ON THE USE OF DOUBLE SAMPLING METHOD IN ANALYSING INTERNALLY GENERATED REVENUE: A CASE STUDY OF OLABISI ONABANJO UNIVERSITY

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ABSTRACT

Funding Nigerian Government owned Institutions has been the responsibility of the Government. Federal institutions have been enjoying the ease flow of cash from the Federal Government. However, State-owned Government Institutions like Olabisi Onabanjo University, as revealed in THE NATION newspaper, has been faced with under-funding from her host Government, hence, calling for creativity for this institution to create or increase the Internally Generated Revenue (IGR). Taking Olabisi Onabanjo University as a case study, this research used a Double Sampling for Regression Statistical Sampling with estimation method to estimate approximate total amount of eight hundred and sixty nine million naira (N869 Million) that can generate annually from six proposed businesses with reference to the undergraduate population. These six businesses have the following estimate, percentage of contribution to IGR and the corresponding percentage coefficient of variation: Students’ Accommodation (N265 Million: 30.5%: 4.24%), Female Hair do and Male Hair cut (N172 Million: 19.77%: 12.21%), Egg Sales (N64 Million: 7.42%: 5.81%), Fruit Juice (N112 million: 12.90%: 8.56%), Customised Exercise Book (N36 million: 4.15%: 15.69%) and Bread Production (N220 million: 25.2%: 7.77%). It was recommended that Nigerian Institutions should endeavour to do these businesses. Similarly, there is need for Nigerian Institutions to establish the IGR directorate that will be delegated with the objectives on how to strategise on boosting, running and maintaining IGR activities for the institution in the most aggressive and profitable ways.

Keywords: Double Sampling, Estimation, Internally Generated Revenue, Olabisi Onabanjo University.

INTRODUCTION

One of the major challenges of running a government owned Institution in Nigeria is the inability to get sufficient capital to run these institutions’ activities. The federal and state governments through the National Universities Commission (NUC), have continuously directed all federal and state owned institutions to explore ways of generating revenue internally, called Internally Generated Revenue (IGR) for providing financial solution to all their financial challenges. (Okoje, 2009) defined IGR as the creation of either tangible or intangible resources within the confines of one entity. The Internally Generated Revenue (IGR) implies that the federal and state government do not have to accept responsibility for providing funding for all their universities on every expenditure. Currently, Nigerian institutions such as Olabisi Onabanjo University, are encouraged to engage in the development of critical access to IGR because of the essential importance that comes from it. In an institution, IGR can be generated by providing products and services for the population of the students, staff and the host community of the institution. Olabisi Onabanjo University is a state-owned university sited in Ogun State of South West of Nigeria. The university was founded in July 7, 1982 as Ogun State University and was renamed Olabisi Onabanjo University on May 29, 2001. This study critically uses double sampling for regression to estimate total income that a Nigerian institution would raise from six (6) proposed businesses that are viable on the university campus, taking Olabisi Onabanjo University as a case study. These six businesses are providing undergraduate students’ accommodation, hairdo and haircut business units, fruit juice production, OOU customised exercise book production, bread production (flour, cassava and wheat types) and poultry egg sales. It is worth mentioning that fruit juice within the context of this study includes kunu Juice, zobo juice and juice made from fruits like apple, orange, mango, pineapple, pawpaw and plantain. It is expected that with the outcome and recommendations from this study, most government owned institutions in Nigeria can improve on their IGR for the
smooth running of the institution.

MATERIALS AND METHODS
One of the ways Nigerian Universities can be a great citadel of learning is for her to consistently encourage Internally Generated Revenue (IGR). This will help in the area of research and development. The IGR unit is a very important unit in an Institution due to the fact that it helps as a second source of income for the Institution and especially when the government may not be able to provide fund for a particular month to run the affairs of the institution.

Traditional Funding source for Federal, States and Private Universities in Nigeria
Odebiyi & Aina (1999), Adewale et al., (2002), (Johnstone, 1998) & (Akinsanya, 2007), ascertained that the traditional funding sources for the Nigerian Institutions vary somewhat from the point of view of the funding and proprietorship of the institutions. Federal institutions are funded by the Federal Government via grants for personnel costs, research funding and capital expenditure. However, (Okojie, 2009) and (Ijaduola, 2010) confirmed that it is on statutory note that federal institutions do not charge any tuition fee and it could be considered a serious violation for any federal institution to impose tuition fees on the students or their parents. On the other hand, (Aina, 2002) revealed that the state institutions are primarily funded by the state governments who established them and these state institutions charge affordable tuition fees and other long list of charges for registration, library fee, departmental fee, Information Technology due and several many other levies. However, since the arrival of the first stream of private Universities in 1999, school fee have proved their most traditional funding source with little support from the proprietors. Some private institutions have also explored generating IGR through fund raising.

There are many advantages associated with the proper-funding of an institution. (Loubert, 2008) established the relationship between institution funding and the output quality of an institution. Another parameter is the low staff morale that accompanies inadequate funding of the Institutions. (Ijaduola, 2010) declares “Experience and evidence abound that workers work less or even refuse to work when salaries and fringe benefits are not forthcoming regularly. This is an incidence which may make national productivity to decline”. Unfortunately, with serious under-funding from the government, the managements of both federal and state universities have had to insist that students pay for one charge or the other as long as the tag is not “tuition” or “school fee”. In some cases, parents have been mandated to donate specific amounts or equipment to the institution before their wards can be granted admission to study certain programmes. While this is most perennial with the state institutions, the federal Institutions are not left out. In fact, private institutions claim they provide all forms of social amenities ranging from water, electricity, housing and roads among others, which the government has failed to provide, hence, supporting their action for charging the exorbitant fees. Above all, (Beve & Ursic, 2008) consider tuition fees as an instrument of price policy in education which can exert negative consequences when the level is inappropriate.

The Funding Gap in Institutions and the Place of Internally Generated Revenue (IGR)
Nwachukwu (1977) emphasized that in federal and state Institutions, the government only funds a narrow list of expenditures including personal, research and capital cost development but without the rightful funding of the operation. (Adeniyi, 2008) supports this claim that the amount the federal government’s advance for electricity, for instance, may only be enough to buy diesel for only one month out of the twelve months in the year. Hence, (Ndagi, 1983), (Odebiyi & Aina, 1999), (Adeniji, 2008) and (Yusuf, 2010) agreed that there is a funding gap that requires new creative means to be filled if the students (through payment of tuition fee) would not have to bear the full burden of the cost of education. This has given rise to the present high emphasis on IGR. (Akinsanya, 2007) suggested a list of IGR sources for federal and state institutions which include consulting services, seminars and partnership with industry and productions. (Odebiyi & Aina, 1999) and (Johnstone, 1998) emphasized that there is, however evidence of improvements in the IGR earning capacity of some Institutions. There are currently fewer or no evidence of partnership with industries such that the research results could be harvested, hence, bring proceeds to the institution.

Very importantly is the recommendation of (Odebiyi & Aina, 1999), (Ouma et al., 2007) and (Johnstone, 1998) who claim that many institutions have embraced commercial activities as a means of earning IGR but they have not given the right emphasis needed for success ,while some have executed businesses without any proper feasibility studies. On a success story is that some institutions have consistently run business without a recorded failure. A typical example of this success story is BABCOCK University flour and wheat bread that have become the number one choice bread for majority of the populace in Ijebu land. The good news is that BABCOCK University has confirmed that institutions can handle businesses successfully.

Sequel to this recommendation, this study has taken a look at six businesses for Nigerian Institution. A field survey data have been utilised to estimate annual (12 calendar months) income that Nigerian institutions can earn depending on the undergraduate population. Though, the result of this study is limited to the undergraduate population, the implementation can be extended beyond this population.
Double Sampling (Extracted from Ogunyinka and Sodipo [2014])

Double sampling becomes necessary when there is need to use auxiliary variable $x_i$ to improve the efficiency of any estimate at the post-selection stage. The preliminary sampling provides information about the auxiliary variable $x_i$ while the second phase sampling provides information on the study variable $y_i$, which is highly correlated with the auxiliary variable. (Cochran, 1977) established that double sampling for regression gives more precise estimate over double sampling for ratio when the linear graph between $x_i$ and $y_i$’s does not pass through the origin. Similarly, (Agunbiade & Ogunyinka, 2013) empirically ascertained that while double sampling increases the precision of an estimate, a higher positive correlation between and will yield a more efficient estimate.

Let $y_i$ and $x_i$ be the sample values of the study character and the auxiliary character respectively which are obtained with simple random sampling without replacement (SRSWOR) of sample size from the population size $N$. The sample mean of the double sampling for regression estimator is presented by (Cochran, 1977)

$$\bar{y}_{dl} = \bar{y} - \hat{b}(\bar{x} - \bar{x})$$  \hspace{1cm} (1)

Where $\bar{x}$ represents the sample mean of the auxiliary variable at the second phase; $\bar{y}$ represents the sample mean of the auxiliary variable at the first (preliminary) phase; $\bar{y}$ represents the sample mean of the study variable at the second phase and $b$ is the estimated regression coefficient between $x$ and $y$.

Okafor (2002) presented the estimated variance of as

$$\hat{V}(\bar{y}_{dl}) = \left[ \frac{1}{n} - \frac{1}{n} \right] \hat{s}_y^2 + \left[ \frac{1}{n} - \frac{1}{n} \right] (\hat{b}^2 + \hat{b}^2 \hat{s}_x^2 - 2\hat{b}\hat{b}\hat{s}_{xy})$$  \hspace{1cm} (2)

$n'$ denotes the first phase sample size while the $n$ denotes the second phase sample size. However, we may be interested in obtaining and $n$ that minimize the variance at a fixed cost of the survey, hence, optimum allocation of resources becomes necessary for usage.

If $c_i$ represents the cost of obtaining a unit at the first phase sampling, $c_i$ represents the cost of obtaining a unit at the second phase sampling and $c_i$ represents total cost of the survey.

$$C_T = c_1 n_i + c_2 n_i$$  \hspace{1cm} (3)

Then, the optimum variance of $\bar{y}_{dl}$ is presented as

$$\hat{V}(\bar{y}_{dl})_{opt} = \frac{s_y^2}{C_T} \left[ \sqrt{c_2(1 - \rho^2)} + \sqrt{c_1\rho^2} \right]^2 + \frac{s_y^2}{N}$$  \hspace{1cm} (4)

Furthermore, (Okafor, 2002) presented the optimum sample sizes at the first and the second phases respectively as

$$n_i' = \left[ \frac{C_T \left( \rho^2 s_y^2 / c_1 \right)}{K} \right]^{\frac{1}{2}}$$  \hspace{1cm} (5a)

and

$$n_i'' = \left[ \frac{C_T \left[ s_y^2(1 - \rho^2) / c_2 \right]}{K} \right]^{\frac{1}{2}}$$  \hspace{1cm} (5b)

Where

$$K = \left[ c_1 \rho^2 s_y^2 \right]^{\frac{1}{2}} + \left[ c_2 \rho^2 s_y^2 (1 - \rho^2) \right]^{\frac{1}{2}}$$  \hspace{1cm} (6)

Obtaining $n_i'$ and $n_i''$ require the knowledge of $\rho$ and $s_y^2$, which can be estimated in a pilot survey.

The estimated population total is presented as

$$\hat{y}_{nl} = N \hat{y}_{dl}$$  \hspace{1cm} (7)

where $N$ = Population size

Among the authors that have applied double sampling include (Shaw et al., 2008) who estimated the forest soil Carbon and Nitrogen stock, (Bart & Earnst, 2002) estimated the density of nesting birds in northern Alaska and (Mutanga & Skidmore, 2004), in estimating the fuel wood availability in northern Zimbabwe. (Ogunyinka & Sodipo, 2014) used household size as the auxiliary variable to improve the estimated average household expenditure in a double sampling method. They, similarly, applied double sampling to estimate some characteristics about online software repositories.

Coefficient of Variation

Coefficient of variation is a statistical tool that is used to know the level of variability in estimates. (Lohr, 2010) defines the coefficient of variation (CV) of the estimator as the measure of relative variability and defined as:

$$CV(y) = \frac{\sqrt{\hat{V}(y)}}{\bar{y}}$$  \hspace{1cm} (8)

$$CV(\bar{y}) = \frac{\hat{S}}{\bar{y}}$$  \hspace{1cm} (9)

Where $SE$ means Standard Error.

Similarly, computing the coefficient of variation for the estimated population total is presented as

$$CV(\hat{y}) = \frac{\sqrt{\hat{V}(\hat{y})}}{\hat{y}}$$  \hspace{1cm} (10)

It is a measure that does not depend on the unit of measurement. (Lohr, 2010) estimated the CV of an estimator, using the standard error divided by the mean (defined only when mean or estimated total is nonzero).
RESULTS
This study uses a questionnaire administration method for data collection. These questionnaires were administered by students on the main Campus (popularly called Permanent Site) of Olabisi Onabanjo University. Student Income (SI) is used as the auxiliary variable while the Student Expenditure (SE) is used as the study variable. This is justified naturally that Student Expenditure (SE) depends on the student Income (SI). It was ascertained that there exists non-zero interception linear relationship between the Student Income (SI) and the Student Expenditure(SE), hence, this justifies the use of double sampling for regression. The six businesses considered in this study (with each respective abbreviation in bracket) are Undergraduate Students’ Accommodation (SA), Hairodo and Haircut Business Units (HHB), Fruit Juice Production (FJP), OOU Customised Exercise Books Production (OCEB), Flour, Cassava and Wheat Bread Production (BP) and Poultry Egg Sales (PES). Table 1.0 shows the details of the population, first phase and second phase sample sizes used in the study. The population size used is 10291 undergraduate students of Olabisi Onabanjo University which was confirmed on the University’s website, www.ouagoiwoye.edu.ng.

The population size was known in advance. The first and second phase sample sizes (and) were obtained by random from the population size based on the number of questionnaires that were returned by the respondents. 400 questionnaires at the first phase were distributed to the available students in different strategic places on the main campus of the University. Maximum of 330 administered questionnaires were selected after removal of non-respondents (both unit and item are non-respondents). The auxiliary data needed from the first phase were collected from the selected questionnaires. The second phase sample units were selected dependently from the prior first phase sample units. Finally, the study variable data and second phase auxiliary data were collected at this phase.

After this, the data for both the study and auxiliary variables were extracted from the administered questionnaires. Questionnaires were manually administered by the students and the data was collected between 6th and 15th of January, 2015. It is important to mention that this study assumed that there are three academic semesters in one calendar year (12 months), hence, all conversions were done based on this assumption. Similarly, this study is limited to the population of undergraduate students.

The second phase sample is dependent of the first phase sample using simple random sampling without replacement. Similarly, Microsoft Excel (version 2010) was scripted to execute all calculations used in this analysis. Figures 1 through 6 show the non-zero interception linear relationship between Annual students’ expenditure on the six proposed businesses as against the corresponding annual students’ income. The corresponding footnotes explicitly explain each figure.

DISCUSSION AND CONCLUSION
Table 2.0 shows the summary of the sample mean, estimated population total and the corresponding percentage coefficient of variation (%CV). A small Coefficient of Variation reveals that the sample mean and the estimated population total have higher precision or higher level of reliability. Table 2.0 reveals that all the estimated total amounts have high level of reliability. Figure 7.0 shows the graph of the estimated population total for the proposed six businesses. An approximate total of Eight hundred and sixty nine million naira (N869 Million) was estimated for the six proposed businesses for the improvement of IGR to Nigerian Institutions. Students’ annual expenditure on accommodation has the highest contribution level to IGR with approximately two hundred and sixty-five million naira (N 265 Million) that the school can generate on accommodation per year from undergraduate students population only. Bread consumption by students in a year has 25.26% contribution to IGR with approximately two hundred and twenty million naira (N220 million) for a year. Hairodo for female students and hair-cut for male students has 19.77% contribution to IGR with approximately one hundred and seventy two million naira (N172 Million) per annum. Fruit Juice consumption by students has 12.90% contribution to IGR with approximately one hundred and twelve million naira (N112 Million) per year. Similarly, egg consumption by students has 7.42% of approximately sixty four million Naira (N64 million) contribution to the IGR. Finally, OOU customised exercise book purchase by students has the least contribution (4.15%) to IGR of approximately thirty six million naira (N36 million) per year.

This study examines and quantifies the estimates that a Nigerian institution may generate from businesses to boost Internally Generated Revenue (IGR) based on the students consumption of some goods and services. It was established that Students’ accommodation business, Production and Sales of Bread, Fruit juices, Egg Consumption and Exercise Book and rendering service like Female Hairodo and Male Haircut to the student population will significantly boost the IGR for any Nigerian Institution.

This study hereby recommends that Nigerian universities should leverage on some or all of these businesses mentioned in this article in boosting their Internally Generated Revenue (IGR). However, businesses should be executed with proper feasibility studies. Similarly, this study recommends that the management of Nigerian Institutions should create an IGR Directorate that will be delegated with the responsibility to always come up with strategies for boosting, running and maintaining IGR activities for the institution in the most aggressive and profitable ways.

The limitations of this study have created rooms for further investigation to be envisaged for this study. The challenge of outlier, as suspected from the scattered plots (figures 1 through 6) was not confirmed nor addressed in this study.
Non-respondents were removed from the administered questionnaires which consequently might have introduced bias in the estimates. Only one auxiliary variable was used for the improvement of estimates. We hope further research may be interested in using more than one auxiliary variable as more precised estimation will be obtained.

It will be observed in Table 2.0 and Figure 7.0, that purchase of educational materials (OCEB) by the students takes the least estimation. This arouses the concern that the students of Olabisi Onabanjo University might have been paying less attention to the purchase and use of educational materials while on campus. Finally, we hope further research will estimate for other campus activities (that were not captured in this study) that may be transformed into business for boosting Internally Generated Revenue (IGR).

Table 1: The population, first phase and second phase sample sizes for the six proposed businesses for Nigerian Institutions.

<table>
<thead>
<tr>
<th>SN</th>
<th>SA</th>
<th>HHB</th>
<th>FJP</th>
<th>OCEB</th>
<th>BP</th>
<th>PES</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>10291</td>
<td>10291</td>
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<tr>
<td>n'</td>
<td>330</td>
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<td>330</td>
<td>315</td>
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<tr>
<td>n</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: The estimated population total annual expenditure on the six businesses and the corresponding percentage coefficient of variation.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Business Name</th>
<th>Average Expenditure (Naira per year)</th>
<th>Estimated Total Expenditure (Naira per year)</th>
<th>Percentage (%)</th>
<th>% Coefficient of Variation (%CV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students’ Accommodation (SA)</td>
<td>25,769.19</td>
<td>25,190,688.16</td>
<td>30.51%</td>
<td>4.24%</td>
</tr>
<tr>
<td>2</td>
<td>Hairdo/Haircut (HHB)</td>
<td>16,697.09</td>
<td>171,829,729.56</td>
<td>19.77%</td>
<td>12.21%</td>
</tr>
<tr>
<td>3</td>
<td>Egg Consumption (PES)</td>
<td>6,264.90</td>
<td>64,472,100.62</td>
<td>7.42%</td>
<td>5.81%</td>
</tr>
<tr>
<td>4</td>
<td>Fruit Juice Production (FJP)</td>
<td>10,900.71</td>
<td>112,179,208.19</td>
<td>12.90%</td>
<td>8.56%</td>
</tr>
<tr>
<td>5</td>
<td>Customized Exercise Book Production (OCEB)</td>
<td>3,504,86</td>
<td>36,068,558.10</td>
<td>4.15%</td>
<td>15.69%</td>
</tr>
<tr>
<td>6</td>
<td>Bread Production (BP)</td>
<td>21,335.62</td>
<td>219,564,889.03</td>
<td>25.26%</td>
<td>7.77%</td>
</tr>
<tr>
<td></td>
<td>Total Estimated Amount</td>
<td>#869,305,173.70k</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Fig. 1.0: Graph of Annual Accommodation Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).

Figure 2.0: Graph of Annual Hairdo/Haircut Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).

Fig. 3.0: Graph of Annual Egg Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).

Fig. 4.0: Graph of Annual Fruit Juice Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).

Fig. 5.0: Graph of Annual Exercise book Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).

Fig. 6.0: Graph of Annual Bread Expenditure (thousand of Naira) against Student annual Income (thousand of Naira).
Fig. 7.0: Graphical presentation of the estimated population total (Naira per Annual) for the six businesses.
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