



# **A Mathematical Model that Analyzes the Differences between the Cost of Maintaining the Desired Permanent Workforce (Academic Staff) and that of Maintaining the Entire Outsourcing Policy for Private Universities in Nigeria**

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## **Authors' contributions**

*This work was carried out in collaboration between authors OE and AAO. Both authors designed the study, performed the statistical analysis, wrote the protocol and the first draft of the manuscript. They managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The difference between the cost of maintaining the desired permanent workforce (academic staff) and that of maintaining the entire outsourcing policy is a useful index that allows management of private universities to know the financial task before them, well ahead of time for a possible solution. However, in the available literature, there are no adequate mathematical models that address such issues. The idea of linear algebra was used to develop a mathematical model that can address such real-life problem.

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## 1. INTRODUCTION

Before 1973, the constitution of the Federal Republic of Nigeria specifies that only the Federal Government can inaugurate universities (Federal Republic of Nigeria National Policy on Education) [1]. Subsequently, the creation of universities was placed on the concurrent list. This means that only the Federal and State Governments can institute universities. Succeeding edition of the National Policy on Education (NPE) involved voluntary agencies, individuals and groups in the establishment of universities (Federal Republic of Nigeria National Policy on Education). This led to the creation of privately owned universities in Nigeria.

The sequence of events of the edition of the NPE shows that the establishment of a university in Nigeria is purely to produce skilled manpower needs of the society and not for profit making. But a survey of the existing literature shows that this is not so with some private universities, some outsourced staff to maximize profit. Management of most private universities relies on outsource academic staff with a view to maximizing profit. Therefore, contradicting the philosophy of establishment of universities by Federal Government as nonprofit making venture.

The issue now is how far do these private universities comply with the minimum standards? Among the primary reason for outsourcing academic staff in private universities has been attributed to profit maximization in the literature [2,3] among others. The author opined that this reason might encourage private universities to outsource academic staff in excess of the permanent staff persistently. In view of these, it becomes imperative to develop a model that could assist (private) universities to determine the difference between the financial implication of maintaining the desired number of permanent academic staff and that of maintaining the entire outsourcing policy for privately owned universities in Nigeria. The difference between these two costs will allow management of private universities to know the financial task before them, well ahead of time for the possible solution.

This paper is aimed at developing a personnel outsourcing model that will give an insight into obtaining an index that allows management of

private universities to know the financial task before them, well ahead of time for a possible solution. Consequently, this paper is intended to achieve the objectives:

- to develop a mathematical model that can be useful in the analyses of the financial implication of outsourcing academic staff for private universities.
- to develop a mathematical model that estimates the difference between the cost of maintaining the desired permanent workforce (academic staff) and that of maintaining the entire outsourcing policy for the given scenario.

### Definition 1.1

- **Staff:** Academic staff alone.

### Definition 1.2

- **Adjunct staff:** An employee of a university that is officially approved to teach for another institution for one year. The contract may be subject to renewal at the expiration of the year.

### Definition 1.3

- **Part-Time staff:** The agreement to teach in this situation is between the part-time staff and the institution that require him for the part-time service. A part-time staff may not be an employee of any university.

### Definition 1.4

- **Adjunct courses:** Courses in an academic programme allocated to be taught by an adjunct staff.

### Definition 1.5

- **Part-time courses:** Courses in an academic programme allocated to a part-time staff.

## 2. LITERATURE REVIEW

This study considers two types of employees, viz.: Outsource staff and permanent academic staff. The scope of the outsource staff is limited to two categories only-adjunct and part-time. Nevertheless, the outsourcing model presented

in this paper can be useful to any tertiary institution where outsourcing (academic staff) strategy is of high precedence.

Outsourced academic staff come into the existing system as an adjunct and part-time staff to run the most of their programmes at low-cost cost rate compared to universities with regular manpower.

The benefits and challenges of outsourcing processes in a Nigerian university were evaluated in the work of Ogbogu [4]. Cleaning and Security were identified as the significant outsourced services in the university. The primary reason for outsourcing these services was the hinge on its cost-saving, improvement in the quality of service delivery amongst others. Job insecurity among university staff was identified as one of the challenges inhibiting outsourcing processes in the university.

Information Communication Technology (ICT) outsourcing services were considered in some selected public university libraries in the work of Mwai et al [5]. A multi-case study strategy was adopted in the study. In particular, four public university libraries in Kenya were selected. Purposive sampling was employed to identify respondents. Data were collected using semi-structured interview schedule. The result from the finding revealed that public universities in Kenya outsource ICT services. The authors opined that the ICT policies and procurement laws are inadequate in guiding the outsourcing processes. More so, high cost and loss of control over dependent on the vendor of services such as an internet, e-resources were some of the challenges inhibiting ICT outsourcing in these universities.

Awino and Mutua [6] examined Business Process Outsourcing (BPO) strategy and performance of all 144 Kenya State organisations as at December 2012. The study aimed to show whether a relationship exists between BPO and firm performance. Some statistical techniques were employed in the analysis of the data. The findings revealed that BPO contributed positively to the corporations' overall performance. The method for determining the required number of permanent academic staff needed to complement the existing staff in a university was given in Enagbonma and Osagiede [7]. Enagbonma and Osagiede [8] formulated a mathematical model that analyses the financial implication of outsourcing policy for

private universities intending to control the staff strength. Data of outsourcing personnel were collected and collated from the relevant section of the university. The results obtained from the study gave the financial implication for the entire personnel outsourcing policy.

Sali and Akor [9] opined that the Benchmark Minimum Academic Standard (BMAS) is the guideline for quality assurance in Nigerian universities. The BMAS stipulates among others, the physical facilities, library facilities, the staff mix by rank ratio, the staff-student ratio per discipline. The authors gave some useful information on the strategies adopted by NUC to ensure that universities in Nigeria adhere to these guidelines.

Wachira et al. [10] examined the impact of outsourcing on organisations in Nairo-Kenyan. Questionnaires were distributed to elicit information from the management of 85 profit-making organisation. The findings revealed that outsourcing could yield positive or negative outcome depending on some factors such as company policy, risk encountered in the business among others. The authors, however, opined that standard outsourcing policies, price regulations for outsourcing could evaluate the positive impact of outsourcing by organisations in Kenyan.

Adedayo and Aderinto [11] examined the social-economic costs of security services outsourcing in selected institutions in Ogun State. A questionnaire was administered to elicit information from 783 respondents. The multi-stage sampling method was used for the study. The results revealed that effective and efficient improvement in the award of outsourcing contracts was the primary objective of government and not just the cost reduction advantage in literature.

### 3. METHODOLOGY

The following assumptions are necessary to develop the model

- (i) A certain percentage  $\rho$  of the salary of permanent staff in grade  $i$  be paid monthly to the adjunct staff
- (ii) Graduate assistants are excluded
- (iii) Two outsourced staff in grade  $i$  are equivalent to one permanent staff in grade  $i$
- (iv) An adjunct staff can also be a part - time staff but the converse is not true.

- (v) There is variation in the amount paid to adjunct staff at different grades.
- (vi) The permanent staff in grade  $i$  earn average personnel cost for that grade

### 3.1 Mathematical Notations

The following notations used in the model and their meanings are:

$i$ : grade of the university academic staff  $i = 1, 2, 3, \dots, 7$

1 denotes Graduate Assistant, 2 denotes Assistant Lecturer, 3 denotes Lecturer II, 4 denotes Lecturer I, 5 denotes Senior Lecturer, 6 denotes Reader and 7 denotes Professor.

$v_i$ : Number of adjunct staff in grade  $i$

$g_i$ : Number of part-time courses taught by adjunct staff in grade  $i$

$p_i$ : Amount paid to part-time staff in grade  $i$  for a course taught in grade  $i$

$s_i$ : Salaries of permanent academic staff in grade  $i$

$\rho$ : The percentage of the salary of permanent staff in grade  $i$  paid monthly to an adjunct staff

TRCO ( $T, \bar{s}$ ): Cost implication of maintaining outsource staff in a given academic session

$\lambda(L, \bar{S})$ : Financial implication for the entire personnel outsourcing policy model

$\pi_i$ : Number of permanent academic staff in grade  $i$

$c_i$ : Number of part-time staff in grade  $i$

$I_i$ : the number of academic staff to be employed on full-time basis to complement the existing permanent staff in grade  $i$ .

TRCO ( $I, \bar{S}$ ): Total cost implication of maintaining the desired academic staff

D: Desired number of permanent academic staff in an institution

TRCO( $\pi_i, I_i, \bar{s}_i$ ): Total personnel cost of maintaining the desired academic staff

### 3.2 Model for the Financial Implication of Maintaining Existing Permanent Staff

If the assumption that the permanent staff in grade  $i$  earn average personnel cost for that grade holds, then the financial implication of maintaining the existing permanent staff in the university for the academic session can be described simply by the relation

$$L(\Pi, \bar{s}) = 12 \sum_{i=1}^7 \pi_i \bar{s}_i \quad (1)$$

where the constant 12 is assumed to be the number of calendar months in an academic session. Equation (1) can be transformed to

$$L(\Pi, \bar{S}) = 12 \Pi \bar{S}' \quad (2)$$

where  $\bar{S}'$  denotes the transpose of  $\bar{S}$ . Again,  $\Pi, \bar{S}$  and  $L$  are row vectors

Let a certain percentage  $\rho$  of the salary of a permanent staff in grade  $i$  be paid monthly to the adjunct staff irrespective of whether the school is in session or not for the period for which the contract is valid. The cost implication of maintaining outsource staff in a given academic session can appear as Equation (3). It is simply the sum of the cost implication of maintaining adjunct and that of maintaining the part-time staff.

$$\begin{aligned} \text{TRCO}(T, \bar{s}) &= 12 \sum_{i=1}^7 \rho v_i \bar{s}_i + 2 \sum_{i=1}^7 g_i p_i \\ &= 2 \sum_{i=1}^7 (6\rho v_i \bar{s}_i + g_i p_i) \end{aligned} \quad (3)$$

the constants 12 and 2 represent the number of calendar months and semesters respectively in a session.

Put differently, equation (3) can be written as

$$\text{TRCO}(T, \bar{S}) = 2(6\rho v \bar{s}' + g p') \quad (4)$$

Where,

$s = (s_1 \ s_2 \ s_3 \ s_4 \ \dots \ s_h)$ ,  
 $v = (v_1 \ v_2 \ v_3 \ v_4 \ \dots \ v_h)$ ,  
 $g = (g_1 \ g_2 \ g_3 \ g_4 \ \dots \ g_h)$  and  
 $p = (p_1 \ p_2 \ p_3 \ p_4 \ \dots \ p_h)$  are row vectors.

Combining equations (1), (2) together with equations (3), (4), we obtain

$$\begin{aligned} \lambda(L, \bar{s}) &= 12 \sum_{i=1}^7 \pi_i \bar{s}_i + 2 \sum_{i=1}^7 (6\rho v_i \bar{s}_i + g_i p_i) \\ &= 2 \sum_{i=1}^7 [6(\pi_i \bar{s}_i + \rho v_i \bar{s}_i) + g_i p_i] \end{aligned} \quad (5)$$

This transforms to

$$\begin{aligned} \lambda(L, \bar{S}) &= L(\Pi, \bar{S}) + \text{TRCO}(T, \bar{S}) \\ &= 2[6(\Pi \bar{S}' + \rho v \bar{S}') + g p'] \end{aligned} \quad (6)$$

The cost implication of personnel outsourcing based on the model is given by equation (6)

The method takes National Universities Commission (NUC) into consideration. BMAS [12]

A method for the determination of the number of staff to be recruited (on permanent basis) to complement the existing permanent staff is given as

$$I_i = \begin{cases} 1, & \text{if } 0 < \frac{n(V_i \cup C_i)}{2} < 1 \\ \left\lfloor \frac{n(V_i \cup C_i)}{2} \right\rfloor, & \text{otherwise} \end{cases} \quad (7)$$

The cost implication of maintaining the desired number of academic staff in an institution is given as

$$\begin{aligned} \text{TRCO}(\pi_i, I_i, \bar{s}_i) &= 12 \sum_{i=1}^7 \pi_i \bar{s}_i + 12 \sum_{i=1}^7 I_i \bar{s}_i \\ &= 12 \sum_{i=1}^7 (\pi_i + I_i) \bar{s}_i \end{aligned} \quad (8)$$

The difference between the estimate of the cost of maintaining the desired number of permanent academic staff and that of the entire outsourcing policy is equation (8) – equation (6)

$$\begin{aligned} \text{TRCO}(\pi_i, I_i, \bar{s}_i) - \lambda(L, \bar{s}) &= 12 \sum_{i=1}^7 (\pi_i + I_i) \bar{s}_i \\ &\quad - \left\{ 2 \sum_{i=1}^7 [6(\pi_i \bar{s}_i + \rho v_i \bar{s}_i) + g_i p_i] \right\} \end{aligned} \quad (9)$$

$$= 12 \sum_{i=1}^7 I_i \bar{s}_i - 2 \sum_{i=1}^7 (6\rho v_i \bar{s}_i + g_i p_i) \quad (10)$$

Equation (9) is re-written as

$$\begin{aligned} \text{TRCO}(I, \bar{S}') - \text{TRCO}(T, \bar{S}) &= 12(\Pi + I) \bar{S}' \\ &\quad - 2[6(\rho v \bar{S}') + g p'] \end{aligned} \quad (11)$$

$$= 12I \bar{S}' - 2(6\rho v \bar{S}' + g p') \quad (12)$$

#### 4. NUMERICAL APPLICATION

We illustrate the utility of the proposed model. Data of academic staff (permanent and outsourced) together with the remuneration were collected and organized. The information from these data were fitted into the various models and analyzed.

**Table 1. Remuneration and number of outsourced staff**

i	Number of permanent staff in grade I $\pi_i$	Number of adjunct staff in grade I $v_i$	Number of part-time courses taught by adjunct staff in grade i $g_i$	Remuneration of part-time staff for a course taught in grade I $p_i$ (in ₦)
1	0	0	0	0
2	9	2	3	40000
3	3	5	5	45000
4	1	13	26	50000
5	2	3	8	60000
6	1	3	6	65000
7	4	1	2	70000

Source: Osatohanmwun Enagbonma and Augustine A. Osagiede (2018d)

**Table 2. Average personnel cost for permanent academic staff in grade i**

i	1	2	3	4	5	6	7
	GA	AL	LII	LI	SL	Reader	Professor
Average permanent personnel cost $\bar{s}_i$ (in ₦)	0	98,133.91	133,409.90	182,152.25	239,822.89	284,346.41	353,963.19

Source: Osatohanmwun Enagbonma and Augustine A. Osagiede (2018d)

The information in Table 1 together with 40% of the average permanent personnel cost of financing adjunct staff is used to illustrates the model.

The financial implication of maintaining the existing permanent staff for the academic session is

$$L(\Pi, \bar{S}) = 12(0 \ 9 \ 3 \ 1 \ 2 \ 1 \ 4) \begin{pmatrix} 0 \\ 98133.91 \\ 133409.90 \\ 182152.25 \\ 239822.89 \\ 284346.41 \\ 353,963.19 \end{pmatrix} = \text{N}43745185.08 \quad (13)$$

The total cost implication for this outsource staff (adjunct and part-time) in a session is

$$\begin{aligned} \text{TRCO}(T, \bar{S}) &= 12 \left[ 0.4(0 \ 2 \ 5 \ 13 \ 3 \ 3 \ 1) \begin{pmatrix} 0 \\ 98133.91 \\ 133409.90 \\ 182152.25 \\ 239822.89 \\ 284346.41 \\ 353,963.19 \end{pmatrix} \right] \\ &+ 2 \left[ (0 \ 3 \ 5 \ 26 \ 8 \ 6 \ 2) \begin{pmatrix} 0 \\ 40000 \\ 45000 \\ 50000 \\ 60000 \\ 65000 \\ 70000 \end{pmatrix} \right] = 24757284.7776 + 5310000 \\ &= \text{N}30067284.7776 \end{aligned} \quad (14)$$

Hence, the cost of maintaining the entire personnel outsourcing policy is given as

$$\lambda(L, \bar{S}) = L(\Pi, \bar{S}) + \text{TRCO}(T, \bar{S}) = 2[6(\Pi \bar{S}' + \rho v \bar{S}) + gp] \quad (15)$$

$$\lambda(L, \bar{S}) = 43745185.08 + 30067284.7776 = \text{N} 73812469.8576 \quad (16)$$

In this section, we present a table for the data of staff (permanent and outsourced) in an institution.

**Table 3. Staff profile**

i	Number of permanent staff in grade i $\pi_i$	Number of adjunct staff in grade i $n(V_i)$	Number of part-time staff in grade i $n(C_i)$
1	0	0	0
2	9	2	4
3	3	5	6
4	1	13	15
5	2	3	8
6	1	3	5
7	4	1	3

Source: Osatohanmwun Enagbonma and Augustine A. Osagiede (2018a)

Applying equations (7) to Table 3 we have the entries in Table 4

The results given in Table 4 shows that a total number of nineteen (19) academic staff need to

**Table 4. Desired number of permanent academic staff**

i	n(V <sub>i</sub> )	n(C <sub>i</sub> )	n(V <sub>i</sub> ∩ C <sub>i</sub> )	$\frac{n(V_i \cup C_i)}{2}$	$\pi_i$	$I_i = \left\lceil \frac{n(V_i \cup C_i)}{2} \right\rceil$	Desired number academic staff in grade i $D = \pi_i + I_i$
1	0	0	0	0	0	0	0
2	2	4	2	2	9	2	11
3	5	6	5	3	3	3	6
4	13	15	13	7.5	1	7	8
5	3	8	3	4	2	4	6
6	3	5	3	2.5	1	2	3
7	1	3	1	1.5	4	1	5
					$\sum_{i=1}^7 \pi_i = 20$	$\sum_{i=1}^7 I_i = 19$	$\sum_{i=1}^7 (\pi_i + I_i) = 39$

**Table 5. Cost implication of maintaining the desired number of permanent academic staff**

i	Desired number academic staff in grade i $\pi_i + I_i$	Average academic Staff Salary Structure $\bar{s}_i$	$(\pi_i + I_i)\bar{s}_i$
1	0	0	0
2	11	98,133.91	1079473.01
3	6	133,409.90	800459.40
4	8	182,152.25	1457218
5	6	239,822.89	1438937.34
6	3	284,346.41	853039.23
7	5	353,963.19	1769815.95
$\sum_{i=1}^7 (\pi_i + I_i) = 39$		$\sum_{i=1}^7 \bar{s}_i = \text{₦}1291828.55$	$\sum_{i=1}^7 (\pi_i + I_i)\bar{s}_i = \text{₦}7398942.93$

be employed on full-time basis to complement the existing permanent staff in grade i.

$$TRCO(\pi_i, I_i, \bar{s}_i) - \lambda(L, \bar{S}) = 88787315.16 - 73812469.8576 = \text{₦}14974854.3024$$

The cost of maintaining the desired number of permanent academic staff is given as

$$TRCO(I, \bar{S}) - TRCO(T, \bar{S}) = 12I\bar{S}' - 2(6pv\bar{S}' + gp') \quad (18)$$

$$TRCO(\pi_i, I_i, \bar{s}_i) = 12 \sum_{i=1}^7 (\pi_i + I_i)\bar{s}_i = \text{₦}88787315.16 \quad (17)$$

$$= 45042130.08 - 30067284.7776 = \text{₦}14974854.3024$$

Suppose that the data in Tables 1, 2 and 3 are applied in equation 12, then we can ascertain the difference in the cost of maintaining the desired number of permanent academic staff and that of maintaining personnel outsourcing policy given in equation(12) as

This result shows that the institution need additional  $\text{₦}14974854.3024$  per academic session to finance the desired number of permanent staff. It means the institution will employ 19 additional permanent staff.

Simply put, the institution requires additional  $\text{₦}14974854.3024$  annually to maintain the new 19 new employees. If this is done, the

disadvantages associated with personnel outsourcing identified in the literature would be upset.

## **5. DISCUSSION OF RESULTS**

The results obtained show that there is a large positive difference between the cost of maintaining the desired number of permanent academic staff and that of maintaining the entire outsourcing policy. The reason may be either because of the profit maximization intention or due to insufficient fund on the part of proprietors of these private universities. Consequently, the philosophy for the establishment of universities by Federal Government as a non-profit making venture is negated. This wide gap should be filled by owners of private universities by employing academic staff on permanent basis.

## **6. CONCLUSION**

Finally, most of the work on outsourcing in literature either explains the theories of outsourcing or examine the processes of outsourcing in various organizations. We found out that there are no mathematical models to evaluate the cost implication of personnel outsourcing in privately owned universities in Nigeria. Mathematical models that can address such situations have been developed.

The significant difference between the cost of maintaining the desired number of permanent academic staff and that of personnel outsourcing policies in the academic institutions. Has given insight into obtaining an index to determine how far management of private universities in Nigeria have complied with NUC guideline that two adjunct staff in grade *i* can be assessed as equivalent to one permanent staff in the institution.

It is suggested in this paper that management of private universities in Nigeria should as a matter of fact source for the positive difference in the cost of maintaining the desired number of permanent staff and that of maintaining outsourcing policy if they must manage universities.

However, if management must outsource academic staff; what would be the ideal number of outsourcing staff for a given university to maintain the lay down standard stipulated by NUC? Model of sort has been addressed in Enagbonma and Osagiede[13].Mathematical

models for estimating the financial implications of outsourcing academic staff has been considered in the literature. For example, Enagbonma and Osagiede [14] identified wastages and shortages of academic staff in universities as issues of major concern to the management of privately owned universities. The authors developed a Mathematical Model that analyses the financial implication of outsourcing policy for private universities in Nigeria to deal with such problems.

To remedy this problem of insufficient fund private universities in this situation should brace up and source for a fund from financial institutions. In addition, the three tiers of government should endeavour to provide emergency relief fund to such universities in the form of Special Intervention Fund as suggested by Abiodun-Oyebanji [3]. The Private University should benefit from Tertiary Education Trust Fund (TETFund), Education Trust Fund (ETF) (Federal and State governments) and special launching (Public and Voluntary Agencies) to solicit for a fund. These are not out of place as education given to a citizen of the nation benefits the entire society and the nation in general.

We developed MATLAB codes depicted in the appendix to facilitate the computations in this paper.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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## APPENDIX

**Matlab codes for computing the difference between the cost of maintaining the desired number of permanent staff and that of maintaining entire personnel outsourcing policy in the institution in Naira.**

```
clc
% This Code is written for the application
s =[0 98133.91 133409.90 182152.25 239822.89 284346.41 353963.19] % average salary of
permanent staff in grade i
sT=transpose(s)
pi=[0 9 3 1 2 1 4] % number of permanent staff in grade i
disp('the financial implication of maintaining existing permanent staff')
12*(pi*sT)
v = [0 2 5 13 3 3 1] % The number of adjunct staff in grade i
rho = 0.4 % The percentage of permanent staff salary paid to 'an' adjunct staff in grade i
s =[0 98133.91 133409.90 182152.25 239822.89 284346.41 353963.19] % salary of permanent staff
in grade i
g= [0 3 5 26 8 6 2] % number of part-time courses taught by adjunct staff in grade i
p= [0 40000 45000 50000 60000 65000 70000] % amount paid to Part-time staff for a course taught in
grade i
sT=transpose(s)
pT=transpose(p)
disp('cost implication when a certain percentage of permanent staff salary is paid monthly to adjunct
staff in Naira.')
[2*(6*rho*v*sT)]
disp('cost paid to adjunct staff for teaching more than one course in the institution in Naira.')
2*(g*pT)
disp('Total Relevant Cost for adjunct and part tim staff in Naira.')
TRCO = [2*(6*rho*v*sT)]+2*(g*pT)
disp('the financial implication of maintaining the entire outsourcing policy given by case 2')
12*(pi*sT)+[2*(6*rho*v*sT)]+2*(g*pT)
nVi=[0 2 5 13 3 3 1] % The set of number of adjunct staff in grade i
nViT=transpose(nVi)
nCi=[0 4 6 15 8 5 3] % The set of number of part-time staff in grade i
nCiT=transpose(nCi)
disp(' half the union of number of set of adjunct and part-time lecturers')
(nCiT(nViT <= nCiT))/2
disp('required number of permanent academic staff needed to complement the existing permanent
academic staff.')
fix((nCiT(nViT <= nCiT))/2)
s =[0 98133.91 133409.90 182152.25 239822.89 284346.41 353963.19] % salary of permanent staff
in grade i
sT=transpose(s)
disp('cost of maintaining the required number of permanent academic staff needed to complement the
existing permanent academic staff.')
s*fix((nCiT(nViT <= nCiT))/2)
pi=[0 9 3 1 2 1 4] % number of permanent staff in grade i
```

disp('cost of maintaining the desired number of permanent academic staff in a year.')

$12 * (\pi * sT + s * \text{fix}((nCiT(nViT \leq nCiT))/2))$

disp('difference between the cost of maintaining the desired number of permanent staff and that of maintaining personnel outsourcing policy in the institution in Naira.')

$(12 * (\pi * sT) + 12 * s * \text{fix}((nCiT(nViT \leq nCiT))/2)) - (12 * (\pi * sT) + [2 * (6 * \rho * v * sT) + 2 * (g * pT)])$

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