

Research Output Analysis for Universities of Technology in Nigeria

Hilary I. Okagbue, Abiodun A. Opanuga, Pelumi E. Oguntunde, Patience I. Adamu,
Chukwuemeka O. Iroham and Angie O.I. Adebayo

Abstract— Research outputs of universities are often used for the determination of their ranking, prestige and impact among competing partners across the globe. This research focused on the qualitative analysis of research outputs, based on 27 identified research areas, for universities of technologies in Nigeria. The 27 subject areas of the top ten universities of Nigeria were obtained from Scopus database. Universities having less than two hundred documents were not included. Ranking and statistical methods were used for data analysis. The result showed that the research outputs from the universities of technology in Nigeria were poor especially when compared with other African countries like Egypt, Morocco, Ghana, South Africa, and Algeria and so on. Agricultural and Biological Sciences, Engineering, Environmental Sciences and Medicine were identified as subject areas of high research output. The universities seem to perform poorly in 3 core science areas which are chemistry, physics and mathematics. Recommendations were made based on the findings of this study.

Keywords— Bibliometrics, Nigeria, rank, ranking analytics, Scopus, statistics, subject.

I. INTRODUCTION

THE Universities of technology (UT) were established in Nigeria as vehicles to convey the nation to the league of the technologically advanced countries. They were given the mandate to develop the nation scientifically and technologically by producing human capital to work in the science and technology sector of the economy. Currently, Nigeria has 8, 5 and 1 Federal, state and private UT respectively that were established at different times. The UT offer mostly science and technology-based courses compared with the conventional universities in the country both at undergraduate and graduate levels. A critical evaluation of the vision of UT points to technological development. This is not surprising as Nigeria is a developing nation.

This research focused on the qualitative analysis of research

This work was supported by Covenant University Centre for Research, Innovation and Discovery.

H.I Okagbue, A.A. Opanuga, P.E. Oguntunde and P.I. Adamu are with the Department of Mathematics, Covenant University, Canaanland, Ota, Nigeria.

C.I. Iroham is with the Department of Estate Management, Covenant University, Ota, Canaanland, Nigeria.

A.O.I. Adebayo is with the Department of Mass Communication, Covenant University, Canaanland, Ota, Nigeria.

H.I. Okagbue is the Corresponding Author with the email address:

hilary.okagbue@covenantuniversity.edu.ng

areas of universities of technologies in Nigeria using the Scopus database to extract the subject areas of the UT. Technological education is often seen as a stepping stone to technological advancement of every nation. Regrettably, Nigeria remains undeveloped and imports most of her technological needs despite the establishment of UT. This has caused the economy of Nigeria to suffer as a result such that, organizations have to depend on outsourcing or employment of expatriates to manage their technological needs. The technological backwardness has led to huge capital flight, high cost of doing business and total dependence on foreign nations for technical assistance. The genesis of the problem can be traced to low allocation of funds to the educational sector, corruption, lack of research activities, red-tapism, tribalism, lack of political will to develop the UT and political interference on educational activities.

Technology is globally seen as the brain child of research activities. The measurement of the research areas serves as a viable tool for auditing the vision and mission of the UT [1]. Generally, several factors seem to contribute to the research productivity such as motivation, available of internet [2], gender [3], conducive environment, unbiased scholarly activities [4-7], improved funding, well- equipped library and portable learning resources [8-12] and others as discussed in [13-17].

Research output can be obtained when the point of reference (controlled or uncontrolled database) containing the outputs are classified into subjects of which the performance or trend can be quantified and can be taken as the scholarly focus of the concerned institution. [18-20].

The outline of the paper is as follows: section one is the introduction, section two is the methodology, section three is the results and section four is the conclusion.

II. METHODOLOGY

A. Scopus

Scopus Elsevier is a controlled database containing millions of bibliographic data of peer-reviewed literature which are generally classified into 27 subject areas. Scopus is currently aiding about 12 million plus researchers (author profile) in interdisciplinary and multidisciplinary research and collaborations. One unique feature is that the database is updated daily which greatly encourages and support strategic

research objectives.

B. Selection Criteria

The universities of technology are all in the Scopus database with unique affiliation numbers. Only those UT with more than 200 indexed documents were included and as such, only 10 were selected and studied. The summary of the 10 UT are shown in **Table 1**, which contains the universities, geo-political region (GPR), funding and year of establishment (YOE).

The selected UT are Federal University of Technology, Akure (FUTA), Federal University of Technology, Owerri (FUTO), Federal University of Technology, Minna (FUTMinna), Federal University of Technology, Yola renamed as Modibo Adama University of Technology (MAUTECH), Federal University of Technology, Bauchi renamed as Abubakar Tafawa University (ATBU), Ladoke Akintola University of Technology (LAUTECH), Rivers State University of Science and Technology (RSUST), Enugu State University of Science and Technology (ESUT), Bells University of Technology (BUT) and Cross River State University of Science and Technology (CRUTECH). The six geo-political region of Nigeria are: North West (NW), North East (NE), North Central (NC), South West (SW), South East (SE) and South South (SS).

Table 1: Geo-political location, year of establishment and funding status of the selected 10 universities of technology in Nigeria

UT	GPR	YOE	Funding
FUTA	SW	1981	Federal
FUTO	SE	1980	Federal
FUTMinna	NC	1982	Federal
MAUTECH	NE	1981	Federal
ATBU	NE	1988	Federal
LAUTECH	SW	1990	State
RSUST	SS	1979	State
ESUT	SE	1982	State
CRUTECH	SS	2004	State
BUT	SS	2005	Private

C. Data Analysis

The data of the selected universities were obtained according to the 27 subject areas of Scopus and undefined subject adding up to 28. The subjects with the highest number of documents are ranked one and the one with the least number of documents is ranked the last number, probably 26, 27 or 28 depending on the profile of the institution. The subjects and their acronym and most importantly their assigned numbers (AN) are presented in **Table 2**.

Table 2: Scopus document subjects and their acronyms

AN	Subject	Acronym
1	Agricultural and Biological Sciences	ABS
2	Engineering	ENG
3	Environmental Sciences	ENV
4	Earth and Planetary Sciences	EPS
5	Biochemistry, Genetics and Mol. Biol.	BGM
6	Medicine	MED
7	Materials Science	MAT
8	Computer Science	CSC
9	Social Sciences	SOS
10	Pharmacol. Toxicol. And Pharmaceutics	PTP
11	Chemistry	CHM
12	Chemical Engineering	CHE
13	Physics and Astronomy	PHA
14	Immunology and Microbiology	IAM
15	Mathematics	MTH
16	Energy	ENE
17	Nursing	NUR
18	Multidisciplinary	MUL
19	Business, Management and Accounting	BMA
20	Arts and Humanities	AAH
21	Econs. Econometrics and Finance	EEF
22	Veterinary	VET
23	Decision Sciences	DES
24	Neuroscience	NEU
25	Health Professions	HEP
26	Psychology	PSY
27	Undefined	UDF
28	Dentistry	DEN

III. RESULTS

Data were organized using the specifications in **Table 2** and presented in **Table 3**. It can be seen from **Table 3** that the UT research output are mostly centered on agricultural and biological sciences, engineering, environmental sciences and medicine.

To get the true picture of the research output of UT in Nigeria, the mean of the subject categories was calculated as chosen in **Table 4**. Thereafter the means are ranked from least to highest. The subject with the least mean is the one with the highest research output and the subject with the highest mean is the one with the least output. Mathematically, the mean is inversely proportional to the research output because the rank is from the subject with the highest indexed documents to the one with the least value.

Grouping was done using the subjects with closer means and that yielded 5 distinct and non-overlapping research areas of the universities of technologies in Nigeria shown in **Table 5**. From **Table 5**, it can be seen that the UT research strength are in agricultural and biological sciences, engineering, environmental sciences and medicine. On the other hand, the UT has low research outputs in Veterinary, Decision Sciences, Neuroscience, Health Professions, Psychology and Dentistry.

Table 3: The summary of the ranking of the document subjects of the selected 10 universities of technology from Scopus

UT	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FUTA	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LAUTECH	2	5	4	15	3	1	13	12	9	6	7	10	17	8
FUTO	1	2	4	13	11	5	3	10	9	19	7	12	8	15
RSUST	1	3	2	4	9	7	16	5	6	19	8	17	15	13
FUTMinna	2	1	4	12	10	9	5	3	13	15	11	6	14	17
ATBU	1	2	4	6	16	5	9	7	3	22	11	10	12	13
MAUTECH	1	3	4	8	2	5	7	14	11	15	9	12	13	6
ESUT	2	5	4	11	3	1	8	14	6	10	12	7	13	9
BUT	1	2	4	17	5	3	6	7	12	8	16	15	11	13
CRUTECH	1	4	5	18	9	2	14	12	3	7	21	13	17	11

Table 3: Continued

UT	15	16	17	18	19	20	21	22	23	24	25	26	27	28
FUTA	15	16	17	18	19	20	21	22	23	24	25			
LADOKE	16	11	14	19	21	22	24	18	23	20	25	26	27	28
FUTO	14	6	18	16	17	20	22	21	23	25	24	26	27	
RSUST	10	14	22	11	12	21	20	18	23	27	26	24		25
FUTMinna	7	8	19	16	18	21	20	22	23	25	24	26		
ATBU	15	8	18	20	17	21	19	14	23	24		25		
MAUTECH	10	18	22	19	20	17	16	21	23	24		26		25
ESUT	19	15	22	17	16	18	20	21	25	23		24		26
BUT	14	20	22	10	9	18	19	25	21	24	23			
CRUTECH	23	10	15	19	20	6	8	22		16				

IV. CONCLUSION

The research has led to the following conclusions and recommendation;

- 1). The research outputs of UT in Nigeria are low when compared with the UT in other African countries.
- 2). Agricultural and biological sciences, engineering, environmental sciences and medicine are the major subject areas of strength of UT in Nigeria. This is a major concern for policy makers in education sector because apart from engineering and environmental sciences, it seems that UT in Nigeria are deviating from their mandate. Moreover, conventional universities in Nigeria have established medical schools that offer medical courses and as such it is expected that medicine should be one of their core strength area. Also, Nigeria has four universities of agriculture that has agriculture as their major subject area.
- 3). This research has shown that agricultural and biological sciences are very research productive in UT in Nigeria.
- 4). The UT in Nigeria is lagging behind in 3 out of 4 core

science subjects. They are doing very well in biology and lagging behind in chemistry, physics and mathematics. This is also a grave concern since those subjects are supposed to be their strength areas with large research outputs. This is not surprising as this can be attributed to poor funding of the universities. This is because with the exception of mathematics, funds are highly needed in physics and chemistry for practical and experiments that can generate publishable results that can be accepted in scholarly journals.

5). Surprisingly, the UT in Nigeria is not very active in energy research. This is supposed to be one of their major strength since Nigeria is a major oil producer and has petroleum and petrochemical industries. It should be noted that for Nigeria to be able to migrate to green economy, UT in Nigeria should be funded in the area of renewable energy research.

6). The low research outputs in the multidisciplinary subject are a pointer to a culture of single authorship, poor quality of postgraduate studies, lack of research funding and dearth of scholarly collaboration and academic mentorship.

ACKNOWLEDGMENT

The authors acknowledge the support from Covenant University.

Table 4: Summary of the mean analysis

AN	Acronym	Mean
1	ABS	1.3
2	ENG	2.9
3	ENV	3.8
4	EPS	10.8
5	BGM	7.3
6	MED	4.4
7	MAT	8.8
8	CSC	9.2
9	SOS	8.1
10	PTP	13.1
11	CHM	11.3
12	CHE	11.4
13	PHA	13.3
14	IAM	11.9
15	MTH	14.3
16	ENE	12.6
17	NUR	18.9
18	MUL	16.5
19	BMA	16.9
20	AAH	18.4
21	EEF	18.9
22	VET	20.4
23	DES	23
24	NEU	23.2
25	HEP	24.5
26	PSY	25.3
27	UDF	27
28	DEN	26

Table 5: The identified groupings of research areas of the selected universities of technology in Nigeria using the Scopus indexed document subjects

Group	Mean	Subjects		
		ABS	ENG	ENV
A	1.3 to 4.4	MED		
		BGM	SOS	MAT
B	7.3 to 10.3	CSC		
		EPS		
C	11.3 to 14.3	CHM	CHE	IAM
		PTP		
D	16.5 to 18.9	ENE	PHA	MTH
		MUL	BMA	AAH
E	20.4 to 27	NUR		
		EEF		
		VET	DES	NEU
		HEP		
		PSY	DEN	UDF

REFERENCES

- [1] A.K. Yusuf, An Appraisal of Research in Nigeria's University Sector. *J. Res. Nat. Devpt*, vol. 10, no. 2, pp. 321-330, 2012.
- [2] A.A. Oduwole, Impact of internet use on agricultural research outputs in Nigerian Universities of Agriculture. *Lib. Hi Tech News*, vol. 21, no. 6, pp. 12-15, 2004.
- [3] C.O. Ogbogu, An analysis of female research productivity in Nigerian universities. *Journal of Higher Educ. Policy Magt.*, vol. 31, no. 1, pp. 17-22, 2009.
- [4] H.I. Okagbue, A.A. Atayero, M.O. Adamu, P.E. Oguntunde, A.A. Opanuga, S.A. Bishop, Dataset and analysis of editorial board composition of 165 Hindawi journals indexed and abstracted in PubMed based on affiliations. *Data in Brief*, vol. 19, pp. 520-525, 2018.
- [5] H.I. Okagbue, A.A. Atayero, M.O. Adamu, S.A. Bishop, P.E. Oguntunde, A.A. Opanuga, Exploration of editorial board composition, Citescore and percentiles of Hindawi journals indexed in Scopus. *Data in Brief*, vol. 19, pp. 743-752, 2018.
- [6] A.A. Atayero, S.I. Popoola, J. Egeonu, O. Oludayo, Citation analytics: Data exploration and comparative analyses of CiteScores of Open Access and Subscription-Based publications indexed in Scopus (2014–2016). *Data in Brief*, vol. 19, pp. 198-213, 2018.
- [7] H.I. Okagbue, A.A. Atayero, M.O. Adamu, A.A. Opanuga, P.E. Oguntunde, S.A. Bishop, Dataset on statistical analysis of editorial board composition of Hindawi journals indexed in Emerging sources citation index. *Data in Brief*, vol. 17, pp. 1041-1055, 2018.
- [8] M.A. Iroaganachi, R. Izuagbe, A Comparative Analysis of the Impact of Electronic Information Resources Use Towards Research Productivity of Academic Staff in Nigerian Universities. *Lib. Philos. Pract.*, Art. 1702, 2018.
- [9] O.S. Nicholas-Omoregbe, A.A. Azeta, I.A. Chiazor, N. Omoregbe, Predicting the Adoption of E-Learning Management System: A Case of Selected Private Universities in Nigeria. *Turk. Online J. Dist. Educ.*, vol. 18, no. 2, pp. 106-121, 2017.
- [10] C.A. Omonhinmin, O.E. Omotosho, A. Akomolafe, A.A. Atayero, Policy for development and use of open educational resources in covenant university: An open access policy in covenant university. In *Web and Open Access to Learning (ICWOAL), 2014 International Conference on.*, Art. 7009198.
- [11] C.A. Omonhinmin, E. Agbaike, A.A. Atayero, Implementing open access in a private nigerian university: A case study of covenant university. In *Web and Open Access to Learning (ICWOAL), 2014 International Conference on.* Art. 7009197.

- [12] C.A. Omonhinmin, D. Olopade, A. Afolabi, A.A. Atayero, Open education and digital scholarly communication in covenant university. In *Web and Open Access to Learning (ICWOAL), 2014 International Conference on*. Art. 7009199.
- [13] Y. Sun, L. Zhou, S. Zhang, A Development Study for Higher Education Informatization in China. *Int. J. Educ. Info. Tech.*, vol. 10, pp. 131-138, 2016.
- [14] M.A.H. Al-Hagery, Google Search Filter Using Cosine Similarity Measure to Find All Relevant Documents of a Specific Research Topic. *Int. J. Educ. Info. Tech.*, vol. 10, pp. 229-242, 2016.
- [15] L. Berényi, N. Deutsch, Effective Teaching Methods in Business Higher Education: a Students' Perspective. *Int. J. Educ. Info. Tech.*, vol. 12, pp. 37-45, 2018.
- [16] P. Nikolaidis, D. Xanthidis, A.S. Iali, A preliminary study of the research production in Saudi universities. *Int. J. Educ. Info. Tech.*, vol. 12, pp. 21-29, 2018.
- [17] K. Myska, L. Samkova, Modern methods used in foreign language learning in the 21. Century. *Int. J. Educ. Info. Tech.*, vol. 9, pp. 209-215, 2015.
- [18] A. Salawu, O. Oyero, M. Moyo, R. Moyo, A survey of research foci and paradigms in media and communication Master's dissertations and doctoral theses in South Africa. *Communicatio*, vol. 42, no. 1, pp. 136-154, 2016.
- [19] B.S. Galadanci, S.A. Muaz, M.I. Muktar, Comparing research outputs of Federal Universities based on the Scopus database. *CEUR Workshop Proceedings*, vol. 1755, pp. 79-84, 2016.
- [20] V.N. Okafor, V.W. Dike, Research Output of Academics in the Science and Engineering Faculties of Federal Universities in Southern Nigeria. *Afr. J. Lib. Arch. Info*