A Proposed Methodology For Economizing Attitudinal Sample Surveys

Ass.Prof.Dr. Abdul-Hameed Al-Beldawi
Al-Mansour University College

ABSTRACT

The Proposed Methodology Utilizing the relationship between Situational and attitudinal data to construct an approach of integrating models and sample design for generating attitudinal data as an attempt to prevent non-essential operation. Also as an imputation approach for missing data.

The finding shows, that the proposed methodology could reduced the surveys cost between 20-30%. And the models been developed proved of highly results for imputation.

Introduction:

The Attitudinal surveys are almost of multi-purposes and associated with multi-dimensional scaling data, which are expensive and difficult to administrate. And many of these surveys are conducted by governmental agencies, which their concern is that, their findings should be objective, statistically defensible, and timelines in reporting these finding are often important. In addition to possibility of using developed

Situational model for imputation for missing values or even for predication.

The hypothesis of the relationship between the situational variables and attitudes had been approved in the last years e.g. Al-Baldawi, 1988 for developing models that aimed to estimate items for non-sampling errors, it will further be utilized in this paper for contracting an economy approach of integrating the models and sample survey for generating the attitudes, as an attempt to eliminate unnecessary duplication of effort in collecting the data, and to prevent non-essential operations, also, as an imputation approach for missing variables.

In part 1 of this paper, a concept about the approach basis and it's procedure are discussed, then an empirical will be carried out in part 2.

1. Conceptual Frame of the Proposed Approach:

1.1 Basic and assumptions:

Within the classical Neyman-Pearson Frame -work (which appears in many statistical textbooks, e.g. Cochran, 1967; Dagpunar, 1988; and Godambe, 1966) of hypothesis testing involves specification of Pr(Type 1) = a associated with a null hypothesis and Pr (Type 11) = b associated with an alternative hypothesis, the fixed sample plan is based on the sample mean x. The required sample size, n is given by the relation:

$$n = (Z_a + Z_b)^2 / S^2$$

$$S = (m_1 - m_0) / s$$

Where:

Z_a and Z_b denote the Upper a- and b -percentiles of the standard normal distribution, e.g. let:

Ni (1=1,2,……,N) denote the population of N Units, the Variant value associated with the Unit i is denoted by Xi (1,2,.....,N) on the basis of the observations Xi for $i \in s$.

Where:

U_0 and m_1 denote the assumed and population means respectively, and s is the population standard deviation.

S is sample (subsets) of Units drawn with a given Probability P (S), from the totality of all possible Samples (subsets) S. We can call the function P on S defining the probabilities P(S), for all samples S, Sample design P, if n (S) denotes the size of the sample S, i.e. the total number of units I such that $i \in S$, then P is said to be a " fixed sample size design " if for all $S \in S$. This method leads to determine the sample size by specifying margins of error for the terms that are regarded as most vital to the survey, that is, when the single item estimated of n have been completed, the largest of the n's is selected, so that we are reluctant to choose the largest, because this will give on overall standard of precision substantially higher than originally contemplated. This means that each item (or variable), Vi has an equal number of subsequently all the survey questionnaires have the same set of questions, that is.

(No. of obs. For V_1) = (No≢ .of Obs. For V_2)=…=

(No. of obs. For V_k) and accordingly, each variable, (or group of variables) may has a different level of significance, ai, that is :

$$av1 \neq (or =)\ av2 \neq \left(or =\right)\ .... \neq (or =) avk$$

Through other statistical methods of determine sample size had been developed and tested e.g. Wald, 1947, of developing item by item sequential analysis method which is detailed in a number of sources e.g. Colton, 1973.

Wald and Wolfowtz, 1948, established the optimal property of the sequential probability ratio test (SPRT), Grundy et al, 1956 considered the optimum size of a second sample when the results of a first sample are already known, Colton and Mopherson, 1976, considered an intermediate type plans of two stages etc. But all these attempts are within the same. Neyman-Pearson for the items that are regarded as most vital to the survey.

Usually, all these traditional methods, decide the sample size upon the variable of the largest n's among the vital variables, in other words, except the largest n's variable all the others have sizes of sample above the largest n's level of significance , a , as it can be concluded from the following example:

Assuming, the we need to conduct a sample survey for collecting data for a set of 14 vatil variables, V1,V2,…..,V14, at 5% level of significance which the largest sample size of 160 observation was required for V6 and V7, while the rest required < 160 observations to satisfy the 5% level of significance, as if can be seen in Table (1). When reflecting this to Figure (1), it means, that according to traditional methods the both areas, - and ≡ of the Figure are requited to collect the data from. While the only area of – can satisfy the desired level of significance (5%) , and the ≡ are is obtained to make the data in tables with same sample sizes, mainly for the use of analytical purpose.

The proposed approach attempts to eliminate the area ≡ from the survey and to be substituted by using the situational models. The starting points towards this attempt is to collect data for the all survey variables at the same level of significance, that is:

$$av1 = av2 = ... = avk$$

This will lead to obtain a varying sample size for each variable (or group of variables) , that is :

(sample size of V1) $\neq (or =)$ (sample size of V_k)

Then, using the data to be collected in the survey for developing models by which, attitudinal data can be generated for raising the sample sizes of variables up to the variable of largest n's size.

A single distinction might be important between the randomization of data to be collected by survey and those to be generated by the modelbased approach. In the randomization approach, the population values are treated as fixed, and inferences are based on the probability distribution used to select the sample. In the modeling approach, the population valued are traded as realization of random variables that are distributed according to some model. The distribution forms the basis for inferences, and the sample selection procedure has an ancillary role, to avoid selection bias. In his example, Little, 1982. shows that for the simple random sampling design, randomization theory and the normal model lead to similar results. The attraction of the randomization theory is that, the need to specify a model is avoided, the probability distribution is known, whereas a model involves a subjective element. More discussion about model-based approach can be obtained in several papers e.g. Little, 1982, Kalton , 1983. Thus, values generated by models are not significantly varied than the observed ones.

Subsequently, the proposed approach application would suggest multi-questionnaires for the survey. This and the sample survey determination are discussed in the following:

1.2. Sample size determination:

As a rule, for developing the situational models, sampled the situational variables should not be less that the variable largest sample size. Therefore, the fixed sample size plan of classical manner would be used for, that is the situational variables should be of an equal sample size to the variable of largest variance among the vital variables understudy. Whereas, the sample size of each attitudinal variables would be determined independently in accordance to the desire fixed level of significance, with taken into account a condition of that, the minimum n's of any attitudinal variable must equal to the number of the situational variables that are intended to be included in the survey, to satisfy the analytical condition of " no. of variables must not be greater than no. of observations". Going back to the Table (1) of the situational variables and 10 attitudinal variables, it can be concluded, that the example survey cost and effort could be reduced by ≈ 31%, as shown in Table (2).

Table 1
Shows an illustration of the proposed approach
sample size design result

Observation No.		Situ. Var.			Attitudinal Variables								
		V1	V2	V4	V5	V6	V8	V9	V10	V11	V12	V13	V14
1		35	180	B*	1	0	1	5	3	0	9	3	2
.		.	.	.	.	.	.	.	.	.	.	.	
.		.	.	.		.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.		.	.	.	.	.	.	.	.	.	.	.	.
.			.	.	.	.	.	.	.	.	.	.	.
40		18	130	B	4	8	4	5	3	2	7	5	1
.		.	.	.	.	.	.					.	
.		.	.	.	.	.	.					.	
50		25	300	NB**	9	6	3	6	4	3	5	.	
.		.	.	.	.		.	.	.	.		.	
.		.	.	.	.		.	.	.	.		.	
.		.	.	.	.		.	.	.	.		.	
.		.	.	.	.		.	.	.	4		.	
70		.	.	.	.		1	.	5			.	
.		.	.	.	0			.				.	
.		.	.	.				.				.	
.		.	.	.				.				.	
80		.	.	.		6		.				.	
.		.	.	.				2				.	
.		.	.	.								.	
.		.	.	.								.	
90		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
110		.	.	.								.	
.		.	.	.								.	
120		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
.		.	.	.								.	
160		53	160	NB								3	

* Business ** Non-business

Figure (1)
Illustrating the example of the Table 1

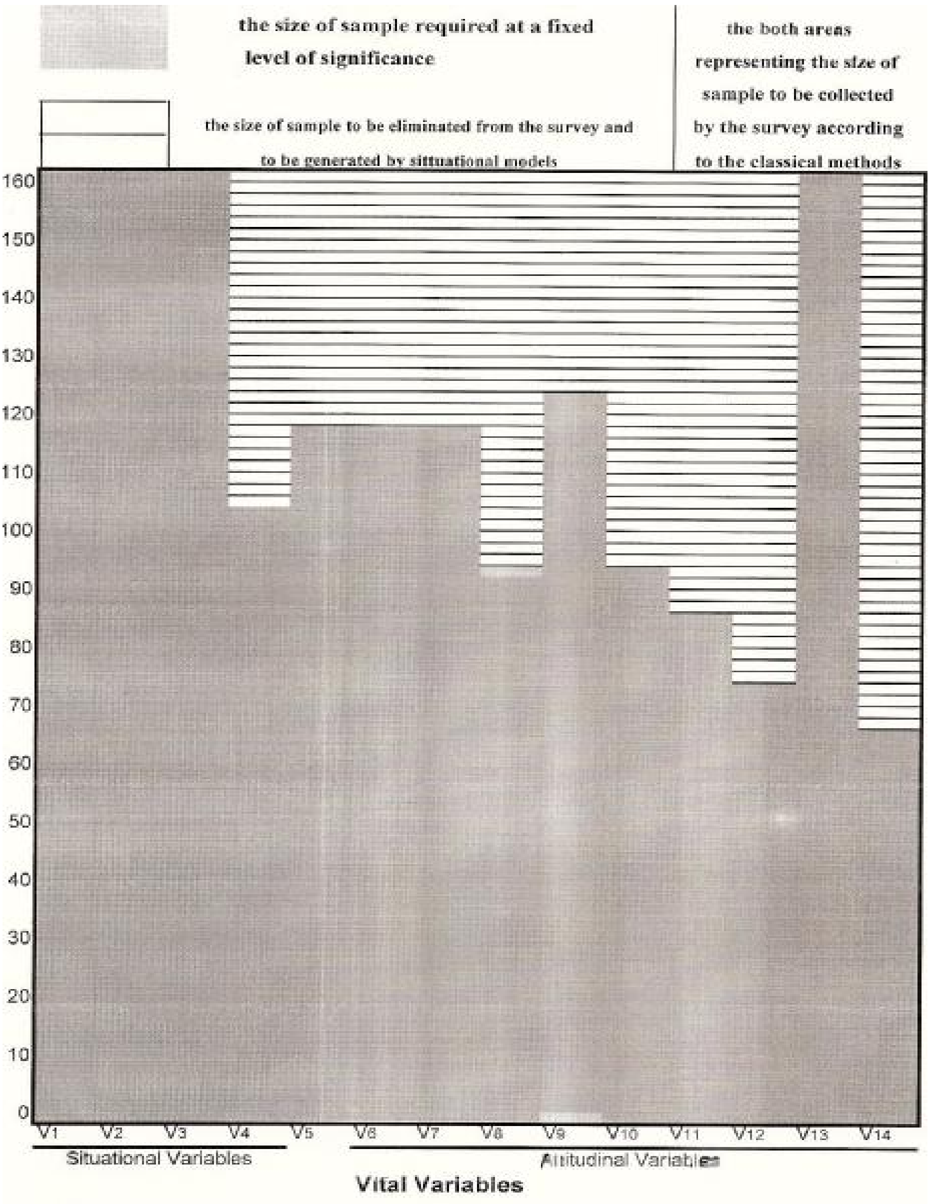

Table 2

Variable, V	The proposed Approach sample size	The classical Method sample size
V1	160	160
V2	160	160
V3	160	160
V4	160	160
V5	090	160
V6	110	160
V7	110	160
V8	080	160
V9	120	160
V10	080	160
V11	070	160
V12	050	160
V13	160	160
V14	040	160
Total obs./variable	**1550**	**2240**

1.3. Survey questionnaires design:

Accordingly, the approach requires more than one questionnaire, each next accounts down the number of questions to be included, and each of these questionnaires be distributed on a sample of different size. The main factor affecting the number of questionnaires in the number of varying sample sizes, so as, the number of questionnaires required for the above example survey would be eight. In the first, all the variables would be included, and to be collected from the sample of the lowest size, which is related to the variable 14, V14 of the 40 observations. It will also cover 40 of the sample for the rest. In the second, only the V14 would be excluded, and all the rest would be included. And to be collected from a sample equals to the remainder number of the next lowest size, which is related to V12, that is a sample of 10 observations to cover the remainder of the V12 and further 10 for the rest, and so an until covering the largest n's size in the eighth questionnaire.

1.4. Situational models description:

Having the survey been conducted, the attitudinal data will, of course, be available at varying sizes, and in order to bring these data up to be at the same size, as well as to sort our problems of non-sampling errors. And to do so, the situational models would take their role to accomplish this job, where the relationship between situational and attitudinal variables was already approved in the previus studies e.g. Al-|Beldawi, 1988, that is: if we consider the sample, m, that was collected labeled (i.j) denoting the J_{th} observation (individual) in the ith variable, for each of the m_{ij} observation in the sample, some value of an attitude z is tabulated. Let z_{ij} denotes the value of z for the m_{ij} observation in the (I,j) the sample. First we shall specify a model for zij which incorporates the situational variables, then the situational model which under certain specified assumptions, be used to generate values (scores) of the attitude z. The form of such model will be of the following :

$$Z_{ij} = a_o + a_{ij} X_{ij} + a_{2j} X ..... + a_{kj} X_{kj}$$

Where:

Z_{ij} = attitudinal value of ij_{th} observation,

X_{ij} = situational variable ij_{th} observation,

a_{ij} = coefficients, and a_o = constant

2. Empirical Illustration of the proposed Approach:

The intent of this chapter is an attempt to examine the applicability and efficiency of using the situational models as integrated part for generating attitudinal data of intercity travelers, using a sample survey (of 842 observations) was carried out in Baghdad city.

2.1 Sample size determination :

Because of the absence of the statistical parameters that are required for the sample size construction, and for checking the approach validity, data of a pilot survey of 190 travelers was conducted (variables and their abbreviations are listed in table 2) and are used to determine X and s which is approximated by S (where the sample is > 30), for designing the new approach sample size for each of the variables under consideration.

Assuming, that, the aim is to determine the sample size at 5% allowable errors, that is, a random sample of this size is 95% certain that the percentage of the sample giving a true response to a particular variable. For justifications relating to ease and efficient, the following formula is used for calculation:

$$n = \frac{S^2 (Z_a + Z_B)^2}{D^2}$$

Where:

S^2 , is variance,

Z_a , is the value of Z under the Allowable error (the critical value of N (0,1),

Z_B , is the point leaving an area B probability of type II error).

D , is ' $|m - X|$

m , is the population mean, and

X , is the sample mean

The tolerable difference between m and X is determined at 0.05 of the X value, and the error amount made in estimating the m by X is also at 5% level of significance. The power of the test, 1-b at 85% (the critical value is Z_b =1.04) .

The results of calculation which are given in Table (2_a) and illustrated in figure (2) indicate the largest sample size among the vital variables is 842 observations is required for MFR variable, and the lowest is 55 observations for MTT variable, the others falling within this range of these two extreme sizes. A glance at these results, it can be concluded that all the variables satisfy the condition of No. of observations > No. of the situational variables, which should be raised up to the largest n's size of 842 observations of the MFR variable, for developing the models.

Thus, on the basis of observation/ variable unit, the survey of the proposed approach, will need 8283 units instead of 10104 units which are required if the classical approach of the fixed sample size, would be applied. This mans that survey cost was reduced by $\approx 20\%$, and the amount of saving can further be increased in the following cases:

Table 2

System attributes variables on which attitudinal Scores were obtained

Variable	Attribute
Y_{TTA}	Travel time
Y_{TCA}	Travel cost
Y_{WTA}	Waiting time
Y_{CCA}	Comfort and convenience
Y_{MFA}	Model frequency
Y_{MSA}	Model safety
Y_{LSA}	Luggage space
Y_{BFA}	Booking facilities
Y_{SRA}	Scheduling reliability
Y_{STA}	Services at terminal

1. Whenever, the number of attitudinal variables increases over the number of situational variables, and
2. Carrying out the investigation of multicollinearity and selection of variables, using the pilot survey data, in order to eliminate unusable ones for analysis.

Table (2 a)
The Vital attitudinal and situational variable sample
Sizes at 5% level of significance

Variable		$\overline{X}$	S^2	e^2 $(m-x)^2$	n at e(0.05) z(0.05)	N to be colle-cted
Vital Situational variables	ASEX AGE NOCCUP FINCO NTRIPP TTV WTV	1.23 31.681 2.251 186.565 1.267 181.1 23.194	.178 75.176 0494 3662.426 0713 11313.522 61.325	0.004 2.51 0.013 87.016 0.004 82.0 1.345	171 115 146 162 685 530 175	842 842 842 842 842 842 842
Attitudinal Variables*	MTT MTC MWT MCC MFR	7.105 3.074 4.974 4.247 2.268	1.789 2.961 11.562 3.421 2081	0.126 0.0236 0.0618 0.045 0.0128	55 482 718 292 842	55 482 718 292 842

* Their values represent the traveler's scores of the level of importance of each. The attitudes are scored on an integer scale of 0 to 9. The largest number, "9" was taken to be the most important down to "0" as the least important.

Questionnaires Design:

From the Table (2), it can easily be observed that five different questionnaires (No. of the different sample sizes) are required, where as already been conditioned, all the seven vital situational variables should be increased to the largest n's size. The contain of each questionnaire and the number to be collected are determined as follows:

Questionnaire No.1 : Contains all the 12 Vital variables, and To be collected from 55 respondents. It covers the MTT Sample size, and the same number for the other 11 variables.

Questionnaire No. 2 : Contain the rest 11 variables, and to be collected from 237 (292-55) respondents, that is to cover the remainder of the MCC sample size and further 237 for other 10 variables.

Questionnaire No. 3 : Contains the rest 10 variables, and to be Collected from 154 (482-55-237) respondents. It covers the remainder of the MTC sample size, and further 154 for the other 9 variables.

Questionnaire No. 4 : Contains the rest 9 variables, and to be Collected from 272 (718-55-237-154) respondents, to cover the remainder of the MWT sample size, and further 272 for the other 8 variables.

Questionnaire No. 5 : Contains the rest 9 variables, and to be Collected from 124 (842-55-237-254-272) respondents, to cover all these 8 variables sample size.

Of course, since the pilot survey made 190 questionnaires available, so each attitudinal variable has sample size of 190 or less, needs not to collect by the survey.

Situational models for optimizing sample sizes:

According to the approach requirements, only the sample sizes that are shown in last column of the table (2_a) should be collected through the media of survey, and in order to complete the sample sizes of less than the size of 842, situational models would be developed using the data that are made available by the survey to generate the required attitudinal values for the completion or even for estimating the missing values or solving problems resulting from non-sampling errors. In the following the final four models are given, and only one of them, that is the Z_{SWT} model (waiting time) is discussed, because of the same manner and steps that were applied.

(1)Waiting time model, Z_{SWT} :

In developing a model for generating attitudinal scores of model waiting time, the sample size of 718 Observations related to the MWT variable is used. Employing the same procedures that were mentioned 1.4, the following equation was obtained.

$$Z_{SWT} = .449 + .432\ NMODE - .32LFINCO$$

S.E. (.094) (.011) (.041)

Sig. AT $(0.0)^{**}$ $(0.0)^{**}$ $(0.0)^{**}$

R = .83

Adjusted $R^2 = .686$

D.F. = 2, 715

F – ratio (equation) = 784.714

A look at the model, it can be seen that, it is highly consistent with the original model of the total sample of 842 observation, as well as with the sub-samples models, either from the point of coefficient size or from the other measures of significance.

To generate the required Z_{SWT} values for raising the size of sample from 718 to 842 observations, each of the NMODE and LFINCO variables values of the Observations between 719 to 842 is substituted in to the above model. The result is given to Table (3) which, also includes a comparison between the true values, that were made available by this study survey and those been generated by the model. Using the criterion of Normal deviates (Draper & smith, 980) at 5% level of significance, that is, to accept results when the differences lining within + 2.0. It was found that the results satisfy the criterion, further more, 98% of the values are significant at 1%. Therefore, it can be concluded, that the job of using the situational models for generating the attitudinal scores is effective and efficient.

(2) Travel time Model, Z_{STT}:

$$Z_{STT} = -\,290.57 + 161.285\ LFINCO + 9.313\ LTCV$$

	Constant	LFINCO	LTCV
E.S.	(20.595)	(8.474)	(4.117)
Sig.at	(0.0)**	(0.0)**	(0.02)*

R = .82

Adjusted R^2 = .67

D.F. = 2 , 187

F-ratio (equation) = 193.77

(3) Travel cost model, Z_{LTC} :

	Coefficient	Variable	S.E.	Sig.at:
Z_{LTC} =	- 1o54.619		(479.442)	(0.0)**
	- 329.841	NFINCO	(24.492)	(0.0)**
	+184.683	NTRIPP	(17.486)	(0.0)**
	+169.137	NMODE	(30.024)	(0.0)**
	+266.574	LMFV	(55.023)	(0.0)**
	+11096.11	NDAY	(3566.034)	(0.0)**

R= .66

Adjusted R^2 = .424

D.F. = 5,491

F – ratio (equation) = 74.12

** = highly significant (1% level of significance)

(4) Modal convenience and comfort model , Z_{DCC}

Z_{DCC} =.336-.411NMODE+.689LEFINCO-.253LTCV-1.99NDAY
S.E. (.171) (.018) (.058) (.033) (.435)
Sig.at (0.05)* (0.0)** (0.0)** (0.0)** (0.0)**

R= 085
Adjusted R^2 = .712
D.F. = 4 , 286
F-ratio (equation) = 180.28

Table 3

Comparison between the true and generated Z_{SWT} values

Obs.	$\bar{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
719	2	2.255	0.522	0.625	- 0.475	-.103
720	2	2.279	0.580	0.584	-0.018	-.004
721	2	2.322	0.621	0.570	0.235	.051
722	2	2.477	0.520	0.520	0.0	0.0
723	2	2.544	0.481	0.499	-0.083	-0.018
724	2	2.114	0.789	0.637	0.700	0.152
725	2	2.279	0.653	0.584	0.318	.069
726	2	2.332	0.546	0.567	-0.097	-.021
727	2	2.204	0.712	0.608	0.479	.104
728	1	2.017	0.0	0.235	-1.083	-.235
729	1	2.38	0.452	0.120	1.530	.332
730	1	2.204	0.0	0.176	-0.811	-.176
731	1	2.279	0.220	0.152	0.313	.068
732	1	2.079	0.0	0.216	-0.995	-.216
733	1	2.342	0.0	0.107	00.493	-.107
734	2	2.255	0.596	0.591	0.023	.005
735	2	2.230	0.690	0.60	0.415	.090
736	2	2.301	0.566	0.577	-0.051	-.011
737	2	2.146	0.761	0626	0.622	.135
738	2	2.477	0.520	0.520	0.0	0.0
739	2	2.079	0.456	0.648	-0.885	-.192

-Continued-

Obs.	$\bar{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
740	2	2.301	0.636	0.577	0.272	.059
741	2	2.477	0.520	0.520	0.0	0.0
742	2	2.204	0.634	0.608	0.12	.026
743	2	2.114	0.438	0.637	-0.917	-.199
744	1	2.204	0.474	0.176	1.373	.298
745	1	2.544	0.267	0.067	0.922	.200
746	1	2.279	0.0	0.152	-0.70	-.152
747	1	2.204	0.0	0.176	-0.811	-.176
748	1	2.292	0.357	0.148	0.963	.209
749	1	2.255	0.0	0.159	-0.733	-.159
750	1	2.079	0.274	0.216	0.267	.058
751	1	2.176	0.0	0.185	-0.853	-.185
752	1	2.301	0.0	0.145	-0.668	-.145
753	2	2.301	0.636	0.577	0.272	.059
754	2	2.505	0.503	0.511	-0.037	-.008
755	2	2.230	0.537	0.599	-0.286	-.062
756	2	2.255	0.596	0.591	0.023	.005
757	2	2.362	0.462	0.557	-0.438	-.095
758	2	2.204	0.632	0.608	0.111	.024
759	2	2.061	0.560	0.653	-0.428	-.093
760	2	2.342	0.610	0.564	0.212	.046
761	1	2.176	0.490	0.185	1.405	.305
762	1	2.301	0.495	0.145	1.613	.35
763	1	2.55	0.0	0.065	-0.299	-.065

- Continued -

Obs.	$\bar{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
764	1	2.230	0.0	0.167	-0.796	-.167
765	1	2.255	0.59	0.159	1.986	.431
766	2	2.176	0.735	0.617	0.544	.118
767	2	2.114	0.70	0.647	0.29	.063
768	2	2.544	0.481	0.499	0.083	.018
769	2	2.079	0.640	0.648	-0.037	-.008
770	2	2.380	0.452	0.551	-0.456	-.099
771	2	2.041	0.477	0.660	-0.843	-.183
772	1	2.398	0.443	0.114	1.516	.329
773	1	2.146	0.0	0.194	-0.894	-.194
774	1	2.041	0.0	0.228	-1.051	-.228
775	1	2.332	0.341	0.135	0.949	.206
776	2	2.114	0.789	0.637	0.70	.152
777	2	2.255	0.447	0.591	-0.664	-.144
778	2	2.322	0.552	0.570	-0083	-.018
779	2	2.544	0.481	0.499	-0.083	-.018
780	1	1.978	0.103	0.248	-0668	-.145
781	1	2.398	0.0	0.114	-0.525	-.114
782	1	2.255	0.0	0.159	-0.733	-.159
783	1	2.301	0.0	0.145	-0.668	-.145
784	1	2.114	0.0	0.204	-0.94	-.204
785	1	2.398	0.316	0.114	0.931	.202
786	1	2.176	0.0	0.185	-0.853	-.185

-(Continued)-

Obs.	$\bar{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
787	1	2.398	0.0	0.114	0.525	-.114
788	1	2.079	`0.0	0.216	-0.995	-.216
789	2	2.55	0.596	0.494	0.47	.102
790	2	2.398	0.510	0.546	-0.166	-.036
791	2	2.301	0.566	0.577	-0.051	-.011
792	2	2.362	0.527	0.557	-0.138	-.03
793	2	2.00	0.70	0.673	0.124	.027
794	2	2.176	0.572	0.617	-0.207	-.045
795	2	2.342	0.61	0.564	0.212	.046
796	1	2.255	0.0	0.159	-0.733	-.159
797	1	2.283	0.433	0.151	1.069	.282
798	1	2.041	0.572	0.228	1.539	.344
799	1	2.362	0.33	0.125	0.945	.205
800	1	2.176	0.0	0.185	-0.853	-.185
801	1	2.243	0.0	0.163	-0.751	-.163
802	1	2.462	0.352	0.093	1.193	.259
803	1	2.079	0.365	0.216	0.687	.149
804	1	2.415	0.0	0.108	-0.498	-.108
805	1	2.061	0.0	0.221	-1.018	-.221
806	1	2.342	0.0	0.131	-0.604	-.131
807	1	2.255	0.0	0.159	-0.733	-.159
808	2	1.903	0.783	0.704	0.346	.079
809	2	2.398	0.510	0.546	-0.166	-.036
810	2	2.322	0.552	0.570	-0.083	-.018

-(Continued) –

Obs.	$\overline{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
811	2	2.301	0.636	0.577	0.272	.059
812	2	2.114	0.70	0.637	0.29	.063
813	2	2.041	0.57	0.660	-0.415	-.09
814	2	2.322	0.62	0.570	0.23	.05
815	2	2.176	0.41	0.617	-0.954	-.207
816	2	2.041	0.57	0.660	0.415	-.09
817	2	2.301	0.42	0.577	-0.724	-.157
818	2	2.342	0.61	0.564	0.212	.046
819	2	2.255	0.67	0.591	0.364	.079
820	2	1.954	0.843	0.688	0.714	.155
821	2	2.398	0.38	0.546	-0.765	-.166
822	2	2.322	0.55	0.570	-0.092	-.02
823	2	2.114	0.79	0.637	-0.705	-.153
824	2	2.301	0.283	0.577	-1.355	-.294
825	2	2.146	0.68	0.626	0.249	.054
826	2	2.230	0.383	0.599	-0.995	-.216
827	1	2.204	0.474	0.176	1.332	.298
828	1	2.146	0.423	0.194	1.055	.229
829	1	2.114	0.0	0.204	-0.94	-.204
830	1	2.602	0.35	0.048	1.392	.302
831	1	2.255	0.0	0.159	0.733	-.159
832	1	2.204	0.0	0.176	-0.811	-.176
833	1	2.415	0.31	0.108	0.931	.202

- (Continued) -

Obs.	$\bar{X}_i$		SWT (true value)	Z_{SWT} (generated value)	Normal Deviate	
	NMODE	LFINCO				
834	1	2.322	0.483	0.138	1.59	.345
835	1	2.079	0.0	0.216	-0.995	-.216
836	1	2.38	0.0	0.119	-0.548	-.119
837	1	2.423	0.31	0.106	0.94	.204
838	1	2.041	0.0	0.228	-1.051	-.228
839	1	1.954	0.0	0.256	-1.18	-.256
840	1	1.929	0.434	0.264	0.78	.17
841	1	2.230	0.46	0.167	1.35	.293
842	1	2.413	0.0	0,109	-0.502	-.109

Normal deviate, $D_i = \frac{E_i}{S.D.}$ where E_i is the difference between SWT and Z_{SWT} values

SWT = MWT / $\sqrt{FINCO}$

NMPDE, CO (coach) = 1; MB (Medium bus) = 2

ZSWT = .449 + .432 NMODE - .32 LFINCO

S.D. (standard deviation) = $\sqrt{\frac{\sum (x-x)^2}{n}} = \sqrt{\frac{5.835}{124}} =$ 0.217

X = 0.38 $\sum = 47.141$ n = 124

$$S^2 = \frac{\sum (X_i - X)^2}{n-1} = \frac{5.835}{124} = .047$$

S= 0.217

3. References:

3.1. A.H. Al-Beldawi (1995), Applied Sampling Methods, 7th April . University, Libya.

3.2. Al-Beldawi, A.H. " Modeling Travel Patterns and Attitudes Towards Intercity Transportation System for a Developing Country Using Multivariate Techniques ", Ph. D. Thesis, U.C.N.W., Wales, U.K. (1988).

3.3. Armitage, P. (1971). " Statistical Methods in Medical Research" John Wiley and sons, Inc. New York.

3.4. Colton, T. (1973(. " Sequential analysis in A.L. Delaunois" Biostatistics in Pharmacology, Vol.11 Oxford : Pergamon Press, ch.14.

3.5. Colton, T. and McPherson, K. (1976). " Two Stage plans compared with fixed-sample size wald SPRT Plans " Journal of American Statistical Association, Vol. 71, N0.353, pp 80-86.

3.6. Coehran, W.G. (1963). " Sampling Rechniques ", John Wiley and Sons, Inc., New York.

3.7. Coehram, W.G. (1963). " Sampling Techniques", John Wiley and sons, Inc. New York.

3.8. Godamble, V.P. (1966). " New approach to sampling from finite populations Journal of Royal Statistical Society, B, 28, pp 310-328.

3.9. Draper, N.R. and Smith, H. (1998). Applied regression Analysis", John and Sons, Inc. London.

3.10. Grundy P.M. et. Al (1956). " Economic choice of the amount of experimentation, joural of Royal Statistical society, B,18, PP32-55.

3.11. Johan Dagpunar (1988), Pronciples of Random Variate Generation, Oxford University Pres, London.

3.12. Kalton, G. (1983). " Models in practice of survey sampling" International Statistical Review, 51, PP 175-188.

3.13. Little, R. J. (1982). " Models for Nonresponse in sample survey" Journal of American Statistical Association, Vol.77., No. 378, PP 237-240.

3.14. Sendecor, G.W. and Cochran, W.G. (1967). " Statisical Methods" 6th edition, Ames, Lowa : Lowa State University Press.

3.15. W. J. Krzanowski (1988) , Principles of Multivariate Analysis, Oxford University Press, London.

3.16. Wald, A. and Wolfowitz (1948) . " Optimum character of SPRT", Annals of Mathematical Statistics, 19, PP326-339.

منهجيــة تقليل تكلفــة مســـوحات العينـــة لبيانات الرأي

الاستاذ المساعد الدكتور عبدالحميد البلداوي
كلية المنصور الجامعة

المستخلص

تستهدف المنهجية المقترحة لهذا البحث تقليل كلفة مسوحات البيانات النوعية من خلال توظيف نماذج ظرفية (Situational) مع امكانية استخدام هذه النماذج في ايجاد تقديرات لتعويض البيانات المفقودة او لاكمال الجدول التحليلي.

وتقوم المنهجية على اساس تطبيق مستوى دقة a موحدة لجميع المتغيرات التي يستهدفها البحث وليس على اساس مستوى الدقة للمتغير الذي تباينه هو الاعلى بين باقي المتغيرات . ولأجل ذلك تطرق البحث الى :

1. الاسلوب التقليدي المعمول به حاليا في تصميم عينات المسوحات الاحصائية .
2. الاساس التي تم اعتمادها بموجب المنهجية المقترحة ومستلزمات تنفيذها .
3. اعتماد حالة دراسية تطبيقية لاختبار المنهجية المقترحة .

وتشير الحصيلة الى امكانية توفير ما نسبته 30%-20 من اجمالي كلفة المسوحات في حالة اعتماد المنهجية المقترحة ، مع بناء تقديرات عالية الدقة بواسطة النماذج التي تم تطويرها لغرض تعويض البيانات المفقودة .