

## THE BEHAVIOUR OF PERSONNEL COST EXPENDITURE AND EFFICIENCY OF USAGE WITH THE INTRODUCTION OF IPPIS AMONG THE PUBLIC INSTITUTIONS IN NIGERIA: SYNOPSIS FROM DATA ENVELOPMENT ANALYSIS

**Philip Olawale ODEWOLE<sup>1</sup>, James Ayanwale OBADEYI<sup>2</sup> & Adesola Adebayo AKANDE<sup>3</sup>**

<sup>1,2&3</sup>Department of Accounting and Finance, Faculty of Humanities, Social and Management Sciences, Elizade University, Ilara-Mokin, Ondo State, Nigeria

### **Abstract**

*The study examined the pattern of personnel cost expenditure behavior and its efficient usage among decision-making units (DMUs) in the geo-political zones in Nigeria from 2014-2021. Population of the study comprised eighty-five (85) DMUs in the six (6) geo-political zones of the country. Taro Yamane technique was adopted in selecting fifty (50) DMUs from three (3) geo-political zones among education and health sectors. Data used were collected through the Annual General Warrants. Data Envelopment Analysis (DEA) model was adopted for the analysis. The results revealed that there were fluctuations in the efficiency scores of the personnel cost utilization among the DMUs across the geo-political zones. The average efficiency scores of CCR and BCC models showed 0.71 and 0.82, 0.69 and 0.82 efficiency scores for both health and education sectors respectively. The overall results indicated that none of the units achieved full efficiency across the geo-political zones. The study recommended a central scheme of control initiatives by the Ministry of finance to the DMUs to reduce slack personnel cost balances and ensure full resource utilization. The conclusion of the study is that only a periodic and regular evaluation of the resource inputs to the DMUs and the efficient usage among the DMUs across the geo-political zones of the country can enhance full efficiency.*

**Keywords:** BCC, CCR, Data Envelopment Analysis (DEA), Decision Making Units (DMUs), Efficiency Scores, IPPIS

### **1. Introduction**

Before the introduction of Integrated Payroll and Personnel Information System (IPPIS) into the public institutions, one of the common challenges of the financial management is the determination of the efficient usage of emolument costs released to all the Decision-Making Units (DMUs) operating in all the six geo-political zones of the country. Out of all the statutory financial allocations to the DMUs, personnel cost releases assume the largest proportion. It is also deeply controversial in usage and vulnerable to abuse (Odewole & Salawu, 2020). Personnel cost is a part of the financial releases to both fully and partly funded public institutions throughout the financial year for settling staff salaries. The advent of IPPIS brought about a change in the dynamics of personnel cost usage. There was a sudden shift from the traditional method and procedure to the electronic releases of the personnel costs to the DMUs. Arrangement was put in place for statutory financial provisions to be made annually from the budgeted personnel cost allocations and credited to the DMU's budget line in either IPPIS's office or GIFMIS's office (Odewole, Ololade & Akande, 2022). Access to the personnel fund is strictly regulated by the

accountant-General's office. The pattern of releases is uniform across the DMUs throughout the six geo-political zones of the country. The challenge among the DMUs is the assessment of the efficiency of the usage of the cost inputs in the geo-political zone with the introduction of IPPIS. Therefore, the focus of the study is the assessment of the pattern of personnel cost expenditure and the efficiency of usage across the geo-political zones in Nigeria. Data Envelopment Analysis (DEA) was adopted as a technique to generate the efficiency scores. It is a non-parametric tool commonly employed in determining the technical efficiency of an entity's resource utilization. Most of the previous literatures on the study of efficiency concentrate largely on productive and technical efficiency in the analysis of resource allocation and usage of cost inputs in an entity. The shortcoming of the approach is its limitation and restriction on only firms' efficiency with the private sector. The focus has therefore been on the micro-economic variables. The public sector service efficiency of resource usage is which deals with macro-economic variables and wider scope is hardly harnessed and addressed. The gap created by the previous studies is therefore the main focus of this work. The macro-economic variables of the economy were considered. This makes the work largely essential and beneficiary not only to operators at the micro-economic levels but also to government functionaries and the larger society. The study is therefore driven by public service efficiency theory. The remainder of the paper is as follows: following the introductory section, section 2 of the study reviewed the literature. Section 3 dwells on the methodology. Section 4 presents, analyses, and discusses the results of the work while section 5 concludes the study.

## **2. Literature Review**

Financing public sector entities for efficient service deliveries is one of the burning issues in public financial theory and management. Efficient usage of personnel cost releases to the DMUs has become a renewed challenge to the central authority even after the introduction of Integrated Payroll and Personnel Information System into the public sector entities. IPPIS was specifically initiated into the public service payroll management to moderate the trends of payroll abuses in the entity (Iloanya, Udunze & Nebo, 2020). The inability of the conventional, manual payroll system to achieve a fraud -free personnel payment system. and account accurately for aggregate salary payments for the total workforce in the public service propelled its introduction as a gateway to transparent personnel cost disbursement and utilization (Nangih & Davies, 2017, Asishana, 2020). The shift to the payroll payment system changed the pattern of cost releases to the DMUs. Unlike the conventional and traditional method of personnel cost releases, IPPIS platform brought about a complete dynamic into the personnel payment procedure. The employee provides a unique number tagged 'IPPIS No' with a designated account number at the point of capturing where monthly salaries are paid (Nangih & Davies, 2017). Monthly salaries inputs, new

placements, salary adjustments, incremental credits, and implementation of salary awards etc are initiated on a monthly basis to smoothen the process of salary payments. A trial payment payroll is released to the DMUs to verify the correctness of payment components for all employees enrolled on the payment system. At the trial payroll stage, corrections on monthly salary computations are allowed before the release of final payroll when salaries payment is finalized (Jared, Migiro & Mutambara, 2017, Odewole & Salawu, 2019). Out of all the central statutory allocations to the DMUs, personnel cost releases are more prone to much abuse with a high incidence of 'ghost worker syndrome' payments prevalent in the federal civil service (Odewole & Ololade, 2022, Idris, Adaja, & Audu, 2015). With the introduction of IPPIS payment platform, the integrity of employees' personnel payment data is enhanced and preponderance of serial wastages in personnel cost fund is minimized (Iroanusi, 2019, Odewole, Olowookere & Oladejo, 2021). Salient provisions in the contents of the new personnel payment platform are to ascertain the actual personnel cost emoluments payable on monthly basis by the central authority. One of the greatest hurdles among the DMUs is the ascertainment of the efficiency in personnel cost usage across the geo-political zones.

The determination of the efficient usage of resource utilization among the DMUs with the use of DEA has a trace to the field of economics, finance, and accounting theories (Inua & Maduabum 2018, Robert, Beata & Kristina, 2018). DEA's application focuses not only on single input/output flows but also on multiple inputs/outputs variations in the entity's efficiency determination (Agasisti & Pohl 2019, Abdulkareem & Oyeniran, 2019). Early proponents of DEA measurement based its use on single variable input/ output and multiple inputs/output variables. Charnes, Cooper, and Rhodes (1978) originally proposed DEA as a technical tool of resource assessment with the assumption of no random mistakes. However, assumption was heavily criticized by many scholars as being unrealistic (Tuskan & Stjanovic, 2018, Bonaccorsi & Dario, 2019). The efficiency performance measurement dated back to the theories of both allocative and technical efficiency by Farrel (1957). The initial application of DEA was visited on not-for-profit-making organization's assessment of efficiencies such as hospitals, schools, etc. The usage later extended to other private institutions like insurance companies, banks etc (Inua & Okafor, 2019, Kempkes, G., & Pohl, C., 2018). Currently, its adoption has prominence and over-bearing dominance over the univariate financial ratios in the appraisal of entities' performance (Lin & Zuo 2019, Cheng, Cai, Tao, He, Chen, & Chen, 2019, Hernandez & San, 2019 Rhys & Tom, 2019). Prominent scholars on DEA have anchored their studies on productive efficiency theory in line with Farrel's (1957) proposition across different fields of study. The present study however focuses on public service allocative efficiency theory

as a departure from the norm. The theory also provides a theoretical framework that drives the rest of the work.

### 3. Method of Analysis

The models of Charnes, Cooper, and Rhodes (CCR) (1984) and Banker, Charnes and Cooper (BCC) (1984) were used comparatively in the determination of the pattern of personnel costs efficiency analysis across three geo-political zones. Both constant, variable inputs and outputs were adopted by the study in the assessment of DEA techniques. The output-oriented version carries efficiency scores for the DMUs, within the range of 1 to infinity. Whereas efficiency score is localized between 0 and 1 in the input - oriented version. The rate of efficiency for each of the DMU as a unit of resource in a set of  $k = 1, \dots, n$ . A particular decision-making unit is therefore assessed according to other available resource. The maximal value is 1, or 100% indicates highest efficiency scores while any value less than 1 is an indication of the relative inefficiency.

The functional proposition of the Data Envelopment Analysis model with  $s$  outputs variables, variable inputs of  $m$ , and  $u$  DMU's, in line with (Charnes *et al.*, 1978) and Cooper *et al.* (2007) is therefore as follows:

$$\max h_0(u, v) = \frac{\sum_r u_r y_{r0}}{\sum_i v_i x_{i0}}$$

Subject to:

$$\begin{aligned} \frac{\sum_r u_r y_{r0}}{\sum_i v_i x_{i0}} &\leq 1 \text{ for } j = 1, \dots, n, \\ u_r, v_i &\geq 0 \text{ for all } i \text{ and } r \end{aligned} \tag{1}$$

Charnes and Cooper (1962) proposition adopted for the linear fractional programming with a combination of solution of  $(u, v)$  for which  $\sum_{i=1}^n v_i x_{i0} = 1$  was selected. The equivalent linear problem arising from the solution resulted to the variance of variables from  $(u, v)$ , to  $(\mu, v)$ , which is a product of the application of DEA model and universally re-written as follows:

$$\max z = \sum_{r=1}^s \mu_r y_{r0}$$

Subject to:

$$\begin{aligned} \sum_{r=1}^s \mu_r y_{rj} - \sum_{i=1}^m v_i x_{ij} &\leq 0 \\ \sum_{i=1}^m v_i x_{i0} &= 1 \\ u_r, v_i &\geq 0 \end{aligned} \tag{2}$$

While the linear programming dual problem is

$$\Theta^* = \min \Theta$$

Subject to:

$$\begin{aligned} \sum_{j=1}^n x_{ij} \lambda_j &\leq \Theta x_{i0} \quad i = 1, 2, \dots, m; \\ \sum_{j=1}^n y_{rj} \lambda_j &\geq y_{r0} \quad r = 1, 2, \dots, s; \\ \lambda_j &\geq 0 \quad j = 1, 2, \dots, n. \end{aligned} \tag{3}$$

The transformation model which is often referred to as the "Farell's model" among the academia, or output-oriented model, maximizes outputs of a given DMU with the given input level.

The second expressional transformation is the input-oriented model. It minimizes inputs at a given output level (Zhu, 2009, Cooper *et al.*, 2007):

$$\min \theta - \varepsilon \left( \sum_{i=1}^m S_i^- + \sum_{r=1}^n S_r^+ \right)$$

Subject to:

$$\begin{aligned} \sum_{j=1}^n \lambda_j x_{ij} + S_i^- &\leq \theta x_{i0} \quad i = 1, 2, \dots, m; \\ \sum_{j=1}^n \lambda_j y_{r0} + S_r^+ &= y_{r0} \quad r = 1, 2, \dots, s; \\ \lambda_j &\geq 0 \quad j = 1, 2, \dots, n \\ \sum_{j=1}^n \lambda_j &= 1 \end{aligned} \tag{4}$$

Where,  $x_{ij}$  indicates the  $i$ th input of the  $j$ th DMU,  $y_{rj}$  indicates the  $r$ th output of the  $j$ th DMU, and  $\lambda_j$  and  $u_r$  indicate the weight of the  $j$ th DMU while  $v_r$  is the efficiency score of DMU <sub>$j$</sub> .

The VRS assumption or BCC model is used in the determination of the scale of efficiency which is as follows:

$$\text{Scale Efficiency} = \frac{\text{Technical efficiency from CRS}}{\text{technical efficiency from VRS}} \tag{5}$$

Cook, Kaoru and Joe (2014) rolled out a relationship between a minimum number of DMUs to the number of variable inputs and expressed as follows:

$$n \geq \max\{m \times s, 3(m + s)\}, \tag{6}$$

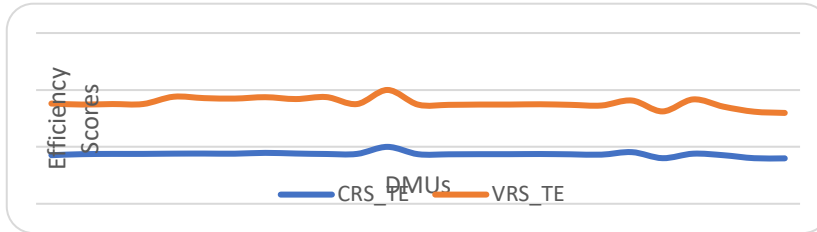
Where  $m$ ,  $s$ , and  $n$  are the numbers of inputs, outputs and DMU's respectively.

#### 4. Interpretation and Discussion of Results

Figure 1 and 2 show the generated efficiency scores from the DMUs in both health and educational institutions respectively in year 2014. The efficiency scores through CCR and BCC models were based on personnel costs utilization among the DMUs. The mean efficiency scores were 0.871 and 0.901 for CCR and BCC respectively. The interpretation in comparing with average efficiency, is that 40% of the DMUs in the health sector operated above the sectoral average of 0.899, whereas the remaining 60% were less efficient. Similarly, under the BCC only 28% of the DMUs in the education sector operated above the sectoral average of 0.861 in comparison with the overall average, while the remaining 72% were inefficient. It therefore implies that most of the DMUs in both sectors were not efficient in personnel costs utilization. The Decision-Making Units (DMUs) could not therefore efficiently utilize all cost allocations in their respective envelopes in each allocative financial year without slack balances (Salawu & Odewole, 2020, Lin & Zuo, 2019). In analyzing the personnel cost utilization on geo-political zones under health sector, the efficiency score attained in the Southwest region 1. The North central zone recorded the mean score of 0.883, while in the Eastern zone, 0.880 was the highest recorded mean score. By implication, the DMUs under health sector in the Southwest region displayed the highest efficiency frontiers in personnel cost utilization among the three regions. Under the education sector, Southwest region displayed the highest attainable efficiency score at 0.851. However, in the North central, 100% efficiency was obtainable among the DMUs. while Eastern zone recorded 0.852 as the highest efficiency score attainable. It therefore implies that, North central performed better than the other regions by fully

utilizing all emolument cost releases to all the DMUs without idle balances in the personnel cost fund. The personnel cost budget was transparently free from being padded.

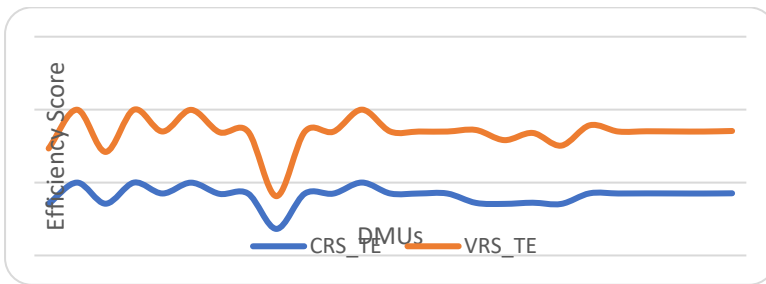
**Figure 1: Efficiency scores curves of personnel costs utilization in the health sector on geo-political zone basis in 2014**



Source: Authors computation (2023).

Figure 1 shows the graphical presentation of the results of usage of personnel costs for the ministries among health institutions using both variable returns to scale and constant return to scales (BCC and CCR) models.

**Figure 2: Efficiency scores curves of Personnel costs utilization under education sector on geo-political zone in year 2014**



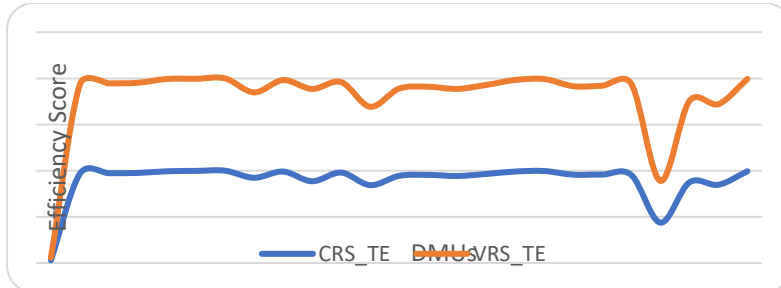
Source: Authors computation (2023)

Figure 2 presents the graphical illustration of the personnel costs usage among educational institutions using the constant returns to scale and variable returns to scale (CCR and BCC Models).

Figures 3 and 4 present the trend of the efficiency scores generated from the DMUs in the usage of personnel costs in 2015. Under the health sector, 80% of the DMUs operated above the benchmark. The DMUs were averagely efficient in the utilization of personnel cost fund during the year. That is, the DMUs could not achieve the maximal efficiency score of 1. However, the remaining 20% units were distinctively inefficient. Similarly, under the education sector, the sectoral average is 0.945 under BCC, the findings revealed that only 72% of the DMUs in the sector operated above this level. The assessment therefore rated DMUs under the health sector in the Eastern region above the other two zones. The entities maximally utilized all the allocated personnel cost fund efficiently without left-over balances during the accounting year (Odewole&Salawu,2021). In the North central, 0.990 efficiency score was obtainable,

while the Eastern zone recorded 0.973. The ability of the DMUs to effectively utilize the personnel fund was clearly manifested better in the Southwest than the other regions.

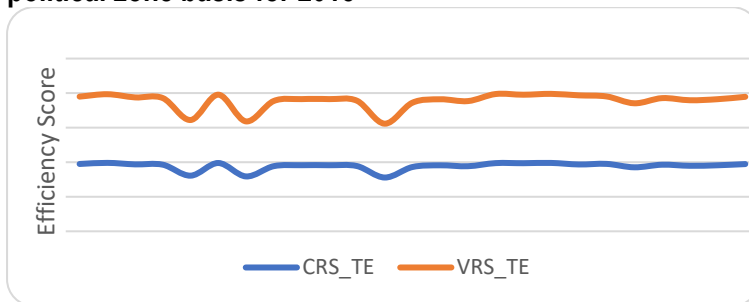
**Figure 3: Efficiency scores curves of personnel cost utilization under health sector on geo-political zone basis in 2015**



Source: Authors computation (2023).

Figure 3 shows the trend of Efficiency of Personnel cost fund among the DMUs under Health Sector in 2015 with the application of CCR and BCC models. It shows that the DMUs were averagely inefficient in personnel cost fund under the two models in the three regions.

**Figure 4: Efficiency scores curves on personnel cost utilization under education sector on geo-political zone basis for 2015**



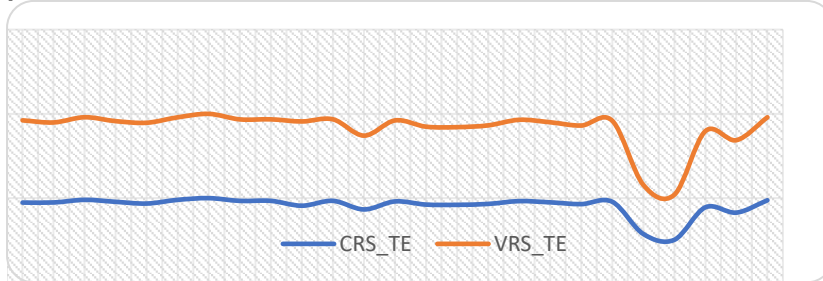
Source: Authors computation (2023).

Figure 4 shows trend of the scores of efficiencies of personnel cost funding among the DMUs in the Education Sector for all six geo-political zone of the country for the year (2015). Both CCR and BCC reveal that the DMUs were inefficient.

Figures 5 and 6 illustrate the performance of cost inputs' usage among the DMUs in the two sectors in 2016. The efficiency frontiers were marginally different from the previous years' assessments. None of the entities attained efficiency score of 100% or equal to 1. On the zonal basis analysis, the highest efficiency mean score attained in the Southwest region was 0.980. The north central zone recorded 0.968, while the eastern zone recorded 100% efficiency score in fund utilization. During the year, the DMUs in the eastern region fully utilized the personnel cost fund allocated to the DMUs in the region. On the contrary, in the education sector, 0.924 was the highest attainable efficiency score among the DMUs in the Southwest. The North central recorded 0.913 efficiency score, while 0.921 was the highest efficiency score attainable in the Eastern zone. The efficiency index was therefore highest among the

DMUs in the Southwest region in the usage of allocated personnel fund compared with other regions (Odewole, Olowookere & Oladejo, 2020).

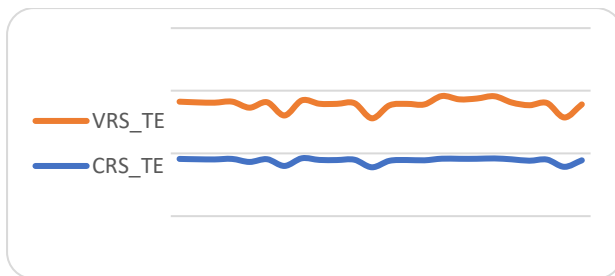
**Figure 5: Efficiency scores curves for personnel cost utilization under health sector on geo-political zone basis for 2016**



Source: Authors computation (2023)

Figure 5 portrays the pattern of cost efficiency scores among the health institutions in 2016. Both CCR and BCC models' results reveal that most of the DMUs were inefficient in personnel cost usage.

**Figure 6: Efficiency scores curves for personnel usage under education in 2016**



Source: Authors computation (2023)

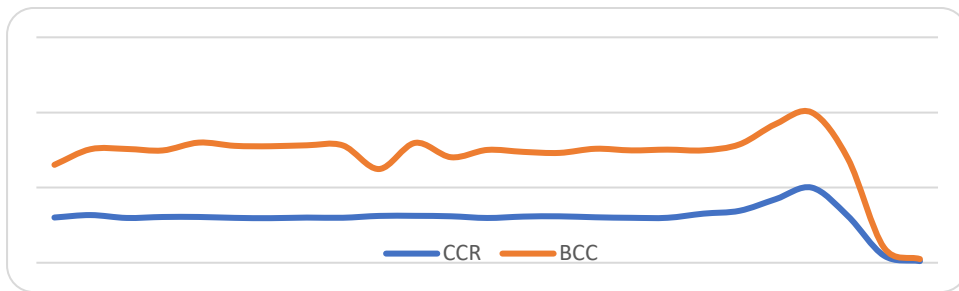
Figure 6 indicates the pattern of scores of personnel cost efficiency among the educational institution in 2016 using CCR and BCC models. The results reveal that most of the DMUs were inefficient in fund usage within the accounting year.

Figures 7 and 8 represent the scores of efficiencies generated from Decision-making units in both sectors in 2017. The average cost efficiency usage in the selected geo-political zones level were 0.595 and 0.822 respectively for CCR and BCC. That is, 76% of the DMUs in the health sector among the geo-political zones operated above the sectoral average of 0.822. The efficiency scores of the remaining 24% DMUs were below the cut-off points. The behavior of input usage was however different among the educational institutions during the year. Under sector, the sectoral average was 0.930 for the BCC results, and only 48% of the DMUs operated above the standard. The remaining 52% of the DMUs could not utilize the available inputs to the level of the benchmark. Also, the analysis of the inputs' utilization shows that the highest mean score was attained in Southwest region with full efficiency frontiers of 100% or 1. It therefore indicates an improvement over the 2016 input utilization performance. The highest attainable mean score was 0.634 in the North while the Eastern zone recorded 0.624 efficiency score. It therefore implies that



South-western region was ranked top with the highest mean efficiency score compared to other regions under health sector. The trend of inputs' usage however differs significantly under education sector. The Southwest attained the highest efficiency scores of 0.693 and 0.768 in the North Central. The Eastern zone recorded 0.623. The performance efficiency score analysis therefore put the North central region as the best performer in the personnel inputs' usage for the year.

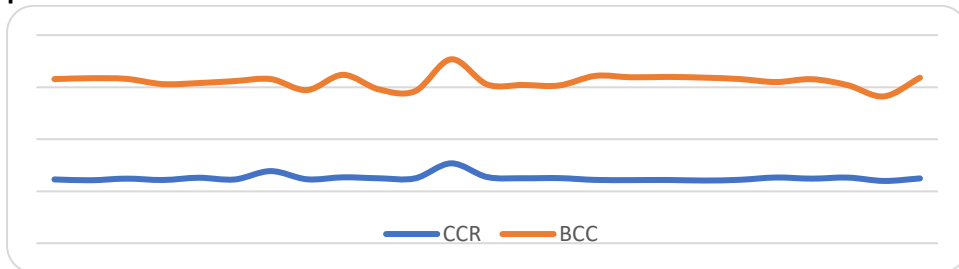
**Figure 7: Efficiency scores curves for personnel cost usage under health sector on geo-political zone basis for 2017**



Source: Source: Author's Computation (2023)

Figure 7 presents the trend of the cost efficiency among the health institutions for the three geo-political zones of the country for the year (2017). Both CCR and BCC reveal that the entities could not maximize all the allocated fund budgeted for the year

**Figure 8: Efficiency scores curves for personnel cost utilization under education sector on geo-political zone basis in 2017**



Source: Author's Computation (2023)

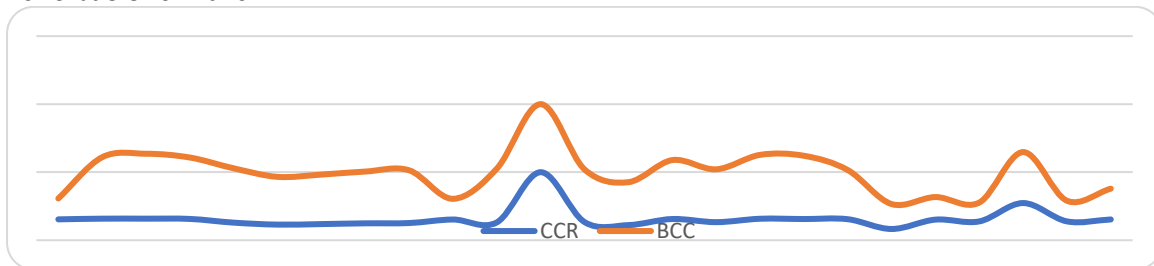
Figure 8 illustrates the trend of the efficiency of personnel cost funding among the DMUs in the Education Sector for the three geo-political zones of the country for the year (2017). Both CCR and BCC results reveal that the DMUs in the sector were marginally inefficient in the personnel cost usage for the year

Figures 9 and 10 indicate the summary of the efficiency scores for both education and health sectors in 2018. The results of the mean efficiency levels for both CCR and BCC models are 0.317 and 0.682 respectively. The overall sectoral average efficiency score was put at 0.682. From the analysis, only 72% of the DMUs in the health sector were afloat above the sectoral average and are adjudged marginally

efficient in the personnel cost usage, while the remaining 28% are distinctively inefficient in the personnel cost inputs' utilization. Similarly, under education sector, the sectoral average is 0.879 with BCC model. The result of the finding therefore shows that only 52% of the DMUs in the sector could sustain an acceptable efficiency level above the sectoral average while the remaining 48% were inefficient.

The highest efficiency score of 100% was attained in the Southwest followed by North central with 0.317 and Eastern zone was 0.312. It therefore implies that both the North central and Eastern zones had heavy idle personnel cost balances. This could be because of excess personnel cost allocations to the DMUs in the zones over and above the actual amount required. Under education sector, 0.320 is the highest attainable efficiency score among the DMUs in the Southwest, the Eastern zone, 0.321, North central, 0.319 efficiency score. Eastern region performed better than the other regions in the efficient utilization of personnel cost inputs' appraisal for the year.

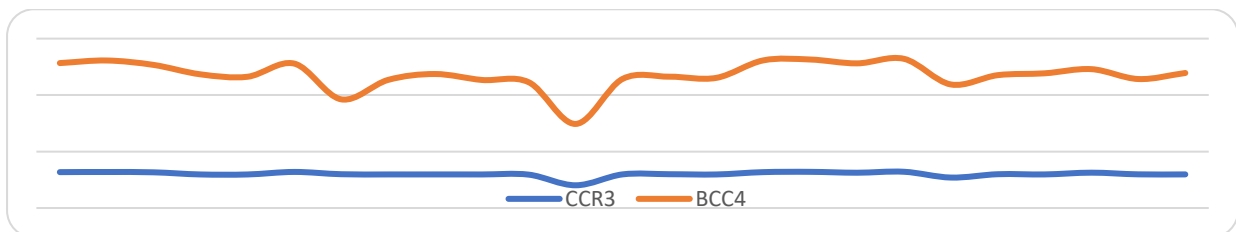
**Figure 9: Efficiency scores curves for personnel cost usage under health sector on geo-political zone basis for 2018**



Source: Source: Author's Computation (2023)

Figure 9 indicates the trend of efficiency in the utilization of personnel cost inputs among the DMUs in the health sector for the year (2018). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

**Figure 10: Efficiency scores curves for personnel cost usage under education sector on geo-political zone basis in 2018**

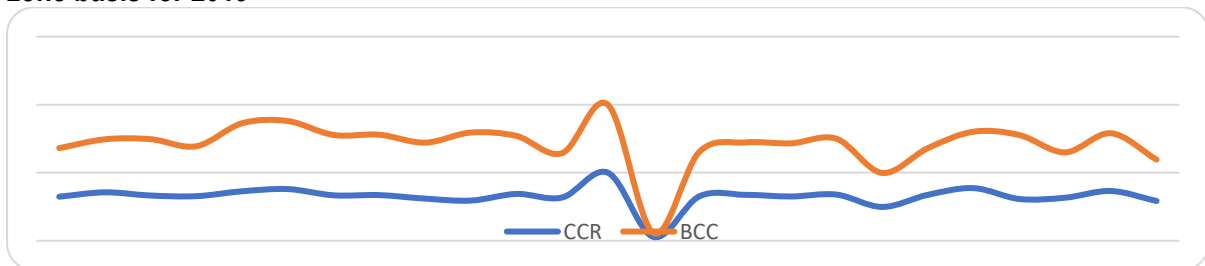


Source: Source: Author's Computation (2023)

Figure 10 shows the trend of the efficiency of personnel cost usage among the DMUs in the education sector for the year 2018. Results of CCR and BCC reveal that the DMUs were inefficient in the personnel cost inputs' usage and could not fully utilize all the allocated personnel fund budgeted for the year.

Figures 11 and 12 display the pattern of behavior of efficiency scores curves generated from the decision-making units under both education and health sectors in 2019 in the geo-political zones. Only 48% of the DMUs in education soared high above the average of 0.763 with the application of BCC model. In the Southwest region, the mean score attainable was 100% efficiency. The DMUs operated at the highest efficiency frontiers in the personnel cost usage during the year. The Southwest optimum efficiency score was, however, restricted to the region. In the North central zone, the mean score obtainable was 0.731 while Eastern zone recorded 0.688 as the highest average score. By implication, the DMUs in the Southwestern region demonstrated the ability of fully utilizing the personnel cost releases among the three regions. The trend was however restricted to the DMUs in health sector. In the education sector, Southwestern zone obtained 0.641. Also, in the North central, 0.710 efficiency was recorded among the DMUs. The Eastern zone recorded 0.633 as the highest efficiency score attainable. The implication therefore is that the North central region was performing better than the other regions in the personnel cost usage during the year in the sector.

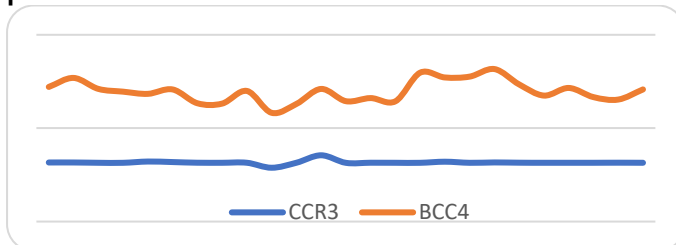
**Figure 11: Efficiency scores curves for personnel cost usage under health sector on geo-political zone basis for 2019**



Source: Source: Author's Computation (2023)

Figure 11 shows the trend of the efficiency of personnel cost funding among the DMUs in the health Sector for the three geo-political zones of the country for the year (2019). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

**Figure 12: Efficiency scores curves for personnel cost usage under education sector on geo-political zone basis for 2019**

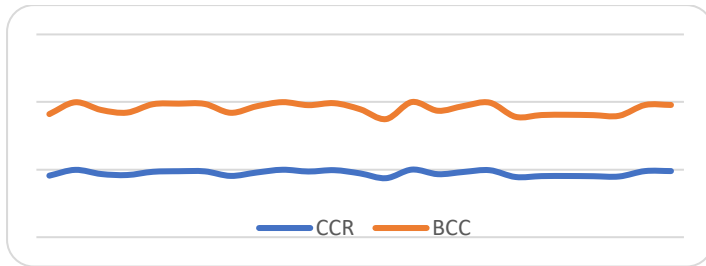


Source: Author's Computation (2023)

Figure 12 shows the pattern of the efficiency of personnel cost funding among the DMUs in the Education Sector for the three geo-political zones of the country for the year (2019). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

Figures 13 and 14 highlight the performance of the efficiency scores generated from both education and health institutions in 2020. In the health sector, 52% of the DMUs sustained a benchmark of 0.955 with 48% operated below the minimum level. Under the education sector, only 88% of the DMUs achieved an average of 0.865 using the BCC model while others were overtly inefficient. The highest mean scores obtained by the three regions - Southwest region, North central and Eastern region were 0.998, 0.996 and 100% respectively. It therefore shows that Eastern region dominated other three regions in the health sector. In contrast, under education sector, the Southwest zone recorded the highest attainable efficiency score of 0.932 while the North central achieved 0.894 as the highest mean obtainable with 0.889 for the Eastern zone as the highest efficiency score attainable. The Southwestern region demonstrated a special ability in the personnel cost usage among the other zones during the year.

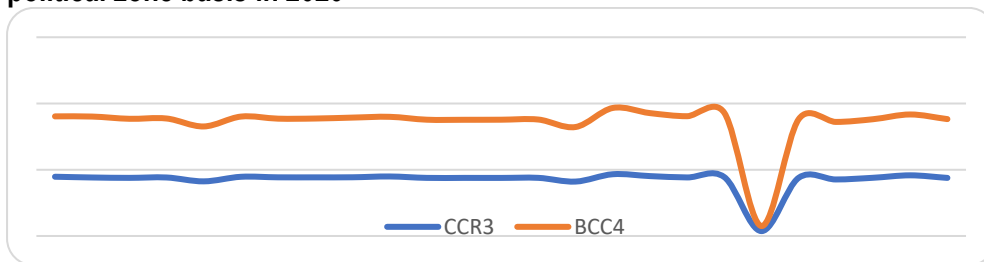
**Figure 13: Efficiency scores curves for personnel cost usage under health sector on geo-political zone basis in 2020**



Source: Author's Compilation (2023)

Figure 13 shows the performance of the efficiency of personnel cost funding among the DMUs in the health Sector for the three geo-political zones of the country for the year (2020). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

**Figure 14: Efficiency scores curves for personnel cost usage under education sector on geo-political zone basis in 2020**



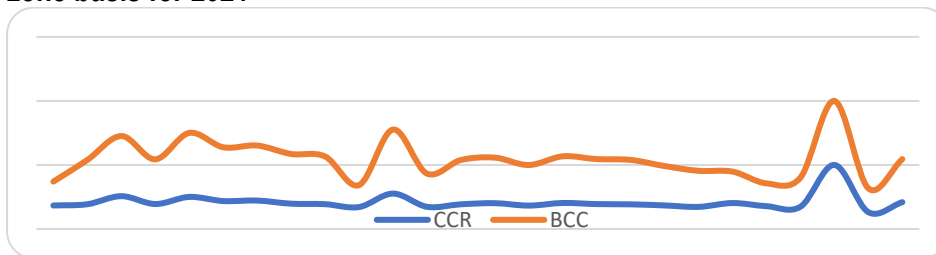
Source: Author's Compilation (2023)

Figure 14 represents the pattern of the efficiency of personnel cost funding among the DMUs in the Education Sector for the three geo-political zones of the country for the year (2020). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

Figures 15 and 16 are the summary of the efficiency score curves for the entities in both education and health sectors in 2021. The mean efficiency level for both CCR and BCC Models were stated as 0.419

and 0.672 respectively. The sectoral average efficiency score is 0.672. In comparison with the overall average score, therefore, it means that only 60% of the DMUs in the health sector scaled through above the sectoral average while the remaining 40% operated below the efficiency level. Also, under the education sector, only 40% of the DMUs operates above the sectoral average of 0.678 (BCC) while the remaining 60% were inefficient. During the year, the highest obtainable efficiency mean in the Southwest region was 0.501, which is below the benchmark. The North central zone recorded 100% while Eastern zone is 0.553. From the analysis, therefore, North central region has the highest mean value. Under the education sector, the behavior of the efficiency scores took a different pattern. The Southwest recorded 0.415 as the highest attainable efficiency score among the DMUs. Also, in the North central, the efficiency score generated for the DMUs was 0.424 while Eastern zone recorded 0.354 as the efficiency score attainable. The results of the analysis therefore rated the DMUs in the North central region as the best performers in personnel cost utilization during the year.

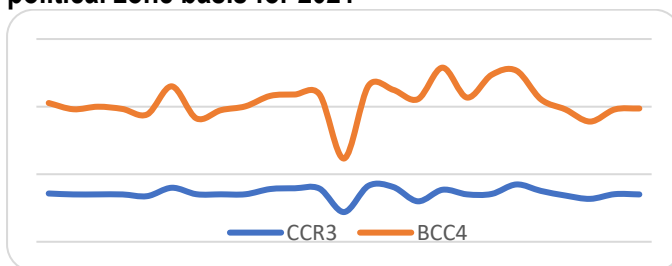
**Figure 15: Efficiency scores curves for personnel cost usage under health sector on geo-political zone basis for 2021**



Source: Author's Compilation (2023)

Figure 15 shows the trend of the efficiency of personnel cost usage among the DMUs in the health Sector for the three geo-political zones of the country for the year (2021). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

**Figure 16: Efficiency scores curves for personnel cost usage under education sector on geo-political zone basis for 2021**

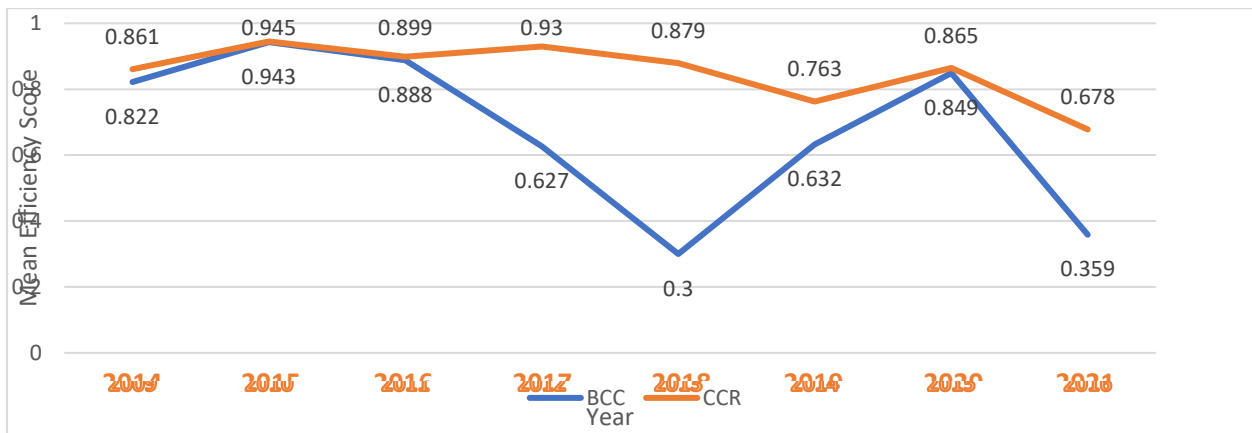


Source: Author's Compilation (2023)

Figure 16 presents the pattern of the efficiency of personnel cost utilization among the DMUs in the education Sector for the three geo-political zones of the country for the year (2021). Both CCR and BCC reveal that the DMUs could not fully utilize all the allocated personnel fund budgeted for the year

Fig 17 shows the mean efficiency scores analysis across DMUs in both Education and health sectors between 2014-2021. The behavior of the efficiency scores clearly revealed the irregular trend in the personnel cost utilization among the federal institutions across the geo-political zones in the country. The fluctuation in the efficiency level among these DMUs therefore indicates that while some DMUs were fully efficient in the personnel cost usage during the accounting year, many of them operated below the efficiency scores benchmarks. The fluctuation is most significant in the CCR approach. It is also noteworthy that there is a sharp plunge in the efficiency score in year 2021.

**Figure 17: Mean Efficiency Scores Analysis Across DMUs in both Education and Health Sectors in the 3 geo-political zones between (2014-2021)**



Source: Author’s Computation (2023)

Fig 17 shows the average efficiency scores analysis among DMUs in both Education and health sectors between 2014-2021. The pattern of the mean efficiency scores in the geo-political zones clearly revealed the fluctuations in the personnel cost usage among the federal institutions.

**5. Conclusion**

The study assessed the behavior of personnel cost expenditure among education and health sectors in the three (3) geo-political zones in the country with the introduction of IPPIS in the public institutions. Both CCR and BCC models were used to analyze the data comparatively between the entities. The findings revealed that there were fluctuations in the personnel cost usage among the DMUs across the three geo-political zones. The spread of the efficiency scores among the institutions in the zones however skewed dominantly towards marginally and averagely inefficient DMUs across both sectors. The implication of inadequate efficiency score is that some of the federal educational and health institutions could not utilize fully the personnel cost allocations budgeted for the individual DMU without slack balances in their personnel cost accounts. The idle personnel cost balance is an indication of either inefficient personnel cost usage across the institutions or inability of the DMUs to properly channel the personnel cost allocations to the relevant quarters or both. The results of personnel cost efficiency among the DMUs in

the three (3) geo-political zones reveal three clear categorizations of inefficiency. The first category of inefficient DMUs fall within marginally inefficient zone where efficiency scores are above 70% but less than 100% efficiency frontiers. The institutions in this category only need marginal effort to reach full efficiency when total personnel cost allocations would be fully utilized as budgeted by the central authority. This category of DMUs can therefore achieve full efficiency of 100% or 1 either by increasing output within the organization or decreasing personnel input costs. Apart from the first categorization, the second group of DMUs with inefficiency scores is made up of DMUs that are averagely inefficient in personnel cost usage in the zones. The efficiency scores for the category of DMUs is greater than 0.65 but less than 0.70. They fall within the middle level performing DMUs (Agasisti & Pohl 2019). Extra effort is needed to push the DMUs in the category to full efficiency. Therefore, to sustain full efficiency frontiers and attain maximum scale of operation during the year in the group, the DMUs should manage both input output resources to reduce slack fund available. The last category is the distinctively inefficient DMUs. The efficiency scores range between 0.5-0.64. The DMUs are low-level performers. The common denominator of the DMUs is the inability to effectively utilize greater percentage of the appropriated personnel costs during the financial year (Salawu & Odewole, 2020, Lin & Zuo 2019). The top echelons of the distinctive DMUs are therefore expected to channel resources or double up efforts to boost the efficiency scores to reach full efficiency. It is therefore the collective and pragmatic attempts of the stakeholders, among both the education and health sectors in the geo-political zones, taken towards enthrone soundproof financial systems that the desired goals of achieving a full efficiency in personnel cost utilization across the geo-political zones can be realized with the introduction of IPPIS to the public institutions.

## **6. Recommendations**

Nearly all the Decision- Making Units (DMUs) in both Education and Health sectors sustained slack fund in the utilization of the personnel cost allocations in the three geo-political zones covered by the study. The implication is that the DMUs were allocated budgeted sum far and above the necessary personnel cost payments needed for their employees. The idle fund therefore constitutes conduct pipes where scarce resources of the nation leaked away. Unless the unfortunate scenario is abated, the country will get to a point where prompt salary payment will be a mirage. Therefore, to prevent the trend of pre-rental personnel cost losses to the institution, the following recommendations are important:

One, there should be a realistic personnel cost budget prepared by each DMU based on the institutions' Nominal Roll and closely monitored by the parent ministry before submission to the Finance Ministry for funding.

Two, personnel cost releases to the DMUs should be on monthly basis instead of annual basis. This will enable the budget office to take into consideration all the existed staff and withdrawals/retirements during the budget year.

Three, budget office should set up a workable monitoring committee on personnel cost allocation and utilization by the DMUs with the mandate among others. to report on the monthly personnel cost utilization by the DMUs and apportion punishment for deviations.

Four, personnel cost allocation should be centrally controlled and monitored at the centre. Any decision-making unit with excess personnel cost allocations should be mandated to refund or face the wrath of the law.

It is when all these recommendations are adhered to an proper monitoring and control mechanisms are in place that effective personnel cost allocations to all the DMUs across the three geo-political zones will be a reality.

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