



# EFFICIENT REVENUE GENERATION FOR SUSTAINABLE GROWTH AMONG EDUCATIONAL INSTITUTIONS IN NIGERIA: DATA ENVELOPMENT ANALYSIS APPROACH

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## Abstract

The study investigated the efficiency of Internally Generated Revenue among the federal educational institutions between 2008-2019 in Nigeria. Secondary data used for the study were sourced from the Audited Financial Statements of the public sector entities and the Warrants from the Accountant-General of the Federation's office. The study population comprised of (92) federal educational institutions within four (4) geo-political zones. The sample size was made up of (50) educational entities out of the total population. Taro Yamane technique was employed in the determination of the sample size. Data were analyzed using Data Envelopment Analysis. The results revealed that the federal educational institutions were averagely efficient in generating revenue to meet the basic needs of the entities. The study recommended that there is the need to overhaul the entire internal revenue generating capacities of the entities for a better positioning for an improved revenue generation. The study concluded that full efficiency of revenue generation for federal educational institutions can be achieved only when there is overhauling of entities' revenue generating mechanisms.

**Keywords:** Data Envelopment Analysis, DMUs, Educational Institutions, Efficiency, IGRs

**JEL Classification:** C8, H83, G10, H21, H27

## 1. INTRODUCTION

Every entity admires growth in a sustainable dimension. It may be in form of a rapid business growth, organic business growth, strategic business growth or internal growth. The federal educational institutions are not let out in the drive for a pathway for sustainable growth. The federal educational institutions are subsets of public sector entities and Decision-Making Units (DMUs), whose core mandate is the production of qualitative education, result-oriented researches and the development of different phases of educational services (Salawu & Odewole, 2020). Apart from the federal government allocations to meet both the basic and the statutory responsibilities of the Decision-Making Units (DMUs), the need to widen the domestic revenue generating base is heavily propelled by many reasons: the challenge of acute drop in the domesticated prices of crude oil in the world market which resulted to the drastic cuts in federal government allocations to the DMUs, and the reality of the shortfalls of aggregate revenue from all revenue sources, which was clearly manifested in the annual appropriated budget to different DMUs. The unfortunate events have provoked the echelons of the various federal educational institutions to think outside the box, with a view to enhancing internally generated revenue as a viable alternative for meeting basic financial pressures of the public entities (Warning, 2019; Kempkes & Pohl, 2018).

The economic shocks experienced by the various DMUs occasioned by persistent dwindling inflows as statutory allocations from the center also hindered rapid economic recovery from the entities (Onrubia, & Sanchez, 2019). Consequently, there was a growing necessity among the DMUs for harnessing adequate internal funding as a supplement for statutory financial



releases from the central authority to meet both the recurrent and capital expenditure. Therefore, the urge to drive revenue realized through the internally generated revenue (IGR) for the Decision- Making Units (DMUs) for sustainable growth becomes a focal point of the pursuit of the federal educational institutions in Nigeria. The reliance by the educational institutions on the internally generated revenue as alternate source of funding, therefore, becomes imperative.

The efficiency of the educational institution in generating internal sufficient fund within the domestic operations of the DMUs to meet the rising domestic needs, however, becomes a puzzle (Odewole, Ololade & Akande, 2022). Therefore, the financial inability of the institutions in raising enough inflows that will accommodate diverse expenditure profile and uplifting the standard of education in the country becomes a matter of great concerns to all the stakeholders in the sector. The need for alternative funding apart from the central allocation was the only way out in all public entities for sustainable growth. The challenge of educational institutions is, therefore, the efficiency of raising enough revenue from the operational activities to finance both capital and recurrent expenditures within the sector. The intention of the study is to assess the efficiency of revenue generation among the educational institutions for sustainable growth in Nigeria.

Data Envelopment Analysis (DEA) technique was used in analyzing the data. Most of the literatures on revenue generation by previous authors center on volume of inflows realizable from various entities using descriptive statistics. The efficiency in revenue generating capacities of the various DMUs of federal educational institutions, however, is often neglected. This missing gap is the major consideration of this study. The study, is thus, anchored on public service efficiency theory which drove the rest of the work.

## **2. LITERATURE REVIEW**

The motivation for sustainable growth among the federal educational institutions in Nigeria is driven by the ability to expand the internally generated revenue within the core competence of their operations. Internally Generated Revenue (IGR) is a flow of income derived from any financial entity as a result of legal operation in the ordinary course of business. It is a sum of total receivables in respect of either disposal of assets or conversion of property or both with a ready flow of interest on registered investment in form of interest on convertible funds (Odewole & Ololade, 2022). IGR is the free inflows, less burdensome and without any form of encumbrances compared to domestic loans and borrowings that are usually sometimes tied to stringent conditionalities (Siyanbola, 2019; Olumide & Adeola, 2018; Zafiroopoulos & Vrana, 2018). IGR is the domesticated revenue derivable from entity's internal operations.

There is a growing awareness of the inadequacy of the federal government allocations to the DMUs that are financially dependent on the center for sustainable growth. The drive to generate enough revenue within the local operations among the public sector entities for self-sustenance, therefore, became inevitable (Afuberoh, Dennis & Okoye 2020). The reality of shortfalls in allocated fund from the center to other federating units has propelled the public entities to source for alternate means of funding to accelerate growth and maintain the status quo without reducing the efficient service deliveries (Kpolovie, & Esezil, 2018; Ofoegbu, & Alonge, 2019). In view of this, Akinadewo (2020), opined that the dwindling revenue of government from the federation account has led to the inward-looking steps of federating units, among others for improved IGR.

Furthermore, since oil has always been the major source of revenues for the country, the large decline in global oil prices recently, has significantly reduced the government's aggregate

revenues (Abubakar, Mansor & Wan-Mohamad, 2021). The sharp decline in oil prices was the major reason for the shortfalls in allocated fund to the DMUs and this has necessitated the deep search for alternate sustainable sources of funding within the public entities (Olusola, 2019; Oyesola & Abdul-hamid, 2018). The gross inadequacy in appropriated sum has a negative effect on the qualitative educational service deliveries among the entities. Nigeria's economy, by description, is a mono product economy. The entire populace mainstay is skewed towards proceeds from the sale of petroleum products. Therefore, whatever happens to petroleum sector has a multiplier effects on the rest of the sectors of the nation's economy.

The perennial decline of the inflows from the major source of revenue to the country have weakened the willingness of the central authority in the provision of basic facilities to many DMUs (Idialu & Idialu, 2019; Ogbogu, 2018; Kpolovie & Esezi, 2018). The disruptive inflows from the center has affected the ability of the DMUs in the discharge of their statutory responsibility. Recently, allocations to education sector from the central treasury have not been impressive. Many DMUs have been strangled by perennial revenue shortfalls and their activities paralyzed by the non-release of the appropriated sum to the various entities. The World Bank in her report (2012) disclosed the budgetary allocations on annual basis to the federal educational institutions for twenty countries in African countries. Among these countries, Nigeria was placed at the last position with 8.4% allocation from her annual budget estimates. Whereas, her counterpart country, Ghana, out of her annual budget estimates, allocated 31.0% to finance the country education sector.

The highest appropriated sum ever allocated to education sector in Nigeria was 10% of the country annual budget in the year 2013 (Abayomi, 2018; Arogundade & Olaoye, 2019; Nazarko, Kuzmicz, Szubzda, & Urban, 2019). Subsequent annual allocations to the education sector has been single digits of the annual budget estimates of each consecutive year. Revenue drive, therefore, assumed a different momentum among the federal educational institutions in Nigeria from 2012, with the federal government matching order to all the federal University authorities, to increase local revenue generation capacity to 10% level of estimated total revenue needed by the entities. It becomes imperative, therefore, to measure the efficiency of the federal educational institutions capacity to generate own fund within the respective local operations and without reliance on external assistance for survival.

The measurement of the efficiency of revenue generation among the entities with the adoption of DEA is gaining popularity in modern researches both in the field of economics and finance theory. DEA's adoption is in frequent use as a technique in the determination of entity's efficiency. The limitedness in the potency of financial ratio analysis due to its univariate nature in assessing the performance of firms has increased the wide adoption of the DEA as a better alternative in assessing firms' efficiency (Robert, Beata & Kristina, 2018; Inua & Maduabum, 2018). DEA's application focuses on both single (input/output) and multiple (inputs/outputs) in the entity's efficiency assessment (Abdulkareem & Oyeniran, 2019; Agasisti & Pohl, 2019).

Previous studies on the employment of DEA were based on single variable input/single variable output and multiple inputs/multiple variable outputs. Charnes, Cooper and Rhodes (1978), originally proposed DEA with the assumption of no random mistakes. Subsequent authors later built on this proposition. The assumption of no random variable is vague and far from reality. The efficiency performance measurement dated back to Farrel (1957) with the introduction of both allocative and technical efficiency in the assessment of DMUs efficiency. Application of DEA as a statistical technique cuts across different fields of human endeavor ranging from hospital systems, schools, financial houses, security outfits, and general administration.

Manufacturing concerns etc. The results of its engagement in the assessment of entity's efficiency have been impactful to the different stakeholders (Agasisti & Johnes, 2019; Alikhan. Kunt & Parapati, 2018).

The initial application of DEA was on the assessment of efficiencies of not-for-profit-making organization such as schools, hospitals etc (Kempkes & Pohl, 2018; Inua & Okafor, 2019).). However, its uses have transcended beyond not-for profit making organizations to all categories of private institutions including the profit- making entities. Its employment has been beneficial in the banking sector, insurance companies, health sector, manufacturing industries and the educational institutions' efficiency. Application of DEA window analysis in the evaluation of operational efficiencies of corporate entities have been adopted by numerous scholars. (Bonaccorsi & Dario, 2019; Tuskan & Stojanovic, 2018).

The expansion of DEA application with the inclusion of DEA window analysis has widened the scope of DEA technique in modern research. Currently, its usage has over- bearing prominence over the univariate financial ratios in the assessment of entities' performance (Cheng, Cai, Tao, He, Lin & Zuo, 2019). It has been used to appraise the efficiency of improved revenue generation in both public and private organizations (Chen, & Chen, 2019; Rhys & Tom, 2019; Hernandez & San, 2019). Previous authors on efficiency appraisals have based their works on productive efficiency after Farrel's (1957) proposition. The present study focuses on public service allocative efficiency as a departure from the norm and also to serve as a theoretical framework that drives the rest of the work.

### 3. METHODOLOGY

The study adopted application of DEA as a method of analysis of data. Out-put oriented models/ in-put oriented models applied were applied for the analysis. The capacity of DMU was measured by the Output model in order to achieve the output level proportionate with available inputs. However, the capacity of DMU to maintain the maximum level of output given the available inputs was measured by Input-oriented model. In this version of model, the efficiency score lies between 0 and 1. However, the score of efficiency ranges from 1 to infinity in the output-oriented version. In line with the findings of Charnes (1978), the determination of the score of efficiency is established by the relationship between the weighted outputs and weighted input ratios. In other to maximize the efficiency score, weights in the production processes are assessed from each variable in the unit of analysis. The efficiency is therefore determined for a set of  $j = 1, \dots, n$ . Decision making unit is appraised in relation to other set members where the maximal efficiency score is 1, while inefficient DMU assumes lower values of less than 1 of the analyzed objects.

DEA model as given by (Charnes, Cooper and Rhodes, 1978) with s outputs variables, m inputs variables and u DMU's, is as follows:

$$\begin{aligned} &\text{Maximise } \phi_i \\ &\phi_i \lambda_j \dots\dots\dots (i) \\ &\text{Subject to:} \\ &\phi_{iy} r_j \dots\dots \sum \lambda_j r_j + S_{ri=0} \dots\dots\dots (ii) \\ &r = 1 \dots\dots\dots s \text{ output of institutional entity revenue} \\ &j = 1 \dots\dots \sum \lambda_j X_{kj} - e_{ki} = 0 \dots\dots\dots (iii) \\ &k = 1, \dots\dots\dots m \text{ input of institutional entity revenue} \end{aligned}$$

$$X_j \geq 0, S_{ri} \geq 0, ek_i \geq 0 \dots \dots \dots \text{(iv)}$$

$$j = 1$$

$i, j = 1 \dots \dots \dots n$  institutional entity in the sample where

$\emptyset$  = proportional increase in output possible;

$S_r = r - tn$  output slack

$ek = k - th$  input-slack

$\lambda_j =$  intensity variable employed in order to derive linear combinations of the sample observation, as the value of  $\emptyset_i$ , in equation (i) is 1, also,

$$\lambda_i = 1 \text{ and}$$

$$\lambda_i = 0 \text{ for } j \neq i$$

The  $i - th$  institutional institution lies on the frontier, and therefore it is technically efficient. For the inefficient educational institutions,  $\emptyset > 1$ ,  $\lambda_i = 0$  and  $\lambda_j \neq 0$  for  $j \neq 1$ , where  $j$  in the equation stands for the efficient educational institutions among the samples. Some positive output or/and input slacks also exist among the inefficient educational institutions. The technical efficiency index for the output based of the  $i - th$  educational institutions (TES) are computed as follows:

$$\frac{\lambda}{y_{ri}} = \sum X_{rjyri} = \emptyset_{iyri} + S_{ri} \dots \dots \dots \text{(vi)}$$

Equation (vi) indicates that the output projected is of two components: one stands for the proportional increase in the output ( $\emptyset_{iyri}$ ), the second stands for accounting for the output slack ( $S_{ri}$ ) or non- proportional increase. Also, appraising the maximum output, the output- oriented DEA in equation (i) from the fixed inputs, assessed the slacks inputs conserved for an inefficient educational institution in order to migrate to fully efficient entity, mathematically, the  $k - th$  resource of the  $i - th$  educational institutions ( $X_{ki}$ ) and the projected amounts are expressed as follows:

$$X_{ki} = \sum X_j X_{kj} = X_{ri-eki} \dots \dots \dots \text{(vii)}$$

$$k = 1 \dots \dots \dots m \text{ Input}$$

For the robustness of the study, it adopted two DEA models, an input and output oriented versions. Charnes (1978) along with Cooper and Rhodes developed the first model, coined after the first letters of their names (CCR). BCC model, the second model, was named after the proponents, Banker, Charnes and Rhodes (1984). CCR model was developed on the central assumption of Constant Returns to Scale (CRS), the BCC model, on the other hand, was fashioned after the assumption of Variable Returns to Scale (VRS). The value of relative efficiency score using the CCR model is the entire entity's overall efficiency score. However, the BCC model efficiency score estimated the pure technical efficiency score defined on the internal [0, 1].

**The Charnes, Copper and Rhode (CCR) Model**

Charnes (1978) stated the CCR linear programming model of the fractional form as follows:

$$\eta_0 MA = \frac{\sum_{r=1}^s u_r y_{ro}}{\sum_{i \in I} DV_i X_{io}}$$

Subject to

$$\frac{\sum_{r=1}^s u_r y_{rj} - \sum_{i \in F} v_i (x_{ij} - x_{i0})}{\sum_{i \in D} v_i x_{ij}} \leq 1 \quad j \in [1 \dots \dots \dots N]$$

$$u_r v_i \geq \varepsilon > \text{for } r \in (1 \dots \dots \dots s) \text{ and } i \in I D$$

$$v_i \geq 0 \text{ for } i \in / F$$

The variables are interpreted as follows: u and v denote weights of the input and output respectively. Also, i and r stand for the output and input of DMU. DEA model is sometimes viewed as a technically complex efficiency model. Cooper’s modification brought some uniqueness to the original model (Cooper, Lawrence & Tone 2019). The modification is as follows:

$$\text{Max } \phi_0 + \varepsilon (\sum_{r=1}^s S_{r0}^- + \sum_{r=1}^m S_{i0}^+)$$

Subject to

$$\sum_{j=1}^N y_j y_{rj} - S_{r0}^- = s \phi_0 y_{r0} \quad r \in [1, \dots \dots \dots s]$$

$$\sum_{j=1}^N y_j x_{ij} + S_{i0}^+ = x_{i0}, \quad i \in [1, \dots \dots \dots m]$$

$$\phi_0, y_{ji} S_{r0}^-, S_{i0}^+ \geq 0$$

Where,  $\phi_0$  is the result of the measurement of efficiency of the Decision- Making Unit “O” in the set is  $j = 1, 2, \dots \dots n$ .  $\varepsilon$ , is a small positive number used in the process in order to turn positive both the input and output coefficient.  $S_{r0}^-$  denotes The slack variables used for the input constraints. The slacks variables are entirely constrained to be non-negative. The slack variable for output constraints is  $S_{i0}^+$ . The variables are also wholly constrained to be non-negative. The dual weight allocated to DMUs is  $y_j$ .

### The Banker, Cooper and Rhodes (BBC) Model

The BCC – model focuses on the input technical efficiency measure in the DMU processes (Banker, 1984). Therefore, the BCC model differs from the CCR model with the inclusion of convexity constraint for modification (Cvatkoska. & Savic. 2019). It is stated as follows:

$$\text{Max } \phi_0 + \varepsilon (\sum^s S_{r0}^- + \sum_{r=1}^m S_{i0}^+)$$

Subject to

$$\sum_{j=1}^N y_j y_{rj} - S_{r0}^- = \phi_0 y_{r0} \quad r \in [1, \dots \dots \dots s]$$

$$\sum_{j=1}^N y_j x_{ij} + S_{i0}^+ = x_{i0}, \quad i \in [1, \dots \dots \dots m]$$

$$\sum_{j=1}^N y_j = 1 \quad \phi_0, y_{ji} S_{r0}^-, S_{i0}^+ \geq 0$$

If convexity constraint  $\sum_{j=1}^N y_j = 1$ , it therefore means that DMU “O” is operating currently for (the discretionary inputs) at the most productive scale size, with the assumption that the fixed level of non-discretionary input is given. On the other hand, if  $\sum_{j=1}^N y_j > 1$ , the implication is that DMU “O” is operating at a scale (for the discretionary inputs) greater than the most productive scale size. Conversely, if  $\sum_{j=1}^N y_j < 1$ , it therefore suggests that the DMU “O” is operating in the increasing return to scale region. At this point, the scale of operation is relatively smaller than the most productive scale size estimated for the DMU (Banker, 1984). The DEA models are, therefore, viewed as technically sufficient efficiency measures (Onrubia & Sanchez, 2019).

#### 4. RESULTS AND DISCUSSION

Figure 1 shows the efficiency scores among 25 sampled DMUs in the federal educational institutions with their revenue generating ability evidenced by CCR model. The mean efficiency scores recorded against the DMUs are 0.96, 0.92, 0.89, 0.84, 0.82 etc in descending order. The overall efficiency (TE) of the entity was calculated using the CCR model. The adoption of TE is for the purpose of measuring the success of a decision-making unit, in the course of producing outputs with available sets of inputs in the production process (Farrell, 1959). From the figure, WAEC demonstrated the highest proficiency in revenue generation followed closely by JAMB, NOUN, with efficiency scores of 0.96, 0.92, 0.89 etc in descending order respectively.

The capacity to generate enough revenue by the DMUs means less dependence or reliance on the central government funding to carry out statutory responsibilities for the entity's survival. The implication is that the DMUs with high revenue generating capacity can survive the financial shocks arising from the shortfalls in financial releases from the center. The entities, therefore, can rely on available internal capacity to mobilize and generate enough internal funding to cushion the effects of insufficient federal allocations. The ability of the DMUs to generate own adequate revenue without reliance on the center for funding is an indication of financial sustainability (Eme, Chukwurak & Iheanacho, 2018; Odewole, Olowookere & Oladejo, 2021).

The technical efficiency of DMU in revenue capacity generation is appraised based on its actual efficiency scores. A Decision-Making unit is adjudged to be fully efficient when its generated efficiency scores is 100% or 1. The operational level for inefficiency is when the estimated efficiency score is less than 1 or 100%. A marginally inefficient DMU assumes an efficiency score between  $>75 < 100$ , while an averagely inefficient DMU displays an efficiency scores ranging from  $>54 < 75$  (Baidya & Mitra, 2019; Salawu & Odewole, 2020).

From the categorization, therefore, none of the DMUs among the sampled size was purely technically efficient with the efficiency frontier of 100% or 1. That is, none of the DMU could independently generate needed revenue for the internal usage without recourse to the center. Rather, about eight (8) of the DMUs (32% of the sampled size) were marginally inefficient with the efficiency scores hanging between 75%-96% while the remaining 68% were averagely inefficient with efficiency scores between 54%-74%. Implication of the averagely inefficient DMUs is that the entities cannot generate all revenue needed for domestic use without reliance on the subventions from the federal government for survival.

**Figure 1: Pattern of Revenue Generating Capacity of 25 Sampled DMUs among Of Federal Educational Institutions**

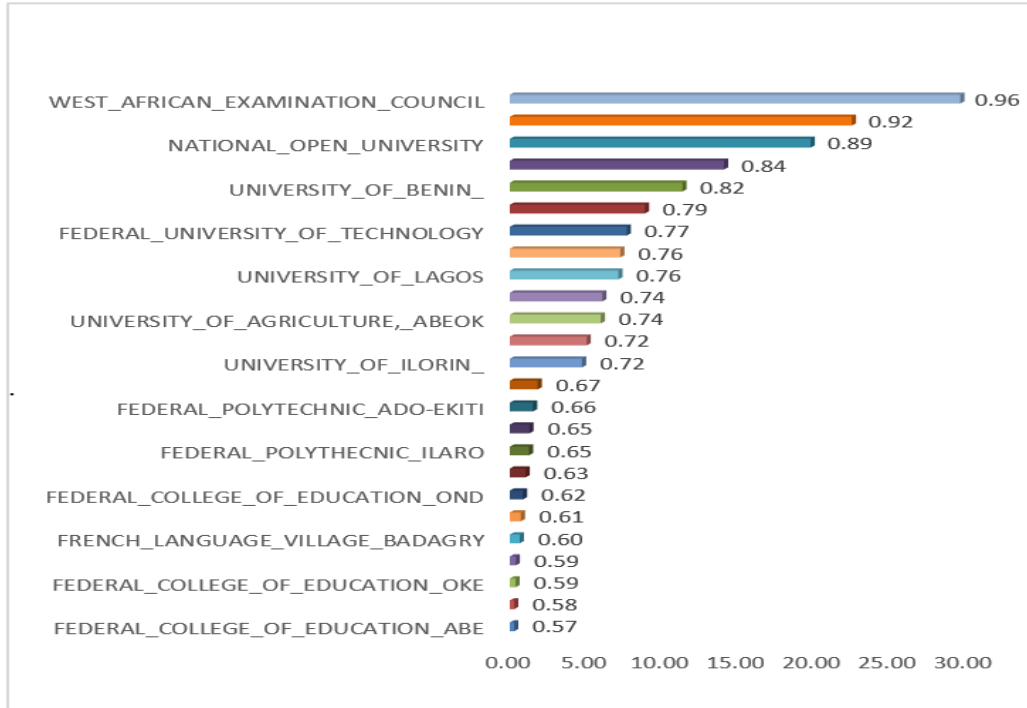


Figure 1 shows the revenue generating capacity of federal educational institutions among the 25 sampled size DMUs. It reveals that most of the federal educational institutions are averagely inefficient with average efficiency scores between  $>54<75$

Source: Authors' Survey (2023)

Figure 2 presents the ranking of the efficiency scores on revenue generating capacity of the DMUs under the education sector at the federal level. From the ranking, WAEC, JAMB dominated the efficiency scores with values over and above 90% while Federal Colleges of Education, Abeokuta and Okene appeared at the lowest ranking respectively. The efficiency ranking of the remaining DMUs oscillates between the high and low extremes.

The results of the summary of the ranking for the DMUs on DEA (CCR MODEL) on revenue generating capacity reveals an average capacity of the entities on revenue generation. The findings from overall assessment of the DMUs on revenue generation is that many of them cannot raise enough fund internally to finance statutory responsibilities without external reliance.



**Figure 2: Efficiency Ranking Of 25 Sampled DMUs among Federal Educational Institutions on Revenue Generating Capacity Using CCR Model**

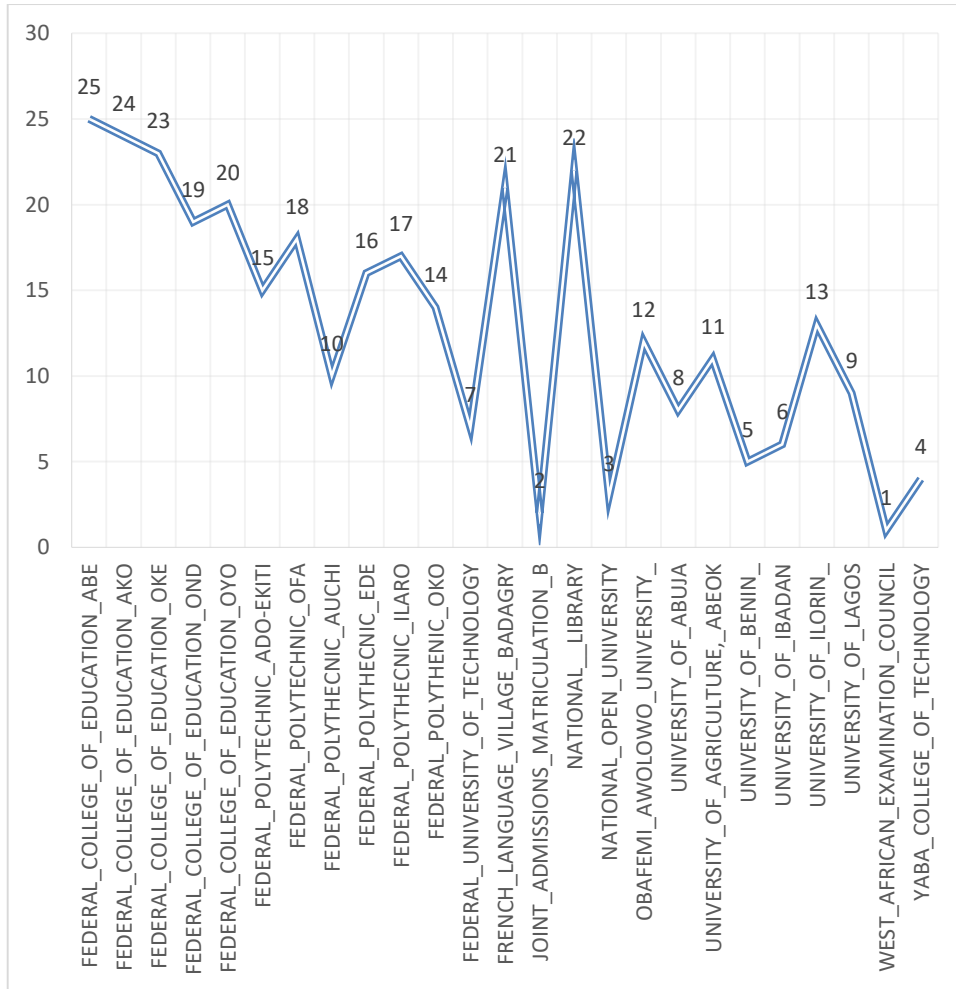


Figure 2 shows the ranking on revenue generating capacity of the DMUs under education sector at the federal level using CCR model. The results reveal that most of the DMUs are averagely inefficient while a few of the institutions are marginally inefficient

Source: Authors’ Survey (2023)

Figure 3 presents the summary of the result of the efficiency scores on capacity to generate revenue among the federal educational institutions using BCC model. The estimated efficiency scores were stated at 0.97, 0.94, 0.93, 0.89, etc in descending order respectively. From the figure, none of the DMUs achieved full efficiency of 100% or 1. That is, none of the DMUs was overtly financially independent of the center. Also, only three (3) of the DMUs had their efficiency scores stated over and above 90%. That is, the DMUs were highly marginally inefficient in raising enough revenue for survival without reliance on external funding. It therefore follows that in times of financial distress or financial shortfalls from the federal government, the DMUs could still weather the storm and keep afloat for a reasonable period of time. The DMUs with efficiency scores of less than 55% were in the group of averagely inefficient entities. The implication is that failure of the DMUs to raise sufficient fund might expose the entities to financial difficulty. Other marginally inefficient DMUs were recorded in the descending order. Four (4) of the DMUs were distinctively inefficient with efficiency scores less than 40%. This implies that the DMUs in this category have tendency to rely heavily on either external funding or inter-governmental allocations for funding or financial survival.

It shows the inability of the DMUs to generate own revenue to meet the basic needs of the entity. Amongst the obstacles confronting the federal educational institutions towards effective revenue drive are dynamic market forces within which the DMUs operate. The market forces within the entities are not only unstable, but severely shifting periodically, beyond the reach of the DMUs in their respective operating environments, and therefore constitute major limiting factors against effective revenue mobilization among the DMUs. More also, within the educational system, there exists keen market competitors such as private universities, which shared existing markets with the subsisting federal educational institutions. Influx of the private universities into the educational market, did not only weaken the steady flow of revenue of the federal educational institutions but curiously serve the market more efficiently and effectively. This cutting edge on the part of the private educational institutions does not only draw a large chunk of existing students from the federal institutions but constitute a major source of financial depletion to the federal educational establishments.

**Figure 3: Patern of Revenue Generating Capacity of 25 Sampled DMUs of Federal Educational Institutions Using Bcc Model**

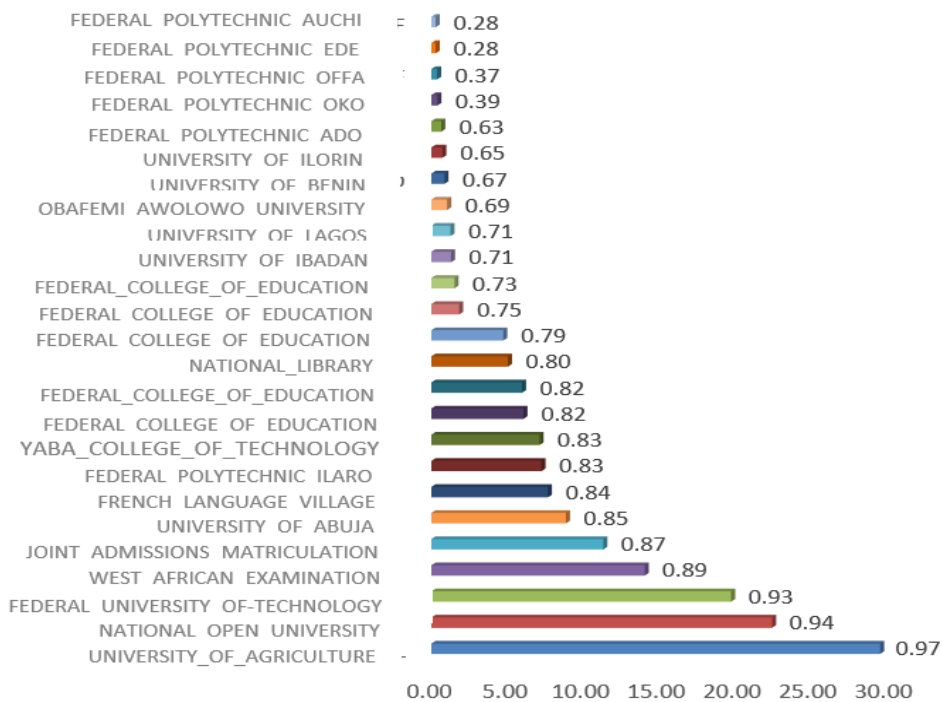


Figure 3 shows the ranking of the DMUs in the educational institutions on their capacities to generate revenue using BCC model. The figure shows that none of the DMU was fully efficient in revenue generation. The spread of efficiency was along marginal efficiency and average efficiency.

Source: Authors' Survey (2023)

Figure 4 presents the ranking of the DMUs on revenue generating capacity using BCC model. The efficiency scores were ranked in order of performance of the DMUs among the sampled size in the federal educational sector. The ranking of the efficiency in the revenue generating capacity of the DMUs with BCC Model is slightly different from the results of the ranking with CCR model. WAEC was ranked in the 4<sup>th</sup> position under the BCC ranking but came on top of the ranking of the efficiency scores under CCR Model. Also, National Open University



maintained her 2<sup>nd</sup> position in the ranking under both CCR and BCC models. The summary of the ranking shows that the performance of the DMUs under the two models are fairly the same signifying the true reflection of the entities' capacities in revenue generation during the period. None of the DMUs attained full efficiency frontiers in their capacity to generate revenue under the two models. That is, none of the DMUs under the sampled size achieved efficiency scores of 100% or 1 with a zero reliance on the center for financial sustenance. Also, it reveals that while a few of the DMUs were marginally efficient in generating enough revenue needed for financing both recurrent and capital expenditure with the efficiency scores of  $>74<100$ , some are averagely inefficient and distinctively inefficient.

The DMUs are judged marginally inefficient when their efficiency frontiers are close to full efficiency scores. The entities in this category had capacities to survive acute financial shocks without financial supports from the center. They seamlessly fulfil the basic condition of financial sustainability where financial resources are available to meet financial obligations without reliance of governmental or external assistance. The DMUs are averagely inefficient when their efficiency scores are plotted in between  $>65<75$ . The DMUs in this category have limited capacity to absorb financial shocks in times of irregular inflows from the central government.

A few of the DMUs were distinctively inefficient with efficiency scores fall below 40%. DMUs were overly dependent on federal authority funding on every aspect of financial responsibilities. Federal government subventions therefore remain the mainstay for the entity's survival against all the economic crunch and financial responsibilities. Therefore, in times of national economic hardships which normally characterize by delay in subvention releases from the center, unexplainable cuts in statutory allocations, a sharp drop in revenue as a result of global glut in oil prices etc some of the federal institutions in this category might end up closing 'shops' or adopting some other unethical 'coping' strategies in order to stay afloat.

DMUs in the category of distinctively inefficient were the worst hit in revenue generation. With efficiency scores below 40%, it implies that the DMUs could not generate own revenue to meet up with basic requirements for entity's financial sustainability. The inability to generate minimal revenue required for survival is a clear indication that the entity might not survive in the trying times.

**Figure 4: Efficiency Ranking of 25 Sampled Dmus among the Educational Institutions on Revenue Generating Capacity Using BBC Model**

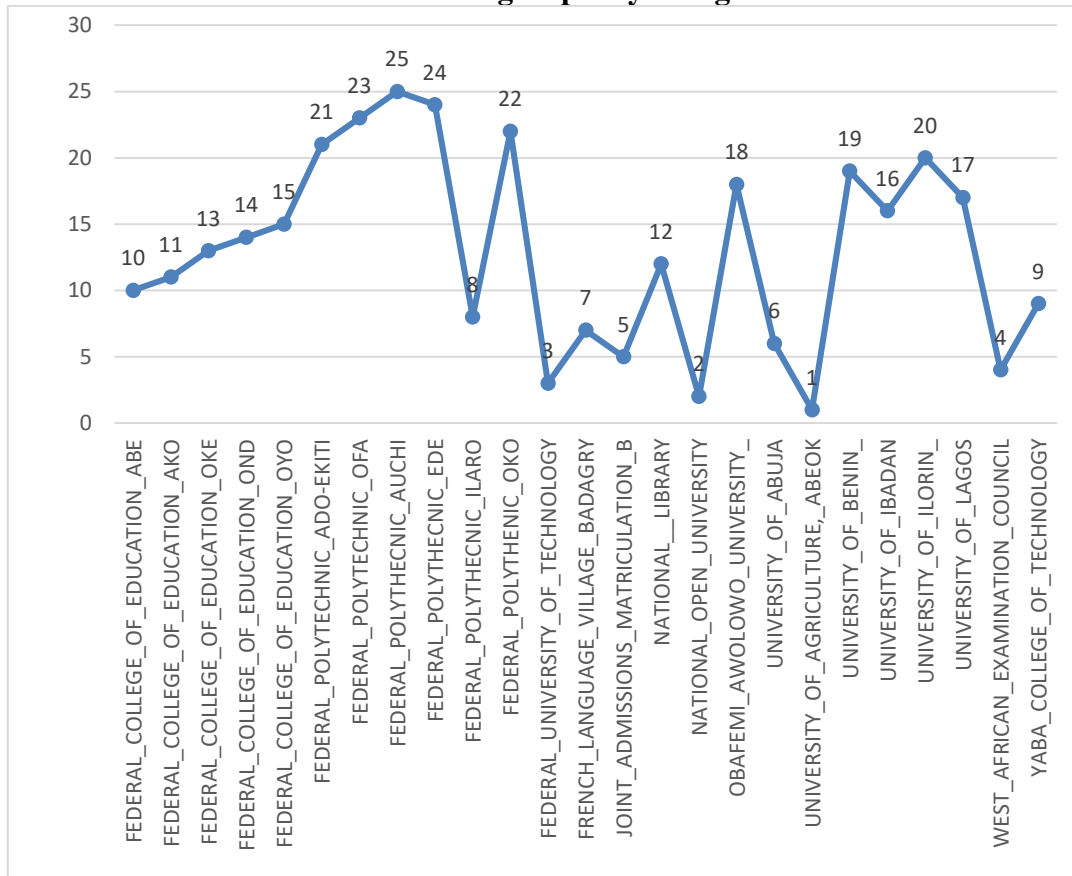


Figure 4 shows the ranking among the DMUs in educational institutions using the BCC model. Efficiency scores distribution shows that the DMUs are either marginally efficient or averagely efficient in revenue generation.

Source: Authors' Survey (2023)

## 5. CONCLUSION AND POLICY RECOMMENDATIONS

The study appraised the efficiency of revenue generating capacities of the DMUs among the federal educational institutions. Efficiency models, CCR and BCC models were used to analyze the data comparatively. The findings revealed that none of the DMUs achieved full efficiency in revenue generation. The spread of the efficiency scores however skewed towards marginally and averagely inefficient DMUs. The implication is that some of the federal educational institutions could not independently generate sufficient own revenue within their normal operations that would meet the financial demands of the entities without some reliance on the central authority for buffers. To keep afloat during the economic crunch, the federal educational institutions should widen their internal fund resource base by looking inwards to more aggressive ways of generating own funding. There is a great need for more pragmatic strategies among the entities to arrest perennial and peculiar obstacles confronting corporate revenue generation drive in the sector. The challenges are deep of a shrinking educational markets and weak demand for some of the courses run by some departments in many of Nigerian federal Universities which are not only obsolete but also irrelevant in the technological age. These

courses attract low patronage and also constitute conduit pipes to the university finances where lecturers recruited to teach the students are paid without corresponding returns as inflows into the institutions. The direct effect is the persistency in the sliding revenue inflows that cannot account for the prevailing recurrent expenses within the entities.

Again, there is a barrier to human capital constraints in the Nigerian federal educational institutions. Despite the invention of various innovations and advanced technology which serve the dynamite of socio-economic market of the educational institutions better, the workforce in some federal educational institutions still operate at the core of success and failure of human capital development. In order to maintain a strong desirable market in the federal educational institution, drive the business and grow IGR, there should be ready tools of available workforce within the academia specifically trained on the economic focus of the entity, map out workable strategies to reduce reliance on the center, set out goals to target self-sustainability, develop workable coping financial strategies, promote and sell the educational services to address the needs of teeming waiting population toward enhanced revenue generation.

### **5.1 Policy Recommendations**

Therefore, for an improved and efficient revenue generating capacity among the federal educational institutions in Nigeria, the following recommendations are necessary for the consideration of all the stakeholders in the sector: One, the federal educational institutions should commit themselves wholly to implementing both credible micro and macro-economic policies in order to accelerate the internal processes targeted to harness all revenue sources and cut government costs and wastages in overhead spending in the citadel of learning.

Two, the central government should initiate steps towards empowering key institutions with appropriate operational, legal and independent authorities that will remove the barriers to revenue growth in our higher institutions. Apart from the core mandates, the federal institutions should take bold steps to mobilize fund within their operational limits as a viable alternative to statutory allocations received from the center. Three, setting up an effective monitoring team to curb the revenue leakages and drive the revenue generation capacity of the universities by enforcing adequate compliance to minimum revenue generation levels of an average educational entities.

It is the collective and pragmatic attempts of the stakeholders in the federal educational entities to enforce workable blue prints and overhaul all revenue generating mechanisms that the desired goals of a full efficiency frontier can be achieved in the sector.

#### **Highlights of core findings**

- None of the federal educational institutions, which are subsets of public sector entities and Decision-Making Units (DMUs) were able to achieve full efficiency in revenue generation.
- These institutions could not independently generate sufficient revenue internally to meet their financial needs.
- Without the financial supports from the federal government these institutions would not be able to break even
- This lack of self-sufficiency became the albatross against their survival during economic crunch.

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## APPENDIX I

### List of selected Federal Institutions

S/No	Decisions Making Units	Selected Federal Institutions In Nigeria
1	UNIAB	University of Agriculture, Abeokuta
2	FLVB	French Language University, Badagry, Lagos
3	FUTA	Federal University of Technology Akure
4	WAEC	West African Examination Council, Nigeria
5	JAMB	Joint Matriculation Board
6	UNIABUJA	University of Abuja
7	NOUN	National Open University
8	FPL	Federal Polytechnic Ilaro
9	YCT	Yaba College of Technology
10	FCEAB	Federal College of Education, Abeokuta
11	FCEAK	Federal College of Education, Yaba, Lagos
12	NLN	National Library of Nigeria
13	FCEOKENE	Federal College of Education Okene
14	FCEONDO	Federal College of Education, Ondo
15	FCTOYO	Federal College of Education, Oyo
16	UI	University of Ibadan
17	UNILAG	University of Lagos
18	OAU	Obafemi Awolowo University, Ile-Ife
19	UNIBEN	University of Benin
20	UNILORIN	University of Ilorin
21	FEDPOLYADO	Federal Polytechnic Ado-Ekiti
22	FEDPOLYOKO	Federal Polytechnic Oko
23	FEDPOLYOFFA	Federal Polytechnic Offa
24	FEDPOLYEDE	Federal Polytechnic Ede
25	FEDPOLYAUCHI	Federal Polytechnic Auchi

Source: Authors' Survey List (2023)