Investigating the creditability of post- ume usng hypothetico- deductive and clustering methods

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Abstract

The adoption of Post- UME examination in Nigerian Universities has raised controversies among Nigerian citizens as regards to its credibility. To confirm or disprove the credibility for the adoption of Post- UME examination, two years data on admission for the thirteen programmes for 2008/ 2009 and 2009/2010 academic sessions are collected from the academic division of Kano University of Science and Technology, Wudil. The attributes considered in this research are JAMB score, post-UME score, number of relevant 'O' level credits earned, number of sittings in 'O' level examination, number of deficiency if any, age of the applicant at the time of admission and these are the parameters considered in admitting a candidate. Each of the thirteen data matrix is standardized, a prediction is deduced based on two formulated hypotheses arose as regards to credibility of post-UME or otherwise and cluster analysis of variables (Complete linkage and Ward linkage on correlation distance coefficient) and the results are compared with the stated prediction. The stated prediction is disproved on five data matrice while the results confirmed the stated prediction on eight data matrices.

Key Words:Data matrix, similarity level, clustering steps, JAMB Score, Post-UME Score, O'level credit

Introduction

Before the establishment of JAMB, each University in Nigeria was responsible for the conduct of concessional examination and admitted its own students based on their performance in 'O' level examination. But this system of admission had serious limitations and was inefficient. The Committee of Vice Chancellors was concerned about this problem. Consequently, the government set up a national committee on University Entrance Examination under the Chairmanship of Mr. Angulu and the committee recommended setting up JAMB" (Idoko, 2008).

On 13th of February, 1987, the Joint Admission and Matriculation Board was established by the Act No 2 of 1978 of the Federal Military Government of Nigeria to

conduct admission examinations into Nigerian Universities (Wikipedia, the free encyclopedia). There is no doubt that the level of credibility earned by the prominent examination bodies; WAEC, NECO and JAMB is greatly diminishing due to some examination irregularities persisting in these examination bodies.

To sanitize the system of admission and to ascertain the level of credibility of the results of any candidate seeking for admission into any of the Nigerian Universities, the Federal Government of Nigeria introduced the policy of post- JAMB examination by Universities in 2005 through the former Minister of Education, Mrs. Chinwe Obaji. Obaji asserts that some candidates scored 280 and above in JAMB examination but could not score 20 percent in the post-JAMB examination, believing that those students must have cheated on their JAMB examinations and could not pass post- UME because there was no way to cheat.

The introduction of post-JAMB in Nigerian Universities has created different reactions. Sobechi (2008) quotes the Vice Chancellor of Ebonyi State University (EBSU), Professor Fidelis Ogah as saying that he had refused to bow to pressure to conduct post-UME test because most institutions have turned it to goldmine. Oyedele (2008) also quotes the Vice Chancellor of the University of Education, Ikere-Ekiti, Professor Dipo Kolawole a well known supporter of the post-UME test, as saying that "in the past a student will score 289, automatically he comes in, but with the post- UME now, you find that such a student is scoring a poor mark".

Makinde (2009) states that Professor Phillip Abiodun, the Vice Chancellor, Adekunle Ajasin University, Akungba- Akoko, Ondo State, has asserted that "two examinations are not "too many to sieve qualified candidates from those who cheated to

pass". Similarly, during the 33rd and 34th convocation ceremony of the University of Bennin, Late Umar Musa Yar' Addua, through the Director of Tertiary Education in the Federal Ministry of Education, Dr. Emmanuel Okon, remarked that the post-UME may be cancelled if complaints against its conduct persist (Aliu, 2008). With these different reactions over the adoption of post-UME examinations this research is faced with the problem of confirming or disproving any of these opinions based on predictive similarities.

The pattern of similarities considered in this research is based on clustering results. According to Romesburg (2004),"Sometimes we may have a good hypothesis in mind. Most likely we got it without using cluster analysis, but we can test this hypothesis using cluster analysis based on predictive pattern of similarities. If the predicted pattern of similarities agreed with our clustering results then the hypothesis is confirmed otherwise it has been disproved". According to Hardle and Simar (2007), in cluster analysis, individuals are grouped in order to build some natural subgroups and this is done by grouping individuals that are "similar" according to appropriate criterion. According to Goodacre et al., (2004), hypothetico-deductive approach to science is the traditional cycle of knowledge, in which background is used to construct a hypothesis to be tested experimentally. The experiment produces data that are consistent or otherwise not consistent with the hypothesis.

Research Hypotheses and Prediction

Based on the two different opinions two hypotheses have been deductively proposed.

$H_{a:}$ post-UME examination is regarded as a measure of credibility of JAMB results.

H_b: post-UME examination is not regarded as a measure of credibility of JAMB results.

The prediction P can be deduced from the hypotheses in order to confirm or disproved any of the two stated hypotheses based on predictive similarities as:

P: there should be at least mildly similarity between post-UME scores and JAMB scores or between any two clusters with the two variables.

Materials and Methods

Data on admission of admitted students for 2008/2009 and 2009/2010 academic sessions was collected from the academic division of Kano University of Science and Technology, Wudil. The University runs thirteen programes which include: Agriculture, Architecture, Food Science and Technology, Biology, Chemistry, Physics, Geography, Mechanical, Civil and Electrical Engineering, Mathematics, Statistics and Computer Science.

In order to test the stated prediction P, data matrix for each of the thirteen programmes listed above were obtained. Each object being described by six attributes which include number of relevant "O" level credits (nr), JAMB scores (jb), post- UME score (pu), number of sittings in "O" level exams (ns), age of the students at the time of admission (ag) and number of deficiencies (df). Thirteen data matrices were used for the study in which those objects with missing values where excluded in the analyses.

Each of the thirteen data matrix is standardized using a standardizing function,

$$Z_{ij} = \frac{X_{ij} - \overline{X}_j}{S_j}$$

For attributes i=1,2,…t and objects j=1,2,…n.

Where:

$\overline{X_j} = \frac{\sum_{i=1}^{t} X_{ij}}{t}$, $S_j = \sqrt{\frac{\sum_{i=1}^{t}\left(X_{ij} - \overline{X_j}\right)^2}{t-1}}$ in order to correct for different scales in measurements and unwanted size displacements. Romesburg, (2004).Thirteen data matices each of the following forms are obtained as follows:

General form of standardized data matrix

		Attributes					
		nr(1)	jb(2)	pu(3)	ag(4)	ns(5)	df(6)
	1	Z_{11}	Z_{21}	Z_{31}	Z_{41}	Z_{51}	Z_{61}
	2	Z_{12}	Z_{22}	Z_{32}	Z_{42}	Z_{52}	Z_{62}
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
Objects	j	Z_{1j}	Z_{2j}	Z_{3j}	Z_{4j}	Z_{5j}	Z_{6j}
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	n	Z_{1n}	Z_{2n}	Z_{3n}	Z_{4n}	Z_{5n}	Z_{6n}

Then with correlation distance coefficient $d_{ik} = 1 - \rho_{ik}$ as a resemblance coefficient, where $\rho_{ik} = \frac{\sum_{j=1}^{n}\left(Z_{ij} - \bar{Z}_i\right)\left(Z_{kj} - \bar{Z}_k\right)}{\sqrt{\sum_{j=1}^{n}\left(Z_{ij} - \bar{Z}_i\right)^2 \sum_{j=1}^{n}\left(Z_{jk} - \bar{Z}_k\right)^2}}$ for $i \neq k$ is the product moment correlation

between attribute i and k.

Analyses

The initial resemblance matrix for each of the 13 standardized data matrices is obtained as follows: $d_{ik} = \begin{bmatrix} 0 & . & . & . & . & . \\ 1-\rho_{12} & 0 & . & . & . & . \\ 1-\rho_{13} & 1-\rho_{23} & 0 & . & . & . \\ 1-\rho_{14} & 1-\rho_{24} & 1-\rho_{34} & 0 & . & . \\ 1-\rho_{15} & 1-\rho_{25} & 1-\rho_{34} & 1-\rho_{45} & 0 & . \\ 1-\rho_{16} & 1-\rho_{26} & 1-\rho_{36} & 1-\rho_{46} & 1-\rho_{56} & 0 \end{bmatrix}$ for $i,k \in t; t = 1,...,6.$

Cluster analyses of attribute was performed on each standardized data matrix using Minitab 13.32 employing the two agglomerative clustering algorithms (complete and Ward's linkage), at each stage of the clustering, attributes with least value of d_{ik} are merged together. The resemblance matrices are updated at the end of each clustering step. The process continued up to t-1 steps.

Results

The results of the clustering solutions of the cluster analyses of attributes produced by complete linkage algorithm and Ward's linkage algorithm are presented on table 1 and 2 respectively.

Table 1: Results of the cluster analysis of variables by complete linkage

Data matrix	Steps and clusters involving jb(2) and pu(3)
1	At the 5th clustering step, pu(3), ns(5), nr(1) joined with jb(2), ag(4) and df(6) at a similarity level of 21.05.

Table 1 continued

2	At the 4th clustering step, pu(3), df(6) joined with jb(2), ag(4) and ns(5) at a similarity level of 41.28.
3	At the first clustering step, jb(2) and pu(3) joined at a similarity level of 65.32.
4	Jb(2) and pu(3) joined at the 1st clustering step at a similarity level of 61.89.
5	At the 2nd clustering step, jb(2) joined with pu(3) at a similarity level of 58.91.
6	At the 4th clustering step, pu(3), df(6) joined with jb(2) at a similarity level of 47.43.
7	At the 1st clustering step, jb(2) joined with pu(3) at a similarity level of 63.16.
8	At the 3rd clustering step, pu(3), nr(1) joined with jb(2) at a similarity level of 57.63.
9	At the 5th clustering step, nr(1), ag(4), jb(2) and ns(5) joined with pu(3) and df(6) at a similarity level of 8.59.
10	At the 5th clustering step, nr(1), ns(5) and pu(3) joined with ag(4), df(6) and jb(2) at a similarity level of 17.03.
11	At the 2nd clustering step, jb(2) and ag(4) fused with pu(3) at a similarity level of 53.61.
12	At the 5th clustering step, nr(1), pu(3) joined with ag(4), ns(5), df(6) and jb(2) at a similarity level of 16.56.
13	At the 5th clustering step, nr(1), jb(2) joined with ag(4), ns(5), df(6) and pu(3) at a similarity level of 13.14.

Table 2: Results of the cluster analysis of variables by Ward's linkage

Data matrix	Steps and clusters involving jb(2) and pu(3)
1	At the 4th clustering step, pu(3), ns(5), joined with jb(2), and df(6) at a similarity level of 47.27.
2	At the 4th clustering step, pu(3), df(6) joined with jb(2) and ag(4) at a similarity level of 36.67.

Table 2 continued

3	At the first clustering step, jb(2) and pu(3) joined at a similarity level of 65.32.
4	Jb(2) and pu(3) joined at the 1st clustering step at a similarity level of 61.89.
5	At the 2nd clustering step, jb(2) joined with pu(3) at a similarity level of 58.91.
6	At the 4th clustering step, pu(3), df(6) joined with jb(2) at a similarity level of 44.85.
7	At the 1st clustering step, jb(2) joined with pu(3) at a similarity level of 63.16.
8	At the 3rd clustering step, pu(3), nr(1) joined with jb(2) at a similarity level of 57.12.
9	At the 5th clustering step, nr(1), ag(4), jb(2) and ns(5) joined with pu(3) and df(6) at a similarity level of 17.09.
10	At the 5th clustering step, nr(1), ns(5) and pu(3) joined with ag(4), df(6) and jb(2) at a similarity level of 18.98.
11	At the 3rd clustering step, nr(1) and jb(2) joined with ag(4) and pu(3) at a similarity level of 51.26.
12	At the 5th clustering step, nr(1), pu(3) joined with ag(4), ns(5), df(6) and jb(2) at a similarity level of 30.31.
13	At the 5th clustering step, nr(1), jb(2) joined with ag(4), ns(5), df(6) and pu(3) at a similarity level of 20.37.

Discussion

Based on the stated prediction, the results of the clustering solution of table 1 of data matrix 2, 3, 4, 5, 6, 7, 8 and 11 confirmed the stated prediction. There is a high level of similarity between JAMB score and post- UME score on data matrix 3, 4 and 7. On data matrix 2 and 6 shows that there is a mildly similarity between cluster involving JAMB score and post-UME score while the results of data matrix 5 and 8 shows that there is a

slightly high similarity between cluster involving JAMB score and post-UME score. The stated prediction is disproved based on results of data matrix 1,9,10,12 and 13 which shows a high dissimilarity between cluster involving JAMB score and post-UME score on each of the 5 stated data matrices.

The clustering solutions of table 2 confirmed the stated prediction on data matrix 1,3,4,5,6,7,8 and 11. It is discovered that there is high similarity between JAMB score and post-UME score in data matrix 3,4 and 7. A slightly high similarity exist between JAMB score and post-UME score from the result of data matrix 5 and slightly high similarity exist between clusters involving JAMB score and post-UME score in data matrix 11. The results of data matrix 1 and 6 shows that there is a mildly similarity between clusters involving JAMB score and post-UME score while the results of data matrix 9,12 and 13 show a high dissimilarity between clusters involving JAMB score and post-UME score while the result on data matrix 2 indicates a slightly high dissimilarity between clusters involving JAMB score and post-UME score and these disproved the stated prediction.

Conclusion

From the result of table 1 and 2, the two hierarchical clustering algorithms (complete linkage and Ward linkage) produced similar results. The results of each confirmed the stated prediction on 8 data marices. Although diffrernce emerged from the results of table 1 and 2 on data matrices 1 and 2.

The result of table 1 on data matrix 1 disproved the stated prediction with a similarity level of 21.05 while the result of table 2 on data matrix 1 confirmed the stated prediction

with a similarity level of 47.27. The result of table 1 confirmed the stated prediction on data matrix 2 with a similarity level of 41.28 which is contrary to what is obtained on data matrix 2 of table 2 which disproved the stated prediction with similarity level of 36.67.

Finally, it is important to note that, the research did not intend to establish a kind of similarity or correlation between JAMB score and post-UME score, but instead to find out if post-UME results is regarded as a measure of credibility of JAMB results in admitting candidates in the 13 programmes run by the University.

References

Aliu, A. O. (2008). FG may scrap Post- UME screening examination in Nigeria. *The Guardian (November)*: *3*
.

Goodacre, R. S. Vaidyanathan, W. B. Dunn, G. Harrigan, D. B. Kell. (2004). Metabolomics by numbers: acquiring and understanding global metabolites data. *Trends Journals,* 22: 245-252.

Hardle, W. and Simar, L. (2007), Applied Multivariate Statistical Analysis, 2nd edition Springer Berlin Heidelberg New York.

Idoko, C. (2008). JAMB celebrates 30th anniversary. *Nigerian Tribune* (December 4): 26

Makinde, F. (2008), NUC begins Universities accreditation in 2009. *The Punch* (November 5): 9.

Oyedele, A. (2008). Post- UME should not be scrapped UNADC. *The Punch* (December 30): 41.

Romesburg, H.C. (2004). *Cluster Analysis for Researchers.* North Carolina. Lulu Press, 9-91.

Wikipedia, the free encyclopedia, http://en.wikipedia.org/wiki/Joint Admission and Matriculation Board.