that no single approach to power enjoys popular support. Indeed, the number of strategies seems to be proliferating due to a lack of consensus on which strategy is optimal and broadly applicable. Empirically derived power, as suggested by Muthen and Muthen (2002) can be computationally intensive, but as the fruit of a Monte Carlo study, it may serve as a useful litmus test by which analytically derived methods can be evaluated. Indeed, the comparison of power derivations with the results of a Monte Carlo study was deployed by Satorra and Saris (1985) as a means to demonstrate the accuracy of their power

derivation. Satorra and Saris' chief contribution was to prove how the noncentrality parameter (λ) in the context of SEM could be approximated by the likelihood ratio test (χ^2_{obs}). After presenting their proof and finding support for their derived power method through a Monte Carlo study, they endeavored to promote their power method, not the simulation method, because their power method was easier to accomplish in practice. A SAS program that computes power using Saris and Satorra's (1993) procedure is provided as an example in the Appendix III.

But it appears that Satorra and Saris' (1985) method for calculating power may not be considered easy enough because MacCallum, Browne, and Sugawara (1996) later offered an easier method where power in SEM is defined in terms of the RMSEA coefficient instead of the χ^2. The RMSEA is a statistic with a known distribution routinely reported in SEM program print outs, and so, may be used easily by practitioners for calculating power. Unlike the Satorra and Saris (1985) method for calculating power, the MacCallum et al. (1996) strategy circumvents the need to specify an alternative model. Only an alternative RMSEA value is needed. Perhaps one hope of MacCallum et al. (1996) was to develop a power method more accessible to practitioners. We refer the reader to their work for further information and a SAS program capable of determining sample size. We also refer the reader to Gefen et al. (2000), who suggest examining the ratio of χ^2 to degrees of freedom. They note that the IS literature is rather lenient in recommending a ratio less than 3:1.

When a researcher is fitting confirmatory factor models or structural equation models to item covariance data and the number of variables considered makes the sample size too small to represent the population, item parceling may be considered as a strategy for improving the condition for power. Item parceling is a method whereby N items on a measure are divided into P groups (parcels) such that each group (or parcel) consists of two or more items that are to be summed. The sum of each group of item responses for each person is treated as the revised unit of analysis, fewer in number than the total number of items on the measure. We are assuming here that items are exchangeable across groups, as all items in question are theoretically measuring the same property. Since there are too many of them, they are summed into parcels. (Note that this is not the purpose of item parceling in general, but item parceling can be used to this end.) This use of item parceling has the effect of recreating a covariance matrix of smaller dimensions suiting the sample size. Assumptions for this procedure include (1) the sample was randomly drawn, (2) the sample is not biased (by nonresponse or some other factor), and (3) the item data are unidimensional. Regarding the last issue, Bandalos (2002) indicated that while item parceling can minimize the effects of nonnormally distributed item data, the practice of parceling is truly problematic, leading to deceptive results when it turns out that items to be parceled are indeed multidimensional. Likewise, Little, Cunningham, Shahar, and Widaman (2002) affirm that before using parcels researchers must study very closely the characteristics and dimensionality of the items to be parceled. Parceling multidimensional items can lead to unknown model misspecification otherwise recognizable at the item level.

Relating this to the issue of sample size, can item parceling be a useful alternative when sample size is too small? Based upon the previously mentioned research, the answer is no. If the sample size is too small for analysis at the item level, then how can the researcher be assured that the most important condition permitting item parceling is present: unidimensionality? If the sample size is too small for analysis, then

investigation into the possibly multidimensional character of the data is precluded, a problem that Little et al. (2002) and Bandalos (2002) indicate must be ruled out before proceeding to parceling.

Issues Concerning External Validity and Statistical Conclusion Validity

In discussing combining TDM with sample size determination, we assume that the resulting sample is a true random sample (where everyone in the population has an equal chance of being selected) and that the sample size is sufficiently large to give the study sufficient power to estimate successfully. The size of the sample is also important for determining statistical conclusion validity. [3] *Statistical conclusion validity* is concerned with whether the presumed cause and effect covary, and is determined by effect size, significance level, and sample size. One of the major threats to statistical conclusion validity is low statistical power. When low statistical power is present in a study, the probability of incorrectly accepting the null hypothesis increases. Thus, the sample size must be adequate to give the study sufficient power to provide statistical conclusion validity.

The relationship between sample size and external validity is complex. On one hand, increasing the sample size may not lead to higher external validity if the sample is biased. A study may actually have higher external validity by having random samples in smaller sample sizes rather than having biased samples in larger sample sizes. That is why we suggest an approach to sample size determination above, with the understanding that adequate sample size is a necessary, but not sufficient condition for external validity, as many other factors are involved as well.

On the other hand, we argue that external validity may be enhanced by increasing the sample size as a result of paying more attention to response rates. In this case, having a larger sample may make it easier to generalize across the population. We acknowledge, though, that external validity may be achieved through variations in persons, settings, treatment variables, and measurement variables, and not necessarily through larger samples sizes. Tradeoffs must be made when considering these sources of variation. For example, there has been considerable debate about tradeoffs that must be made in internal, construct and external validities (e.g., Lynch, 1982, 1983; Calder et al., 1982, 1983). Further, having a smaller random sample from some larger population might not be a better theoretical test than employing a larger convenience (e.g., student) sample, so long as we carefully delimit what constitutes our population. Since theories are stated on a universal level, a sample is relevant as long as it constitutes a test of that theory. However, when trying to apply the results of IS research, the need for external validity in regard to the representativeness of the sample becomes more important, and the smaller random sample may be more appropriate.

McGrath and Brinberg (1983: 124) suggest that "external validity is not only deeper than 'mere realism,' it is broader than 'mere population sampling,' and much more complicated than merely 'generalizing to' – or even 'generalizing over' – variations in

[3] We are indebted to an anonymous reviewer for bring this point to our attention and providing the basis for our discussion of statistical conclusion validity.

some single feature of the design or sample of an earlier study." External validity plays an important and complex role in the systematic tests of theory. In systematically testing theory, we argue that researchers must make the necessary tradeoffs among internal, external, and construct validity.

Conclusion

Enhancing the validity of IS study inferences is a critical and challenging task for a discipline to prosper. IS researchers have rigorously examined the internal validity-related issues in IS publications (Boudreau, et al., 2001; Straub, 1989). The external validity related issues, however, have not received the deserved attention yet. In this study, we examine a particular cause of external validity: low response rate in mail, e-mail, and web-based surveys. Our admittedly limited review of the literature reporting the use of mail, e-mail and web-based questionnaires to gather data finds numerous studies with alarmingly low response rates reported in five of the six well-regarded IS journals that we surveyed. Do we think that IS researchers and journal editors should be content with the low response rates reported in many of these studies? Our answer is an emphatic "NO." Nevertheless, the challenge of improving response rate is to avoid the potential degradation of external validity. For example, improving response rates by using a 'non-sample' of students may negatively impact external validity (Ray, 1981) -- at least when looking at any given study.

Despite the admonitions of Pinsonneault and Kraemer (1993) over a decade ago, low response rates and inappropriate survey application persist. It still is not unusual to find well-regarded IS journals publishing survey results with response rates in the teens, or lower. Even more troubling, an acceptable justification for these low response rates is that other studies also report low rates, and over half the studies (i.e., 58 of 107) make no attempt whatsoever to even assess the possible implications of the low response rates. Attempts to assess nonresponse error often incorporate the approach of comparing the responses of early respondents with the responses of late respondents in a single-wave survey. This is problematic because it does not apply the more rigorous approach described by Armstrong and Overton (1977) based on comparing respondents in an early wave with respondents in later waves in a multi-wave survey. None of the IS research papers we studied attempted to statistically adjust response error, though three did follow up with non-respondents to see why they did not participate and to compare major characteristics.

Moving Forward

We believe that steps should be taken by IS researchers and journal editors to assure external validity. Since the larger the response rate, typically the smaller the nonresponse error (Chen, 1996), the low response rates that are apparently considered appropriate in our discipline may serve as a signal of potential nonresponse error to IS researchers and journal editors. Reviewers and journal editors should be wary of findings based on low response rates, especially when researchers fail to demonstrate that findings based on low response rates do, in fact, display external validity and a lack of nonresponse error. Further, IS research journal editors should demand from authors a detailed description of attempts to enhance survey response rates and to appropriately assess nonresponse error. They should ensure that problems associated with low response rates are thoroughly addressed in the limitations section.

Table 2: Summary of Recommendations

BEFORE SURVEY	DURING SURVEY	AFTER SURVEY
Apply Tailored Design Method: *Minimize costs* • Avoid condescending language • Avoid embarrassment • Avoid inconvenience • Make questionnaires short and easy • Keep requests similar *Maximize benefits* • Make questionnaire interesting *Build trust* • Provide a token of appreciation (Examples: Segars and Grover, 1998; Ravichandra & Rai, 1999; Tan & Teo, 2000; Bhattacherjee, 2001; Jarvenpaa & Staples, 2001) • Get a sponsor for the survey (Examples: Hart & Saunders, 1998; Palmer & Markus, 2000) • Work with key managers (Examples: Banerjee, Cronan & Jones, 1998; Jiang & Klein, 1999; Sethi & King, 1999; Barki & Hartwick, 2001; Sabherwal & Shan, 2001; Jiang, Klein & Carr, 2002)	Apply Tailored Design Method: *Maximize benefits* • Show positive regard • Say thank you • Ask for advice • Support group values • Give tangible rewards • Give social validation • Inform respondents that opportunities are rare *Build trust* • Make completion of survey seem important (See Appendix IV for examples) Use a mixed-mode approach when using email and web-based questionnaires.	Examine nonresponse error: • Comparison of demographic and socioeconomic difference (CDSD) (Examples: Armstrong & Sambamurthy, 1999; Byrd & Turner, 2000; Palmer & Markus, 2000; Sabherwal & Chan, 2001; Tingling & Parent, 2002) • Comparison of differences between early and late respondents (Linear Extrapolation (CELRD) (Examples: Lee & Grover, 1999/2000; Palmer, Speier, Wren & Hahn, 2000; Jiang, Klein & Discenza, 2002; Jiang, Klein & Shepherd, 2001; Shaw, 2002; Tingling & Parent, 2002) • Weighting adjustment (WA) based on randomly-selected sample of non-respondents
Design survey with compliance principles in mind	Apply Tailored Design Method: 1st contact: dispatch questionnaire 2nd contact (one week later): dispatch reminder 3rd contact: a postcard 4th contact (four weeks after 1st contact): a letter and replacement questionnaire 5th contact (seven weeks after 1st contact): a final letter and replacement questionnaire sent by certified mail (See Appendix IV for examples)	Demonstrate external validity • Theoretical variables are similar to population parameters • Nomological validity
Sample size determination	Sample size implementation	Report • Assessments of nonresponse error • Attempts to increase response rate

In Table 2 we summarize steps that researchers should take before, during, and after the administration of questionnaires to (1) improve the response rates in their studies and (2) assess the impact of nonresponse error in their studies. One strategy for increasing response rates prior to survey administration is to apply the compliance principles (Cialdini, 1998). In our survey of journals, Cialdini's authority principle appears particularly effective. To apply the principle, researchers encourage sponsoring associations and managers in participating organizations to write cover letters and otherwise encourage survey participation. A theoretically-based approach (TDM) for researchers who are interested in enhancing survey participation is also recommended to improve response rates. In addition to the more well-known principles on how to identify the target samples (e.g., sampling techniques) and questionnaire design, the TDM emphasizes the importance of the cover letter and follow-ups with non-respondents to enhance mail survey response rates. We have provided samples of applications of this approach to IS research in Appendix IV. We hope our discussion of TDM and samples of its application will be used in the future by IS researchers to test the effectiveness of this a priori approach to increasing the response rate to questionnaires.

Some TDM researchers found interaction effects when examining different ways of enhancing response rate (Dennis, 2003). However, it might be counterproductive, if not costly, for researchers to mix the many ways described in this paper of minimizing costs, maximizing benefits, and building trust to maximize the response rate. It should be remembered that getting a higher response rate is often a matter of price (Dennis, 2003).

We describe three post-survey methods to examine nonresponse error: (1) Comparison of demographic and socioeconomic difference (CDSD), (2) Comparison of early and late respondents difference (CELRD), and (3) Weighting adjustments (WA). A study with a low response rate should further assure the external validity of its findings by demonstrating that the examined theoretical variables are similar to the population parameters (i.e., either known or obtained from reasonable estimations) (Lynch, 1982), and its nomological validity – that the examined variables are consistent with the theoretical literature (Straub et al., 2004). Finally, it is our opinion that researchers should report how they incorporate these adjustments and external validity tests, as well as any approaches that they employed in their research to enhance the response rate.

Delimitations

We devote considerable discussion to nonresponse errors and sample size, and their impact on external validity. This focus clearly is delimited to certain aspects of external validity. Cook and Campbell (1979) refer to external validity as generalizing across persons, settings, and times.

The most coherent, overall presentation of external validity is by Cronbach (1982). He states that *utos* refers to units of assignment (usually persons) *u,* treatments *t*, observations (usually outcomes) *o*, and settings *s*, achieved in a study. When referring to populations rather than samples, this annotation changes to upper case letters UTOS, where 'U' refers to the importance of varying the *units* of the analysis used to measure a construct (sampling issue) so that findings may be shown robust to the *units* selected; 'T' refers to the importance of varying the levels or types of *treatment*, or planned intervention, affecting the dependent variable so that findings may be shown robust to the levels or types of *treatment(s)* chosen; 'O' refers to the importance of varying the

methods of assessment so that findings may be shown robust to the method used to assess each observation or *outcome*; and 'S' refers to the importance of *setting* so that findings may be shown robust to the *setting,* or larger social context, of a study. Shadish et al. (2002) reflect upon Cronbach's objections to Cook and Campbell's view of external validity and attempt to clear up the issues debated by them by proposing five principles for generalizing. These principles are based upon the UTOS framework.

Our research is delimited to only one aspect of Cronbach's (1982) UTOS - the 'U', or unit of analysis (i.e., responses to a questionnaire from a person or firm). Our research does not address external validity as it pertains to which method is used to assess the outcome (O) of interest. Furthermore, our research does not address external validity as it pertains to which setting (S) is chosen for a given study. We do not consider variations in treatments (T) because research using questionnaires does not have a distinctive focus on experimentation, and so external validity in regard to treatment (T) ordinarily will not be applicable. Questionnaire data are seldom the kind of data collected for experiments. Indeed, the treatment of external validity in the context of experiments is generally more complex, as Shadish et al. (2002) indicate:

> In their favor, however, the data generally used with nonexperimental causal methods often entail more representative samples of constructs than in an experiment and a broader sampling scheme that facilitates external validity. So nonexperimental methods will usually be less able to facilitate internal validity but equally or more able to promote external or construct validity. (p 90).

Future studies pertaining to research using questionnaires may consider evaluating ways of enhancing external validity by varying outcomes and settings. While easy to mention in theory, broadly speaking, the planned variation of outcomes and settings in any kind of research is very seldom treated. Indeed, by comparison, much more development across research methods has been dedicated to matters pertaining to what Cronbach (1982) defines as Units or 'U'. Having said this, notable exceptions exist. For example, treatment of the issue of outcome (O) variation may be found in the Structural Equation Modeling literature through Multitrait Multimethod Models.

Our discussion of research using questionnaires is also delimited with respect to Statistical Conclusion Validity. There are current issues pertaining to Statistical Conclusion Validity not addressed in this article. Of particular relevance in current research using questionnaires are concerns regarding how to treat multilevel modeling for clustered data, missing data imputation (using either an EM algorithm or plausible values derived from the application of Item Response Theory), and the use of sample weights. Moreover, the present study does not address validity issues pertinent to longitudinal data. Research using questionnaires often involves the collection of data on multiple occasions raising a number of concerns pertaining not only to external validity but also statistical conclusion validity (see Sivo and Willson, 1998; Sivo and Willson, 2000; Sivo, 2001; Sivo, Fan, and Witta, 2005).

Taking steps to assure adequate levels of response and appropriately assessing and adjusting for nonresponse error can allow IS researchers to be more confident in their interpretation of research findings. Further, it can signal to other disciplines that IS researchers know how to conduct surveys well. McGrath and Birnberg (1983) argue that while the basic researcher in a field might not need to be concerned with external

validity, the field must. They note, and we wholeheartedly agree, that "fully exploring the external validity of a set of finding requires systematic efforts to verify, extend, and eliminate those findings, by replication and by simultaneous robustness analysis (McGrath and Birnberg, 1983: 124)." We think it is imperative that researchers in the IS discipline systematically work to assure the external validity of their findings. An important step in this direction is being conscious of the problems associated with low response rates and proactively dealing with nonresponse error.

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Appendix I

Nonresponse Bias Range with Different Response Rates and Sample Sizes

Sample portion	Sample Size	Nonresponse rate	P_l [a]	P_u	CI
0.1	1000	0.10	0.420135	0.579865	0.159729
0.1	1000	0.15	0.395325	0.604675	0.209351
0.1	1000	0.20	0.370591	0.629409	0.258817
0.1	1000	0.25	0.345938	0.654062	0.308124
0.1	1000	0.30	0.321368	0.678632	0.357265
0.1	1000	0.35	0.296883	0.703117	0.406233
0.1	1000	0.40	0.272491	0.727509	0.455018
0.1	1000	0.45	0.248196	0.751804	0.503609
0.1	1000	0.50	0.224006	0.775994	0.551988
0.1	1000	0.55	0.199933	0.800067	0.600135
0.1	1000	0.60	0.175988	0.824012	0.648024
0.1	1000	0.65	0.152191	0.847809	0.695619
0.1	500	0.10	0.407744	0.592256	0.184512
0.1	500	0.15	0.383012	0.616988	0.233977
0.1	500	0.20	0.358389	0.641611	0.283222
0.1	500	0.25	0.333880	0.66612	0.332241
0.1	500	0.30	0.309487	0.690513	0.381025
0.1	500	0.35	0.285217	0.714783	0.429565
0.1	500	0.40	0.261077	0.738923	0.477847
0.1	500	0.45	0.237074	0.762926	0.525852
0.1	500	0.50	0.213221	0.786779	0.573558
0.1	500	0.55	0.189531	0.810469	0.620937
0.1	500	0.60	0.166025	0.833975	0.667950
0.1	500	0.65	0.142726	0.857274	0.714547
0.1	200	0.10	0.383087	0.616913	0.233827
0.1	200	0.15	0.358510	0.641490	0.282979
0.1	200	0.20	0.334108	0.665892	0.331783
0.1	200	0.25	0.309885	0.690115	0.380230
0.1	200	0.30	0.285847	0.714153	0.428306
0.1	200	0.35	0.262003	0.737997	0.475994
0.1	200	0.40	0.238364	0.761636	0.523272
0.1	200	0.45	0.214943	0.785057	0.570113
0.1	200	0.50	0.191759	0.808241	0.616481
0.1	200	0.55	0.168835	0.831165	0.662330
0.1	200	0.60	0.146200	0.853800	0.707601
0.1	200	0.65	0.123894	0.876106	0.752212
0.1	50	0.10	0.315153	0.684847	0.369694
0.1	50	0.15	0.291007	0.708993	0.417986
0.1	50	0.20	0.267212	0.732788	0.465576
0.1	50	0.25	0.243777	0.756223	0.512445
0.1	50	0.30	0.220716	0.779284	0.558567
0.1	50	0.35	0.198046	0.801954	0.603908
0.1	50	0.40	0.175788	0.824212	0.648424
0.1	50	0.45	0.153971	0.846029	0.692058
0.1	50	0.50	0.132631	0.867369	0.734738
0.1	50	0.55	0.111813	0.888187	0.776373
0.1	50	0.60	0.091579	0.908421	0.816842
0.1	50	0.65	0.072009	0.927991	0.855982

[a] P_l = lower limit of the proportion, P_u = upper limit of the proportion, CI = Confidence Interval

Appendix II

Short Description of Tailored Design Method

Dillman (1999) identifies multiple ways to build trust, maximize benefits and minimize costs in the context of research using questionnaires. Examples of ***minimizing costs*** include (a) avoiding condescending language, (b) avoiding embarrassment, (c) avoiding inconvenience, (d) making questionnaires short and easy and (e) keeping requests similar to other requests to which a person has already responded. Examples of ***maximizing benefits*** include (a) showing positive regard, (b) saying thank you, (c) asking for advice, (d) supporting group values, (e) giving tangible rewards (even token rewards like pens), (f) making the questionnaire interesting, (g) giving social validation, and (h) informing respondents that opportunities to respond are rare. Examples of ways for ***building trust*** include (a) providing a token of appreciation in advance, (b) sponsoring the research by an authority legitimate to the respondent, and (c) making the completion of the questionnaire seem important.

The elements of minimizing cost, maximizing benefits, and building trust are spread throughout Dillman's (1999) suggestions of how to create questionnaires and contact people. Four distinct phases in TDM are identification of the population, questionnaire design, pre-testing, and administration of the questionnaire. Central to the TDM is a set of complementary techniques to overcome the various reasons why even a well-designed questionnaire is not returned. These are two main instruments in maximizing the response rate: the cover letter and follow-up mailings.

The cover letter commences by stressing the usefulness of the questionnaire, by linking the research with the bodies supporting it, and emphasizing the importance of the study. The second paragraph states who should complete the questionnaire and gives an estimate of the costs implied in completing it. The paragraph ends by offering a reward in some form. The third paragraph establishes trust by promising confidentiality and stating how it will be achieved. Finally, the letter concludes by offering assistance and stating how it may be obtained.

The TDM also suggests that five possible contacts with the target population are needed to maximize response: 1st contact: the dispatch of the questionnaire to all sampled respondents; 2nd contact: one week later – the dispatch of a reminder; 3rd contact: a postcard; 4th contact: four weeks after the dispatch of the questionnaire (a letter and replacement questionnaire); and 5th contact: seven weeks after the dispatch of the questionnaire (a final letter and replacement questionnaire sent by certified mail to emphasize the importance of the response).

Appendix III

Example of Saris and Satorra procedure used in a Structural Equation Modeling Course in the College of Business Administration at the University of Central Florida (Instructor: Stephen Sivo)

```
/*********************************************************/
/*********************************************************/
/*                                                       */
/* This program calculates power using Satorra and Saris  */
/* old procedure. First, a model fixed with the parameter*/
/* values of interest is fit to an identity matrix. The  */
/* Sigma matrix produced in the output will be the       */
/* Population Covariance matrix. Second, the Hypothesized */
/* model (a.k.a, Null model) is fit to the Population    */
/* Covariance matrix obtained in step one. The Chi-square */
/* (i.e., T) is also the noncentrality parameter         */
/* (i.e., lambda). This value, along with the degrees of */
/* freedom for the Hypothesized Model and the associated  */
/* Critical Value at the .05 alpha level are used in the  */
/* last step to calculate power.                         */
/*                                                       */
/* To understand better, play with the Table 8.2 in Saris */
/* and Satorra's 1993 book chapter on power in Bollen &   */
/* Long's text. HAVE FUN!!!!                             */
/*                                                       */
/*********************************************************/
/*********************************************************/

options linesize=80;

DATA POPCOVAR (TYPE=CORR);
    INPUT _TYPE_ $ _NAME_ $ y1-y4;

CARDS;
N    .   150  .   .   .
CORR y01 1.00  .   .   .
CORR y02  .00 1.00  .   .
CORR y03  .00  .00 1.00  .
CORR y04  .00  .00  .00 1.00
;

PROC CALIS COV MOD all;
    TITLE  '***** Original Satorra-Saris Procedure *****';
    TITLE2 'STEP1: Using PARAMETERS to Calculate Pop. Covariances';
    TITLE3 '** N=150, loadings=.70, error var=.51 Phi=.90 **';
LINEQS
    y1  = .70 F1 + E1,
    y2  = .70 F1 + E2,
    y3  = .70 F2 + E3,
    y4  = .70 F2 + E4;        ** .70 is the loading value;
COV
```

```
  F1 F2 = .90;              ** .90 is the Phi value;
STD
  E1-E4=4*.51, F1=1.0, F2=1.0;** .51 is the error variance;
                        ** WHY .51??? 1.00-.49 = .51;
                        ** Each Loading .70**2 = .49;
VAR
  y1-y4;
run;

/*************************************************************/

DATA MODELFIT (TYPE=CORR);
    INPUT _TYPE_ $ _NAME_ $ y1-y4;

CARDS;
N    .  300    .    .    .
CORR y1  1.000  .    .    .
CORR y2   .490 1.000  .    .
CORR y3   .441  .441 1.000  .
CORR y4   .441  .441  .490 1.000
;

PROC CALIS COV MOD all;
    TITLE  '***** Original Satorra-Saris Procedure *****';
    TITLE2 'STEP2: Fitting the H0 Model to Pop. Covariances';
    TITLE3 'The Null is a Misspecified Hypothesized Model';
    TITLE4 'Chi-Square (T) = Noncentrality Parameter (Lambda)';
LINEQS
    y1  = LX11 F1 + E1,
    y2  = LX21 F1 + E2,
    y3  = LX12 F2 + E3,
    y4  = LX22 F2 + E4;
COV
  F1 F2 = 1.0;
STD
  E1-E4=the1-the4, F1=1.0, F2=1.0;
VAR
  y1-y4;
run;

/*************************************************************/

Data Power;

BETA=PROBCHI(5.991,2,3.13); *** .05 CRIT. VALUE, df, Lambda;
POWER=1-BETA;output;

proc print;var BETA power;
       TITLE  '***** Original Satorra-Saris Procedure *****';
       TITLE2 'STEP THREE: Calculating Power';
       TITLE3 ' ';
       TITLE4 ' ';
       RUN;
```

(Note: The long run expected value of the noncentrality parameter in practice is ^{2} - df).

Appendix IV

Examples of Applications of Dillman's Tailored Design Method
By Lascelle Adams, Virginia Ilie, Andy Wu

In this Appendix are three examples of applications of Dillman's (1999) Tailored Design Method (TDM) for Information Systems research. Each example constitutes a TDM set with a questionnaire and the five contact letters recommended by Dillman. The questionnaires were all designed for a mail survey. It would be possible, however, to send the URL link to the web-based survey in the first (or second) contact instead of a mail survey. In the fourth contact the mail survey as shown in each of the examples, as well as the URL to the web-based survey would be sent.

Please observe that all questionnaires are short with a limited number of questions to be answered by each respondent. They are also easy to complete and each questionnaire is designed in such a way that the requests for information use a similar format. There is no condescending language and they are designed to be unembarrassing and as convenient as possible for the respondents. Each ends with a thank you. In his first and second contact letters, Lascelle Adams and Andy Wu both offer a token of appreciation.

The contacts apply the TDM approach:
1st contact: the dispatch of the questionnaire to all sampled respondents
2nd contact: one week later – a reminder
3rd contact: a postcard
4th contact: four weeks after the dispatch of the questionnaire - a letter and replacement questionnaire
5th contact: seven weeks after the dispatch of the questionnaire - a final letter and replacement questionnaire sent by certified mail to emphasize the importance of the response.

I. Caribbean Music Consumer Survey by Lascelle Adams
a. Questionnaire
b. 1st contact
c. 2nd contact
d. 3rd contact
e. 4th contact
f. 5th contact

II. Information Systems Continuance Survey by Virginia Ilie
a. Questionnaire
b. 1st contact
c. 2nd contact
d. 3rd contact
e. 4th contact
f. 5th contact

III. Information Systems Security Survey by Andy Wu
a. Questionnaire
b. 1st contact
c. 2nd contact
d. 3rd contact
e. 4th contact
f. 5th contact

Caribbean Music Consumer Survey

Please read each statement and indicate your answer by marking the appropriate box with an **X**.

START HERE

1. Do you have any Caribbean Music in your music collection?

❑ No ➔(Skip to Question #18)
❑ Yes

2. Do you have any downloaded Caribbean music (MP3 files) from the Internet in your collection?

❑ No ➔(Skip to Question #6)
❑ Yes

3. How would you describe your library collection?

❑ Small (between 1 and 100 files)
❑ Medium (between 101 and 200 files)
❑ Large (between 201 and 300 files)
❑ Very large (between 301 and 450 files)
❑ Gigantic (greater than 450 files)

4. Your library/collection is composed of?

❑ Singles only
❑ Albums only
❑ More singles than albums
❑ More albums than singles

5. On average how many songs/files do you download per month?

❑ Between 1 and 10 files
❑ Between 11 and 20 files
❑ Between 21 and 30 files
❑ More than 30 files

6. Do you have any bootleg CDs in your collection?

❑ No ➔(Skip to Question #9)
❑ Yes

7. Where did you obtain your last bootleg copy?

❑ Record Store
❑ Flea Market
❑ Street Corner Vendor
❑ Friend
❑ Internet
❑ Other _____

PLEASE CONTINUE OVERLEAF

CONTINUE HERE

8. How much did you pay?

❑ Free

- ❑ $1.00 to $5.99
- ❑ $6.00 to $8.99
- ❑ $9.00 to $11.99
- ❑ More than $11.99

9. Have you purchased any or all of the music selections in your collection?

- ❑ No ➔(Skip to Question #13)
- ❑ Yes

10. Where ~~did yo~~u purchase your last CD?

- ❑ Record Store/Storefront
- ❑ Mass Merchandiser (*Wal-Mart, Target, etc*)
- ❑ Electronic Superstore (*Best Buy, Circuit City, etc)*
- ❑ Bookshop (*Barnes & Noble, Borders*)
- ❑ On-line retailer
- ❑ Other _____

11. What was the primary reason for using this source?

- ❑ Price
- ❑ Selection
- ❑ Price & Selection
- ❑ Other _____

12. How much did you pay?

- ❑ $9.99 to $10.99
- ❑ $11.00 to $12.99
- ❑ $13.00 to $15.99
- ❑ More than $15.99

13. What is your primary music collection format? (Please select one)

- ❑ Vinyl
- ❑ Cassette tapes
- ❑ CD
- ❑ DVD
- ❑ MP3 files
- ❑ Vinyl, cassette and CDs
- ❑ CDs and DVDs
- ❑ CDs and MP3 files

PLEASE CONTINUE ON NEXT PAGE

⇨

CONTINUE HERE

14. Please indicate if any the following types of music are part of your collection? (Mark box with 'x')

	NO	YES
Roots Reggae	❑	❑
Dancehall Reggae	❑	❑
Dub Music	❑	❑
Lovers' Rock	❑	❑
Reggae Jazz	❑	❑
Soca/Calypso	❑	❑
Ska	❑	❑
Vintage Roots & Rock Steady	❑	❑

15. How do you like your music?

❑ Artists only
❑ Rhythm compilation
❑ Artists compilation
❑ Mixed variety
❑ Vintage
❑ Other _____

16. Would you purchase Caribbean Music from online sources?

❑ No
❑ Yes

17. To what extent do you agree/disagree with the following statements?

	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Not Applicable
Current CD/DVD prices are too expensive!	❑	❑	❑	❑	❑	❑ **N/A**
Older music on CD/DVD should cost less than new music.	❑	❑	❑	❑	❑	❑ **N/A**
I would purchase (more) music if CD cost was between $7.99 & $10.99.	❑	❑	❑	❑	❑	❑ **N/A**

PLEASE CONTINUE OVERLEAF ⇨

⇩ CONTINUE HERE

18. What is your gender?
- ❑ Female
- ❑ Male

19. How old are you?
- ❑ 18 – 24 years
- ❑ 25 – 30 years
- ❑ 31 – 37 years
- ❑ Greater than 37 years

20. What is your racial/ethnic background?
- ❑ Black
- ❑ Hispanic
- ❑ Native American
- ❑ Caucasian
- ❑ Asian or Pacific Islander
- ❑ Other _____

21. What is your estimated annual income?
- ❑ $25,000 or less
- ❑ $25,001 – $35,000
- ❑ $35,001 – $45,000
- ❑ $45,001 – $60,000
- ❑ $60,001 or more

22. How long have you being listening to Caribbean music?
- ❑ I have never listened to Caribbean music
- ❑ Less than 3 years
- ❑ Between 3 to 7 years
- ❑ Between 8 to 12 years
- ❑ More than 12 years

**** Thank you so much for taking the time to complete this questionnaire. ****

Your responses will assist us in understanding the needs of Caribbean music consumers and how the music distributors can best satisfy those needs. If you have suggestions or other information that you think will make this survey more informative, please share any additional comments you have in the box provided below.

I. First Contact

Monday, October 13, 2003

Howard J. Chen
10359 Kapok Court
Orlando, FL 32817-7845

Dear Howard:

Within the next ten days you will receive a request in the mail to fill out a brief questionnaire for an important research project being conducted by the Caribbean Music Institute here at the University of Central Florida.

The survey is concerned with the buying habits and tastes of Caribbean music consumers, as well as the effect of digital technology on the marketplace and on consumption habits.

I am writing to you in advance because we have found that many people like to be informed prior to being contacted. The study is important in that it will help us here at the Institute in understanding who is buying Caribbean music and whether their needs are being met.

Thank you for your time and consideration. It is only with the generous help of people like you that our research can be successful.

Sincerely

Lascelles A. Adams
Chief Research Officer

P.S. We will be enclosing a small token of appreciation with the questionnaire as a way of saying thanks.

I. Second Contact

Howard J. Chen
10359 Kapok Court
Orlando, FL 32817-7845

Dear Howard:

I am writing to ask your help in a study of the factors influencing Caribbean music consumer's buying decisions for the Caribbean Music Institute. This study is part of an effort to learn what factors influence Caribbean music consumer's purchases and whether they are satisfied or unsatisfied with the current manner in which they expand their collection.

It is my understanding that you have been listening and purchasing Caribbean music over the last few years. We are contacting a random sample of Caribbean music buyers from every state to ask what their preferred format is, what their purchasing experience has been, and whether the current distribution and retailing practices are meeting their needs.

Results from the survey will be used to help the institute to design ways to make the purchasing experience more rewarding for consumers like you. By understanding what you, the consumer, want we can help to design programs that will make your purchasing experience more rewarding and fulfilling.

Your answers are completely confidential and will be released only as summaries in which no individual's answer can be identified. When you return your completed questionnaire your name will be deleted from the mailing list and never connected to your answer in any way. This survey is voluntary. However, you can help us very much by taking a few minutes to share your experience and opinions about purchasing Caribbean music. If for some reason you prefer not to respond, please let us know by returning the blank questionnaire in the enclosed stamped envelope.

We have enclosed a small token of appreciation as way of saying thanks for your help.

If you have any questions or comments about this study, we would be happy to talk with you. Our toll free number is 1-888-RHYTHMS (888-749-8467), or you can write us at the address on the letterhead.

Thank you very much for helping with this important study.

Sincerely

Lascelles A. Adams
Chief Research Officer

P.S. If by some chance we made a mistake and you are not a Caribbean music buyer, please answer question 1 followed by questions 16 through 20 and return the questionnaire. Again, many thanks.

I. Third Contact

October 23, 2003

Last week a questionnaire seeking your opinion about the factors influencing Caribbean music consumers' buying decisions was mailed to you. Your name was drawn randomly from a list of names, "Caribbean Music Lovers," provided by the top twenty Caribbean music retailers in your area.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, please do so today. We are especially grateful four your help because it is only by asking people like you to share your experiences that we can understand how people acquire Carribbean music, and the consequences of doing so.

If you did not receive a questionnaire, or if it was misplaced, please call us toll free at 1-888-749-8467 and we will get another one in the mail to you today.

Lascelles A. Adams
Chief Research Officer
The Caribbean Music Institute
Center for Strategic Social and Economic Research

I. Fourth Contact

Monday, October 30, 2003

Howard J. Chen
10359 Kapok Court
Orlando, FL 32817-7845

Dear Howard:

About three weeks ago I sent a questionnaire to you that asked about your buying habits and taste as a Caribbean music consumer. To the best of our knowledge it has not yet been returned.

The comments of people who have already responded have communicated a wide variety of ways in which digital technology as altered their consumption of Caribbean music. We think the results are going to be very useful to distributors and retailers of Caribbean music.

We are writing again because of the importance that your questionnaire has for helping to get accurate results. Although we sent questionnaires to Caribbean music consumers throughout the US, it is only by hearing from nearly everyone in the sample that we can be sure that the results are truly representative.

A few people have written to say that they should not have received the questionnaire because they no longer listen to or have never listened to Caribbean music, or that they have not bought any music in the last two years. If either of these concerns apply to you, please let us know on the cover of the questionnaire and return it in the enclosed envelope so that we can delete your name from our mailing list.

A comment on our survey procedures. A questionnaire identification number is printed on the back cover of the questionnaire so that we can check remove your name from our mailing list when it is returned. The list of names is then destroyed so that individual names can never be connected to the results in any way. Protecting the confidentiality of people's answers is very important to us, here at the Institute.

We hope that you will fill out and return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning a note or blank questionnaire in the enclosed stamped envelope.

Sincerely

Lascelles A. Adams
Chief Research Officer

P.S. If you have questions, please feel free to contact me. The toll free number where I can be reached in Orlando is (888) 749-8467.

I. Fifth Contact

Monday, December 15, 2003

Howard J. Chen
10359 Kapok Court
Orlando, FL 32817-7845

Dear Howard:

During the last two months we have sent you several mailings about an important research study we are conducting here at the Institute.

Its purpose is to help us here at the Institute understand the effects of digital technology on the purchasing behavior of consumers of Caribbean music and their experience with the purchasing process.

The study is drawing to a close and this is the last contact that will be made with the random sample of people whom we think are ardent purchasers of Caribbean music.

We are sending this final contact by priority mail because of our concern that people who have not yet responded may have had different experience and opinions than those who have. Hearing from everyone in this small sample helps assure that the survey results are as accurate as possible.

We also want to assure you that your response in this study is voluntary, and if you prefer not to respond, that is fine. If you have never listened or purchased Caribbean music and you feel that we have made a mistake including you in this study, please let us know by returning the blank questionnaire with a note indicating so. This would be very helpful.

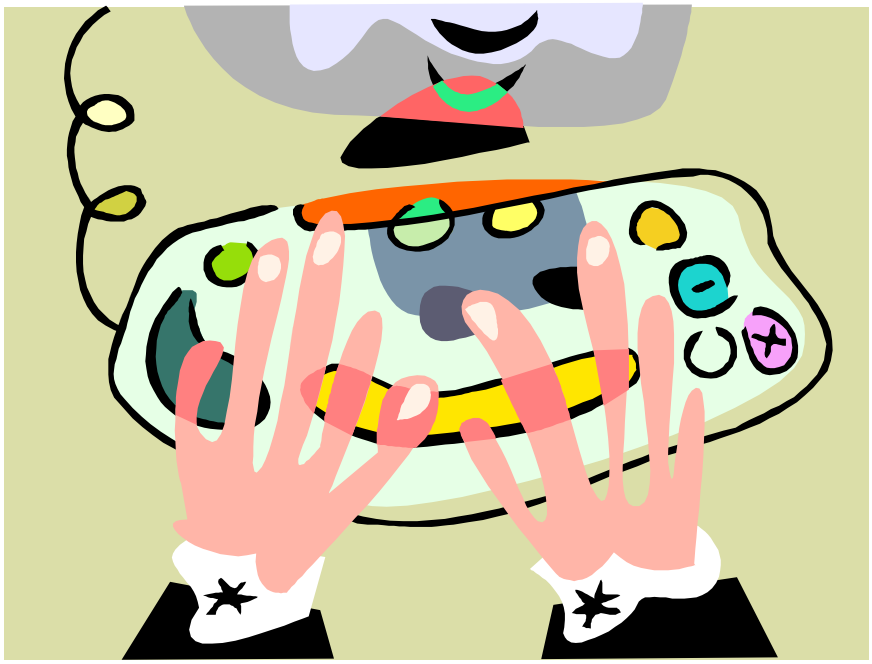
Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand what factors influence Caribbean music consumer's purchases and whether they are satisfied or unsatisfied with the current approach. Thank you very much.

Sincerely

Lascelles A. Adams
Chief Research Officer

September 23, 2003

Information Systems Continuance
"Shall I keep using this system?"



Dear Dr. Sivo,

Thank you for agreeing to participate in our study. Answering the questions below should not take you more than ten minutes. All information will remain confidential. No one outside the study team will know your identity. Thank you again for taking the time to respond to this questionnaire. If you have any questions please direct them to the principal investigator, Virginia Ilie at vilie@bus.ucf.edu or call 407-823-1712.

Thank you!

Instructions: For each of the statements below, please indicate your level of agreement with the statement by circling the appropriate number to the right. If you strongly disagree with the statement, please circle the 1, if you strongly agree with the statement, please circle the 5.

Note: ISP stands for your Internet Service Provider.

START HERE	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
1. I am satisfied with the Internet service offered by my current ISP.	1	2	3	4	5
2. My choice to use the Internet service offered by my current ISP was a wise one.	1	2	3	4	5
3. I am satisfied with the customer service department of my current ISP.	1	2	3	4	5
4. I am satisfied with the technical support provided by my current ISP	1	2	3	4	5
5. For me, the costs in *time and effort* to switch ISPs would be high.	1	2	3	4	5
6. For me, the cost in *money* to switch ISPs would be high.	1	2	3	4	5
7. If I need to change my ISP, there are other good ISPs from which to choose.	1	2	3	4	5
8. I would probably be equally or more satisfied with the services of another ISP.	1	2	3	4	5
9. I would like trying the services of another ISP for a change.	1	2	3	4	5
10. I would rather stick with my current ISP, rather than try a new one of which I am unsure.	1	2	3	4	5
11. Being a subscriber of my current ISP gives me a certain prestige.	1	2	3	4	5
12. I believe the services provided by my current ISP fit with the type of task I perform (i.e. music download, chat, etc.)	1	2	3	4	5
13. I want to continue to use the services provided by my current ISP in the future.	1	2	3	4	5
14. My intention is to continue to use the services provided by my current ISP rather than those of other alternate ISPs.	1	2	3	4	5
15. If I could, I would like to discontinue the services provided by my current ISP.	1	2	3	4	5

Thank you for taking the time to complete this questionnaire!

II. First Contact

October 8, 2003

Dr. Stephen Sivo
Educational Research, Technology and Leadership
College of Education
University of Central Florida
Orlando, FL 32816-1250

Dear Dr. Sivo,

We are writing you in advance to let you know that a few days from now you will receive in the mail a request to fill out a brief questionnaire for an important research study. This study is being conducted by a research team in the Management Information Systems department at the University of Central Florida.

This letter is to let you know that you have been chosen to participate in our study.
The research study is designed to capture the degree to which people will keep using an Internet service after the initial stage of acquiring that service.

Your participation in our study is highly appreciated. We thank you in advance for your time and consideration of this letter.

Sincerely,

Virginia Ilie, MBA

II. Second Contact

October 11, 2003

Dr. Stephen Sivo
Educational Research, Technology and Leadership
College of Education
University of Central Florida
Orlando, FL 32816-1250

Dear Dr. Sivo,

A few days ago we sent you a letter asking you to participate in a research project conducted at the University of Central Florida.

This letters is a follow-up to kindly ask you to help us conduct our research study. This study is part of an academic effort to learn what factors determine people's satisfaction and continued use of an Internet service.

You have been selected to be included in our random sample for conducting this study. We want you to know that we highly valuate your participation. Your participation is very important for both Information Systems researchers and yourself as a consumer, as the results from this study will lead to a better understanding of the factors that determine people's satisfaction and continued use of an Internet service.

So, we kindly ask you to take a few minutes and share your opinions with us about your Internet service and Internet service provider by filling out the enclosed survey. The survey will take less than 10 minutes to complete.

Please be assured of the confidentiality of your answers. We will not identify individual respondents in any of the reports emanating from this survey project. Also, we want you to know that this is an academic survey effort with absolutely no ties to any corporate or marketing interests. We are sincerely interested in conducting this survey as part of an academic study. Your participation in this study is voluntary. However, your response would be of great value to us.

If you have any questions or comments about this study, please direct them to the principal investigator by calling (407) 823-1712 or by email at vilie@bus.ucf.edu. We would be happy to assist you in any way we can.

Thank you so much for your participation in this study. We really appreciate your feedback.

Sincerely,
Virginia Ilie, MBA

P.S. If by chance, you do not have access to any Internet service at this time, please return the blank survey to us. Again, your collaboration is highly appreciated. Many thanks again.

II. Third Contact

October 17, 2003

Dear Dr. Sivo,

Last week, a survey seeking your opinions on the services provided by your current Internet Service Provider was sent to you.

We want to thank you for taking the time to participate in our study. If you have not yet had the time to complete our questionnaire, please do so today. We know that you are busy but your response will determine the success of our study.

If by chance, you misplaced our questionnaire or you did not receive one, please call (407) 823-1712 or email us at vilie@bus.ucf.edu and we will happy to get another one in the mail to you today.

Thank you again for your participation.

Virginia Ilie, MBA
Management Information Systems Dept.
College of Business Administration
University of Central Florida
4000 Central Florida Blvd.
Orlando, FL 32816-1400

II. Fourth Contact

October 31, 2003

Dr. Stephen Sivo
Educational Research, Technology and Leadership
College of Education
University of Central Florida
Orlando, FL 32816-1250

Dear Dr. Sivo,

About three weeks ago, a questionnaire was sent to you that asked about the services provided by your current Internet Service Provider. We have not yet received your completed questionnaire.

We are writing to you again because of the importance your completed questionnaire has to us in getting accurate results in our study. It is only by hearing from nearly everyone included in our random sample that we can be sure the results of our study are representative.

The feedback we have got from people who already responded included a variety of reasons why they are satisfied or dissatisfied with their current Internet Service Provider.

Again, this study is very important for Information Systems researchers and yourself as a consumer, as the results from this study will lead to a better understanding of the factors that determine people's satisfaction and continued use of an Internet service.

Enclosed you will find a replacement questionnaire. We sincerely hope you will take 10 minutes to share your experiences with us by filling out our questionnaire.

Thank you again for your time and participation in the study!

Sincerely,

Virginia Ilie, MBA

II. Fifth Contact

December 8, 2003

Dr. Stephen Sivo
Educational Research, Technology and Leadership
College of Education
University of Central Florida
Orlando, FL 32816-1250

Dear Dr. Sivo,

During the last couple of month we have sent you several letters asking you to participate in an important research study conducted at the University of Central Florida.

Its purpose is to better understand why consumers may decide to keep using an Internet service after the initial stage of acquiring that service.

Our study is drawing to a close. This letter is the last attempt to hear from you. We are sending you this letter by Fed-Ex because we want you to know one more time how important your feedback is for us and the success of our study. Hearing from everyone in this small random sample will help assure the accuracy of our survey results. You may have different experiences with your Internet provider and sharing them with us may actually make a difference in our overall results.

Again, we appreciate your time and willingness to consider our last request to fill out our questionnaire. Thank You!

Sincerely,

Virginia Ilie, MBA

III. First Contact

Apex University
1000 University Ave.
Orlando, FL 32817

Dept. of MIS
School of Business

407.555-1212
Fax: 407.555-1215
biz.apex.edu/mis
mis@biz.apex.edu

July 1, 2004

Mr. Ernst Zimmermann
Presumably Good Protection
1919 Hackingham Circle
Miami, FL 33174

Dear Mr. Zimmermann:

A few days from now you will receive in the mail a request to fill out a brief questionnaire for an important research project being conducted by Apex University.

It concerns the organizational and managerial factors that may be related to the security of organizations' information systems.

I am writing in advance because we have found many people like to know ahead of time that they will be contacted. The study is an important one that will help organizations better understand what will be critical to information systems security and what they can do to improve security.

Thank you for your time and consideration. It's only with the generous help of people like you that our research can be successful.

Sincerely,

Andy Wu
Doctoral Student

P.S. We will be enclosing a small token of appreciation with the questionnaire as a way of saying thanks.

Strive for Excellence

III. Second Contact (Cover Letter)

Apex University
1000 University Ave.
Orlando, FL 32817

Dept. of MIS
School of Business

407.555-1212
Fax: 407.555-1215
biz.apex.edu/mis
mis@biz.apex.edu

Mr. Ernst Zimmermann
Presumably Good Protection
1919 Hackingham Circle
Miami, FL 33174

July 5, 2004

Dear Mr. Zimmermann:

I am writing to ask your help in a study of information systems (IS) security in organizations. This study is intended to explore the organizational and managerial factors important for IS security and what organizations can do to improve them.

It's my understanding that you may be in either a technical position which is directly involved in the implementation of IS security or a managerial position. We are contacting a random sample of managers like you statewide to ask their opinions of their organizations' security policy, decision making, IT staff's capabilities in implementing security measures, and the effectiveness of those measures.

As numerous authors have emphasized, IS security is not simply a technical issue, contrary to the "common wisdom." Rather, it is more of a management and behavioral issue. Although some IS security researchers have conducted studies into the behavioral side, studies of the management side are sporadic at best. Therefore, our study will focus on the management issues related to IS security.

Your answers are completely confidential and will be released only as summaries in which no individual's answers can be identified. When you return your completed questionnaire, your name will be deleted from the mailing list and never connected to your answers in any way. This survey is voluntary. However, you can help us very much by taking a few minutes to share your experiences and opinions about IS security. If for some reason you prefer not to respond, please let us know by returning the blank questionnaire in the enclosed stamped envelope.

If you have any questions or comments, we would be happy to talk with you. Our toll-free number is (800) 555-1212, or you can write to the address on the letterhead.

Thank you very much for helping with this important study.

Sincerely,

Andy Wu
Doctoral Student
P.S. If by some chance we make a mistake and you are neither directly involved in nor able to observe IS security implementation, please return this questionnaire blank. Thanks a lot!

Strive for Excellence

Information Systems Security Questionnaire

Yu "Andy" Wu

I highly appreciate your time and effort in filling out this questionnaire. For each question, please read the question carefully and put an "**x**" in ***one and only one*** checkbox in front of the answer that you think is the best answer to the question. Thank you for your participation!

Start Here

1. If someone in your organization sticks a Post-it note with his password on it to his monitor, will anyone tell him that it is against the organization's policy to do so?

- □ Yes
- □ No

2. Does your organization have a written policy regarding information systems (IS) security?

- □ Yes
- □ No

3. How often does your organization provide training programs on information systems security to information technology (IT) or non-IT staff?

- □ Very often
- □ Often
- □ Sometimes
- □ Not often
- □ Not very often

4. Does your organization have a committee or formal or informal cross-department groups to handle information systems security issues?

- □ Yes
- □ No

5. How often does the IT department in your organization discuss or work on information systems security issues with other departments?

- □ Very often
- □ Often
- □ Sometimes
- □ Not often
- □ Not very often

Continue Here

6. In general, who makes most of the important decisions in your organization?

- □ Board of directors, board of trustees, or equivalent
- □ President, principal, or equivalent
- □ Vice presidents, provost, or equivalent
- □ Division managers, regional managers, deans, or equivalent
- □ Department managers, department chairs, or equivalent
- □ Supervisors, group leaders, or equivalent
- □ Individuals or members of work teams

7. Who makes the important decisions about planning, purchasing, implementation, and maintenance of hardware, software, and services, including those related to IS security?

- □ Always our organization's IT department
- □ Mostly our organization's IT department, but sometimes individual departments as well
- □ Half of the times our organization's IT department and the other half individual departments
- □ Mostly individual departments, but sometimes our organization's IT departments as well
- □ Always individual departments

8. How often do individual departments in your organization, without your IT department's knowledge, do things such as installing hardware/software, hiring consultants for writing programs or building web sites, etc.?

- □ Never
- □ Rarely
- □ Sometimes
- □ Often
- □ Very often
- □ Always

Are you in an IT position responsible for information systems security? If …

□ Yes	□ No
then, for Questions 9 through 12, please answer those on the left side only. ⬇	then, for Questions 9 through 12, please answer those on the right side only. ⬇
9. How will you rate your familiarity with the security measures available for protecting information systems, for example, firewalls, encryption, virtual private network, intrusion-detection system, etc.?	**How do you think about your organization's IT staff's familiarity with security measures available for protecting information systems?**
□ Very familiar □ Familiar □ Neither familiar nor unfamiliar □ Unfamiliar □ Very unfamiliar □ No opinion	□ Very familiar □ Familiar □ Neither familiar nor unfamiliar □ Unfamiliar □ Very unfamiliar □ No opinion

Continue Here

10.	**Do you agree or disagree that, when it comes to implementing security measures, analyzing intrusion, or recovering data from disaster, we follow a set of clear, easy-to-follow procedures?** □ Strongly agree □ Somewhat agree □ Neither agree nor disagree □ Somewhat disagree □ Strongly disagree □ No opinion	**Do you agree or disagree that, when it comes to handling information systems security issues, the IT staff in your organization seems to follow a set of clear, easy-to-follow procedures?** □ Strongly agree □ Somewhat agree □ Neither agree nor disagree □ Somewhat disagree □ Strongly disagree □ No opinion
11.	**What is your stance when it comes to protecting your information systems?** □ We can never over-protect our IS even with all of the possible security measures implemented. □ Our IS will be safe as long as we implement reasonable security measures. □ We can safeguard our IS with security measures, but we probably have used too many of them. □ With or without security measures, security threats are a matter of pure chance. □ We can safeguard our IS with security measures, but hackers probably will be a step ahead of us. □ Even with security measures in place, no information systems can be safe by nature. □ All security measures are unnecessary. □ No opinion.	**What do you think about your IT staff's attitude toward threats to IS security?** □ They treat the security of our information systems as if it were their own life. □ They emphasize information systems security very strongly. □ They somewhat emphasize information systems security. □ They leave the security of our information systems to chance. □ The security of our information systems would be better off left to pure chance than left in their hands. □ They seem to have totally surrendered to the threats to information security. □ They don't care. □ No opinion.
12.	**How do you think about your technical skills in terms of applying security measures to your information systems?** □ Extremely skilled □ Highly skilled □ Average □ Highly unskilled □ Extremely unskilled	**Do you think your IT staff's technical abilities to implement security measures to protect your organization's information systems?** □ Extremely skilled □ Highly skilled □ Average □ Highly unskilled □ Extremely unskilled □ No opinion

Continue Here

13. Do you agree or disagree that your organization's information systems are well protected against security threats?

- □ Strongly agree
- □ Somewhat agree
- □ Neither agree nor disagree
- □ Somewhat disagree
- □ Strongly disagree

14. Within the past 12 months, how many occurrences of security threats have you heard about or dealt with that happened to your organization's information systems? (*Please include both successful and unsuccessful threats*.)

- □ None
- □ 1-3
- □ 4-6
- □ 7-9
- □ 10 or more

15. Do you agree or disagree that when security threats happened, the IT staff in your organization have resolved the problem quickly? (*If threats never happened before, do you agree or disagree they would resolve the problem quickly if threats occurred*)?

- □ Strongly agree
- □ Somewhat agree
- □ Neither agree nor disagree
- □ Somewhat disagree
- □ Strongly disagree

Thank You!

Your participation is a valuable contribution to safeguarding information systems in today's wired organizations. If you want to share your insights into IS security issues or to make suggestions regarding this questionnaire, please comment below. (*If you will be interested in "test driving" an online version of this questionnaire, please provide your email address.*)

Please return your completed questionnaire to:

Yu "Andy" Wu, Department of Management Information Systems
College of Business Administration, University of Central Florida, Orlando, FL 32816
BA1-365 • (407) 823-4833 • andy.wu@bus.ucf.edu • www.bus.ucf.edu/ywu

III. Third Contact
Front of Postcard

Apex University
1000 University Ave.
Orlando, FL 32817

Dept. of MIS
School of Business
biz.apex.edu/mis
mis@biz.apex.edu

To:

Mr. Ernst Zimmermann
Presumably Good Protection
1919 Hackingham Circle
Miami, FL 33174

Strive for Excellence

Back of Postcard

July 15, 2004

Last week a questionnaire seeking your opinions about information systems security was mailed to you. Your name was drawn randomly from a list of managers in a statewide database.

If you have already completed and return the questionnaire to us, please accept our sincere thanks. If not, please do so today. We are especially grateful for your help because it is only by asking people like you to share your experiences that we can understand how we can improve information systems security.

If you did not receive a questionnaire, or if it was misplaced, please call us toll free at (800) 555-1212 and we will get another one in the mail to you today.

Andy Wu
Doctoral Student
Dept. of MIS
Apex University

III. Fourth Contact
July 29, 2004

Mr. Ernst Zimmermann
Presumably Good Protection
1919 Hackingham Circle
Miami, FL 33174

Apex University
1000 University Ave.
Orlando, FL 32817

Dept. of MIS
School of Business

407.555-1212
Fax: 407.555-1215
biz.apex.edu/mis
mis@biz.apex.edu

Dear Mr. Zimmermann:

About three weeks ago I sent a questionnaire to you asking for your opinions of information systems (IS) security in your organization. To date, we have not received it.

The comments of people who have already responded revealed a wide variety of management issues in regard to IS security. Many have described their opinions, both positive and negative, of the current state of security in their organizations. We think the results are going to be very useful to decision makers in organizations.

We are writing again because of the importance that your questionnaire has for helping to get accurate results. Although we sent questionnaires to managers throughout the state of Florida, it's only by hearing from everyone in the sample that our results are truly representative.

A few people have written to say that they should not have received the questionnaire because they are neither directly involved in nor able to observe the implementation of IS security. If either of these concerns applies to you, please let us know on the cover of the questionnaire and return it in the enclosed envelope so that we can delete your name from the mailing list.

Here is a comment on our survey procedures. A questionnaire identification number is printed on the back cover of the questionnaire so that we can check you name off of the mailing list when it is returned. The list of names is then destroyed so that individual names can never be connected to the results in any way. Protecting the confidentiality of people's answers is very important to us, as well as to the University.

We hope you will return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning a note or blank questionnaire in the enclosed stamped envelope.

Sincerely,

Andy Wu
Doctoral Student

Strive for Excellence

P.S. If you have any questions, please feel free to contact me. The toll free number where I can be reached in Orlando is (800) 555-1212.

III. Fifth Contact

Apex University
1000 University Ave.
Orlando, FL 32817

Dept. of MIS
School of Business

407.555-1212
Fax: 407.555-1215
biz.apex.edu/mis
mis@biz.apex.edu

September 5, 2004

Mr. Ernst Zimmermann
Presumably Good Protection
1919 Hackingham Circle
Miami, FL 33174

During the last two months we have sent you several mailings about an important research study we are conducting on information systems security.

Its purpose is to help organizations understand what organizational and managerial factors they can tackle to improve their information systems' security.

The study is drawing to a close, and this is the last contact that will be made with the random sample of managers whose positions are closely related to security.

We are sending this final contact by priority mail because of our concern that people who have not responded may have had different experiences than those who have. Hearing from everyone in this small statewide sample helps assure that the survey results are as accurate as possible.

We also want to assure you that your response to this study is voluntary, and if you prefer not to respond that is fine. If you are not in a position that is exposed to IS security in any way, or you feel that we have made a mistake including you in this study, please let us know by returning the blank questionnaire with a note indicating so. This would be very helpful.

Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand information systems security. Thank you very much.

Sincerely,

Andy Wu
Doctoral Student

Strive for Excellence

About the Authors

Stephen A. Sivo is a Research Psychologist and an Associate Professor of Educational Research at the University of Central Florida teaching structural equation modeling, multivariate statistics, survey research methodology, and advanced measurement theory. He is co-author of an internationally distributed book on Monte Carlo Simulation Studies using SAS software, and he is published research in many journals including *Structural Equation Modeling*, *Multivariate Behavioral Research*, *Psychological Reports*, and the *Journal of Experimental Education*. His research primarily centers on integrating psychometric and econometric models for panel data and studying fit index and power issues in SEM. Since 2000, he has served on more than 85 doctoral dissertation committees either chairing or assisting students with statistical/methodological issues.

Carol Stoak Saunders is Professor of MIS at the University of Central Florida. She served as General Conference Chair of ICIS'99 and Telecommuting '96. She was the Chair of the Executive Committee of ICIS in 2000 and inducted as an AIS Fellow in 2003. Currently she is Editor-in-Chief of *MIS Quarterly*. Her current research interests include the organizational impacts of information technology, virtual teams, time, and interorganizational linkages. Her research is published in *MIS Quarterly*, *Information Systems Research, Journal of MIS, Communications of the ACM, Academy of Management Journal, Academy of Management Review,* and *Organization Science.*

Qing Chang is a PhD candidate in the Management Information System at the University of Central Florida. His research interests are related with the strategic and economic consequences of IT-enabled knowledge transfer in inter organization activities. His current research focuses on IT outsourcing, knowledge management, E-commerce, and research methodology. His articles have appeared in the American Conference of Information Systems (AMCIS).

Dr. James Jiang is a professor of Management Information Systems at the University of Central Florida. He obtained his Ph.D. in Information Systems at the University of Cincinnati. He is also the honorary professor at Yuan Ze University, Taiwan, and the honorary Jin-Din chair professor at National Central University, Taiwan. His research interests include IS project management and IS service quality management. He has published over 100 academic articles in these areas in the journals such as *Decision Sciences, Decision Support Systems, Journal of Management Information Systems, Communications of ACM, IEEE Transactions on Systems Men & Cybernetics, IEEE Transactions on Engineering Management, Journal of AIS, European Journal of Information Systems, Information & Management, Data Base, Journal of Systems & Software, Computers in Human Behavior, and MIS Quarterly.*

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