



SURVEY OF CYBER CRIME AMONG UNDERGRADUATE STUDENTS USING RANDOMISED RESPONSE TECHNIQUE

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ABSTRACT: In recent times, our society is increasingly relying on the internet and other information technology tools to engage in personal communication and conduct business activities among other several benefits. While these developments allow for enormous gain in productivity, efficiency and communication they also create a loophole which may totally destroy an organization. There loopholes are capitalized by those who engaged in cybercrime. Sampling survey is commonly used in numerous fields of statistics research. Sampling survey which related to sensitive information is inevitably encountered. Sensitive questions mean that the content of questions themselves can be considered as intrusive and the answers to questions are socially undesirable or the meanings of questions have threat of disclosure. In this research Alternative Estimator in Dichotomous Randomized Response Technique model by Ewemooje *et al* (2019a) was used to detect sensitive questions to determine the rate of cybercrime among undergraduate student. It was compared to determine the most efficient model between Ewemooje *et al* (2019a) model and the direct method. IBM SPSS was used to analyse the data. Using direct method 14 (4.7%) responded Yes to the sensitive question, why 286 (95.3%) responded No to the sensitive question. Comparing it with the proposed model Alternative Estimator in Dichotomous Randomized Response Technique it shows that 141 (47.0%) of the respondent actually responded Yes to the sensitive question and 159 (53.0%) of the respondent responded No to the sensitive question. With the use of the proposed model it shows how effective the proposed model is used to detect the sensitive question from the respondent.

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1.0. INTRODUCTION

In recent times, our society is increasingly relying on the internet and other information technology tools to engage in personal communication and conduct business activities among other several benefits. While these developments allow for enormous gain in productivity, efficiency and communication they also create a loophole which may totally destroy an organization. There loopholes are capitalized by those who engaged in cybercrime. The term cybercrime can be used to describe any criminal activity which involves the use of computer or the internet network (Okeshola, 2013). Sampling survey is commonly used in numerous fields of statistics research. Sampling survey which related to sensitive information is inevitably encountered. Sensitive questions mean that the content of questions themselves can be considered as intrusive and the answers to questions are socially undesirable or the meanings of questions have threat of disclosure.

Many authors have investigated on cybercrime and also worked on Warner's Randomized Response

Technique. An improved randomized response strategy, Magnat, N.S. (1994), A comparison of estimators for randomized response sampling with continuous distributions from a dichotomous population, Le Roy A. F. (2007), Estimating at least seven measures of qualitative variables from a single sample using randomized response techniques, Lee, C.S., et al., (2013), An Improved Warner's Randomized Response Model, Adebola F. B., et al.,(2015), Improved Randomized Response Technique for Two Sensitive Attributes, Ewemooje, O. S., et al.,(2015), Cybercrime Among University Undergraduates: Implications on their Academic Achievement, Igba et al.,(2018), An Alternative Estimator for Unrelated Questions in Tripartite Randomized Response Technique, Ewemooje O. S. (2019), Cybercrimes and Challenges of Cyber-Security in Nigeria, Idowu (2021), among others.

The issue of cybercrime is a worrisome issue that is why many concerned authors have buttressed much on the situation, cybercrime as a pervasive occurrence that hides in the face of the development of

every nation. In a similar vein, in Nigeria today, cyber-crime has got its rootstock in the country. Identical to a cankerworm, it has eaten deep in the society. Cyber-crime has come as a surprise and a strange phenomenon that for now lives with us in Nigeria. With each passing day, the society is more and more alarming cases of cyber-crimes in Nigeria, amidst each new case more shocking than the one before. In defining cybercrime, there is the need to understand the split meaning of Cyber and Crime. The term "cyber" is a prefix used to express an idea as a component of the computer and Information age and Crime can be defined as any activity that contravenes legal procedure mostly completed by individuals with a criminal motive.

2.0 WARNER (1965) MODEL

Warner's aim was to reduce bias in the response of the respondents by enabling interviewees to respond with answers that provide information on a probability basis. The respondents were asked to choose a statement at random with the help of a spinner and to answer "yes" or "No" sincerely to indicate if he/she agrees to the statement. The "yes" probability is given as:

$$p(\text{yes}) = \pi p + (1 - \pi) \quad (3.1)$$

The estimate of the proportion of respondents that belongs to the sensitive character was given as:

$$\hat{\pi} = \frac{n_1}{n(2p-1)} - \frac{(1-p)}{2p-1} \quad (3.2)$$

Where n_1 is the number of individuals responding "yes", n is the number of respondents selected by a simple random with replacement sample while p is the probability of using a sensitive question.

The variance of the estimate, $\hat{\pi}$, was given as:

$$V(\hat{\pi}) = \frac{\pi(1-\pi)}{n} + \frac{p(1-p)}{n(2p-1)^2} \quad (3.3)$$

3.0 DICHOTOMOUS RANDOMIZED RESPONSE MODEL BY EWEMOOJE ET AL., (2019)

In this model, respondent was asked sensitive question such that if the respondent replies positively, there will be no need to use a randomizer. But if the respondent reply negatively, two randomized devices were used each consisting of two questions with different selection probabilities. Ewemooje et al (2019) also introduced, α and β such that $q = \frac{\alpha}{\alpha+\beta}$ which is the probability of using R_1 and $1 - q = \frac{\beta}{\alpha+\beta}$ is the probability of using R_2 . The unbiased estimate of the population proportion is given as:

$$\hat{\pi} = \frac{\hat{\theta}_1(\alpha+\beta) - P_2\alpha - P_1\beta}{P_1\alpha + P_2\beta} \quad (1)$$

The variance of the estimate is also given by:

$$V(\hat{\pi}) = \frac{\pi(1-\pi)}{n} + \frac{(1-\pi)(P_2\alpha + P_1\beta)}{n(P_1\alpha + P_2\beta)^2} \quad (2)$$

4.0 RESEARCH DESIGN

Descriptive survey research design was used for this study. Describe survey research as research that involves the collection of data from a sample that has been chosen to represent a population to which the findings of the data analysis can be generalized. That is why survey design was considered appropriate for the study.

5.0 DATA COLLECTION

Data will be collected by sharing decks of cards and questionnaire to detect those involved in cybercrime among FUTA undergraduate student. A sample of 300 students will be taken from FUTA undergraduate students.

6.0 DEMOGRAPHIC INFORMATION OF THE RESPONDENTS

The computations and results for this study are presented and discussed in this section. Respondents' characteristics were described using univariate frequencies. Questions on have you ever been involved in Cyber Crime was categorized into Yes or No. Chi square analysis was used to measure the relationship between the respondents' demographic information and the Cyber Crime involvement. Also, binary logistics regression was conducted to determine the factors that predict cybercrime involvement. Analysis were conducted using IBM SPSS and variables are said to be significant if $p < 0.05$.

In table 1, the demographic information of the respondents was presented. The results show that 295 (98.3%) of the respondents are male and 5 (1.7%) of the respondents are female. 102 (35.1%) of the respondents falls between 21-24years age group, 91 (31.3%) falls in >24years age group, 83 (28.5%) falls within 18-20years age group, and 15 (5.2%) of the respondents falls in <18years age group. 259 (86.3%) of the respondents are Christians and 41 (13.7%) are Muslims. 83 (31.7%) of the respondents are in 500level, 57 (21.8%) are in 400level, 48 (18.3%) of the participants are in 100level, 48 (18.3%) of the participants are in 200level, and 26 (9.9%) are in 300level. 278 (92.7%) of the respondents are single and 22 (7.3%) are married. 135 (54.4%) of the participants current CGPA fall within 3.5-5.0, 78 (31.5%) fall within 2.5-3.45, and 35 (14.1%) fall within 1.5 - 2.45.

Table 1 showing the Demographic information of residents against Characteristics, Frequency and Percentage

	Characteristic	Frequency	Percentage
Gender	Male	295	98.3
	Female	5	1.7
Age Group	< 18 years	15	5.2
	18 – 20 years	83	28.5
	21 -24 years	102	35.1
	>24 years	91	31.3
Religion	Christianity	259	86.3
	Islamic	41	13.7
Level	100level	48	18.3
	200level	48	18.3
	300level	26	9.9
	400 level	57	21.8
	500level	83	31.7
Marital Status	Single	278	92.7
	Married	22	7.3
Current CGPA	1.5 – 2.45	35	14.1
	2.5 – 3.45	78	31.5
	3.5 – 5.0	135	54.4
Total sample		300	100

7.0 RELATIONSHIP BETWEEN DEMOGRAPHIC INFORMATION AND CYBER CRIME INVOLVEMENT

The chi square test indicates that there is significant relationship between gender and involvement in cybercrime, there is significant relationship between age group and involvement in cybercrime, there is

significant relationship between religion and involvement in cybercrime, there is significant relationship between class level and cybercrime involvement, and there is significant relationship between marital status and involvement in cybercrime. However, there is no significant relationship between CGPA and cybercrime involvement.

Table 2: Chi Square Test between Demographic Information and Cyber Crime

	Characteristic	Ever been involved in Cyber Crime		P-value
		No	Yes	
Gender	Male	154 (96.9%)	141 (100.0%)	0.034
	Female	5 (3.1%)	0 (0.0%)	
Age Group	< 18 years	0 (0.0%)	15 (11.4%)	< 0.001
	18 – 20 years	40 (25.2%)	43 (32.6%)	
	21 -24 years	64 (40.3%)	38 (28.8%)	
	>24 years	55 (34.6%)	36 (27.3%)	
Religion	Christianity	150 (92.3%)	109 (77.3%)	< 0.001
	Islamic	9 (5.7%)	32 (22.7%)	
Level	100level	27 (21.4%)	21 (15.4%)	< 0.001
	200level	26 (20.6%)	22 (16.2%)	
	300level	0 (0.0%)	26 (19.1%)	
	400 level	34 (27.0%)	23 (16.9%)	
	500level	39 (31.0%)	44 (32.4%)	
Marital Status	Single	137 (86.2%)	141 (100.0%)	< 0.001
	Married	22 (13.8%)	0 (0.0%)	
Current CGPA	1.5 – 2.45	19 (15.1%)	16 (13.1%)	0.112
	2.5 – 3.45	32 (25.4%)	46 (37.7%)	
	3.5 – 5.0	75 (59.5%)	60 (49.2%)	

8.0 PREDICTION OF CYBERCRIME INVOLVEMENT

A logistic regression model showing odd ratios predicting cybercrime involvement was present on the table 4 below. The result significantly show that those that are 24years and above are less likely (OR=0.268,

CI=0.111-0.646) to be involved in Cyber-crime than their counterparts who are less than 18years. Those that practice Islam are less likely to be involved than those who practice Christianity.

As the student's level increases, they are more likely to be involved in the crime.

Table 3: Logistic Regression model showing odds ratios predicting cyber-crime involvement

	Characteristic	Ever been involved in Cyber Crime		
		Odd Ratio	CI	P-value
Gender	Male	1.00		
	Female	0.496	0.01-0.820	0.682
Age Group	< 18 years	1.00		
	18 – 20 years	0.354	0.04-0.612	0.421
	21 -24 years	0.839	0.363 – 1.936	0.680
	>24 years	0.268*	0.111 – 0.646	0.003
Religion	Christianity	1.00		
	Islamic	0.094*	0.032 – 0.271	0.000
Level	100level	1.00		
	200level	0.091*	0.030 – 0.274	0.000
	300level	0.193*	0.078 – 0.477	0.000
	400 level	0.702	0.231-0.911	0.342
	500level	0.206*	0.087-0.487	0.000
Marital Status	Single	1.00		
	Married	0.49	0.212-0.631	0.599

9.0 PREVALENCE OF CYBER CRIME AMONG STUDENTS

From table 5, in direct method of data collection, 14 (4.7%) of the respondents agreed that they have ever been involved in Cyber Crime, 286 (95.3%) said they have never been involved in Cyber Crime. With use of Alternative estimator in dichotomous randomized

response technique, the response rate on the “yes” increase to 141 (47.0%) while “no” reduced to 159 (53.0%). The proportion of those involved in Cyber Crime with the use of the alternative estimator in dichotomous randomized response technique is 0.470 and the proportion of those involved in Cyber Crime with the use of Direct method is 0.047.

Table 4: Cyber Crime responses based on the Direct method and the Randomized response technique

	Response	Frequency (%)
Direct Method	Yes	14 (4.7%)
	No	286 (95.3%)
Randomized Response Technique	Yes	141 (47.0%)
	No	159 (53.0%)

10.0 EFFICIENCY COMPARISON

Comparing the alternative estimator in dichotomous randomized response technique with direct method we use the equations below to obtain the proportion, variance, standard error and Coefficient of variation. The formulae are given below, where $\hat{\pi}_{RRT}$ and $\hat{\pi}_{DM}$ are estimators for alternative dichotomous randomized response technique and direct method, respectively.

Table 6 shows the direct method of questioning in relation to Cyber Crime under the estimated proportion of the respondents involved in the act with an estimate of 0.0470 while the alternative estimator in dichotomous gives 0.1167. The direct method estimates with

0.000149 variances while dichotomous randomized response technique estimates 0.0037 variances. The coefficient of variation (CV) from the true value for the direct method and dichotomous randomized response technique was measured as 26.04% and 16.45%, respectively. Hence, the CV for dichotomous Randomised Response Techniques is smaller than the CV for direct method, these implies that the dichotomous randomized response technique is more efficient in the estimation of the proportion of persons involved in Cyber Crime in the population than the direct method of questioning.

Table 5: Comparative Analysis of the Direct Method and the Alternative Estimator in Dichotomous Randomized Response Technique

Statistic	Method	
	Direct	RRT
$\hat{\pi}$	0.047000	0.11670
$CV(\hat{\pi})$	26.04%	16.45%

11.0 CONCLUSION

In this study, it has been observed that there is high rate of cybercrime involvement in the studied population. The dichotomous randomized response technique estimated the proportion of persons involved in Cyber Crime better than the direct questioning method. Also, youths (<24years old) are more involved in cybercrime and students in 200level, 300level and 500level are more involved in Cybercrime.

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