East African Journal of Education and Social Sciences
EAJESS September –October 2022, Vol. 3, No. 5, pp. 76-83
ISSN: 2714-2132 (Online), 2714-2183 (Print). Published by G-Card
DOI: https://doi.org/10.46606/eajess2022v03i05.0221.

The State of Research in Technical Universities: Evidence from four Ghanaian Technical Universities

Maame Afua Nkrumah
ORCID: https://orcid.org/0000-0002-6059-0394
Centre for Languages and Liberal Studies, Takoradi Technical University, Ghana
Email: maameafuankrumah@yahoo.com

Abstract: This study sought to establish the state of research in Ghanaian Technical Universities (TUs) using a desktop research approach. The study was necessitated by the fact that little investigation if any, had been conducted into the research output of the TUs since they became universities in 2016. The secondary data collected was analysed using descriptive statistics, mainly frequencies and averages Regardless of the differences between the TUs, the total number of publications per annum was 249, an average of 62.25 publications per TU. The minimum and maximum numbers of publications per TU were 20 publications and 107 publications, respectively, per annum. On the international stage, the study points to the need for an increase in the research output of the TUs. It is recommended that individual TUs should put in place specific strategies meant to increase research output. These strategies may include mentoring, partnerships and implementing the governments' promotion criteria that requires research and publication.

Keywords: Research training; research output; the quantity and quality of staff; technical universities.

How to cite: Nkrumah, M. A. (2022). The State of Research in Technical Universities: Evidence from four Ghanaian Technical Universities. East African Journal of Education and Social Sciences 3(5)76-83. **Doi:** https://doi.org/10.46606/eajess2022v03i05.0221.

Introduction

Universities perform the functions of teaching, research and community service. While the teaching and community service components address human capital development and social cohesion issues, the research component targets knowledge creation, development, innovation and dissemination (Benneh, 2003). Of much importance in recent times, however, is the research and publication output of universities because of their relationship with university visibility, technological innovation and national development (Kruss, McGrath, Petersen & Gastrow, 2015). For example, at the institutional level, research is expected to contribute to institutional visibility while determining the promotion and progression of individuals in academia (Matovu, 2018; Nguyễn, 2014). At the national level, research is seen by many as the key to the economic development of countries especially if it is linked to national goals (e.g. patents could be a potential source of wealth and economic growth) (Zeleza, 2014; Abramo, Angelo & Di Costa, 2011). At the continental level, research can help solve continental challenges (Mensah, 2019).

The term 'research output' as used in this article refers to the outcome of research work in the form of a refereed textbooks, chapters in a book, journal articles, conference publications, original creative work, reports for an external body, portfolios, notes, discussion paper etc. (Dandona, Sivan, Jyothi, Bhaskar & Dandona, 2004).

Studies examining research output in universities have focused on (1) publications in specific journals or databases and (2) citations or research impact. For instance, Zia (2021) investigated on the status of research output in Open Access (OA) journals from Brazil, Russia, India, China and South Africa between

2010 and 2019. Papers from selected countries were located using an advanced search option in the Web of Science that restricted selected articles to analyze the characteristics of article citations by Indian Universities from 2017-2019. Twenty central/public universities and 237 state universities were covered. The study showed that Delhi University, a central university (established by an Act of parliament), received the highest average citations (an average citation of 7,481 per year) among the public universities. Punjab University, a state university (established by State legislature), on the other hand, received the highest average citation (3835.50 citations per year) among the state universities.

Patel (2019), on the other hand, checked the performance, growth and sustainability of scholarly research work at Gujarat University between 2008 and 2017 using 1,248 records from Scopus. The study projected journal publications as the most (81.9%) favored. Publications from collaboration doubled from 88 publications in 2008 to 189 publications in 2017. Citation analysis indicated a growth of 77.72% in single or more than one-time citations.

In Africa, research output has generally not been encouraging (Mohamedbhai, 2012). Simpkin, Namubiru-Mwaura, Clarke & Mossialos, (2019), for example, argued that Africa produces only about 2% of the world's research output resulting in the poor visibility and low ranking of most African universities. For instance, in the 2022 Times Higher Education (THE) world ranking, six of the top ten African universities that appeared in that ranking were from South Africa, Algeria, Egypt, Ghana, Kenya and Nigeria in a descending order but these were positioned between 183 and 600. No wonder Africa is usually regarded as a consumer rather than a producer of scientific research and publications.

In Ghana, research output from universities is similarly not encouraging (Iddris, 2017).The Scimago journal and country ranking for 2020 similarly ranked Ghana 79th given that Ghana only produced 26,547 citable documents during the year under review. Nonetheless, only 172 (0.66%) of these were reported to be in high impact factor journals. Also, although there were 397,279 citations, 19.2% of these were self-citations. In terms of innovation, The Global Innovation Index (GII) ranked Ghana 112th among the 132 economies featured in 2021. This ranking was lower than both the 2020 (108th) and 2019 (106th) rankings.

Investigations into research output in Ghanaian universities have generally not been impressive. Iddris (2017), for instance, investigated on the research output of lecturers in four selected traditional public universities over a period of 29 years (some selected years from 1961 to 2017). The purpose was to examine the subject areas that attract more research and the type of research outlets. Medicine, agricultural and biological sciences and environmental science constituted 49% of the 27 subject areas examined. Article publications were the highest (85% of 6,477 publications) with the average publication per university per year being 65.74. Owusu-Nimo and Boshoff (2016) examined the research output of Ghanaian-researchers working with other researchers in affiliated universities (both within and outside Ghana) and the roles the Ghanaian-affiliated researchers played in the collaborations. A bibliometric analysis of articles in the Web of Science between 1990 and 2013 and an online survey of 190 Ghanaian-affiliated corresponding authors of articles were employed. The within collaborations increased from 73% (1990–1997) to 93% (2006–2013) while the international collaborations increased from 49% to 73% over the same period. The international collaborations were often initiated by existing personal working relationships.

Comparable studies in the Technical Universities (TUs) were almost absent. It was therefore, important to investigate on research output within the TUs, particularly those with official institutional records on research output from the university. Perhaps, this approach may be more insightful and specific in helping individual TUs thrive on their strength and mitigate against their weaknesses as they compare their current and previous achievements or compare themselves with those in their cluster.

Another justification for this study is that the World Bank currently ranks Ghana as a lower-medium income country. One of the key areas expected to contribute to Ghana's economic growth is education. However, because the government does not have the requisite technical know-how and the required human resource for driving this agenda partly through research, it has re-laid this responsibility to specialized institutions such as the universities to take the lead. The TUs in particular, are expected to facilitate the industrialization and development agenda of the country in close

collaboration with industry by providing the necessary theoretical knowledge for a proper understanding of technical tasks to be performed through research. Simply put, the purpose of upgrading the TUs from the Polytechnics status in 2016 was to boost skills development for industry as the TUs: (a) train students for the world of work in close collaboration with industry and b) support existing and emerging productive sectors of the economy with technical expertise and research (Effah, 2017). Per the Technical Universities Act (2016), Act 922, the TUs are to differentiate themselves from the traditional universities by focusing on solving practical problems and providing technological and innovative solutions to problems through research. In this way, they may be able to reduce youth's unemployment and drive the economic and socio-economic development of the country (Effah, 2017; Auranen & Nieminen, 2010).

The purpose of this study was to examine the research output of the TUs during the 2019/2020 academic year.

Methodology

Design

This study employed the quantitative (desktop research) approach. The 'secondary data' in this regard, describe a type of data that already exists or has been collected in the past for some purpose quite unconnected to the current study (in this case, the research output of four Technical Universities in Ghana).

Population and Sampling

At the time of collecting data, there were eight TUs in Ghana. The Ghanaian Government constituted the University Rationalization Committee (URC) in 1987 to develop proposals for the reformation, management and academic structuring of tertiary education in the country. The URC's report led to the upgrading of some selected regionally based Polytechnics and Technical Institutes (six) to a tertiary status in 1993 (old Polytechnics). A Polytechnic was also built in each of the remaining four regions that did not have a Polytechnic at the time, in line with the government's policy of making Polytechnics regionally based. Eight of the then Polytechnics that initially qualified as Technical Universities were upgraded based on the Technical University Act 922 of 2016.

Stratified random sampling technique was used in selecting the TUs. The TUs were first stratified into two: the old (5) and new (3) Polytechnics. The stratification was necessary to get information from both 'old and new Polytechnics. Hence, the research instruments were sent to the Directorate of Research and Innovation of all 'old and new' Polytechnics. However, only two TUs from each stratum responded, giving a total of four TUs to participate in the study. Thus, the study involved four participants (Directors).

Research Instrument

Data collection exercise started in October, 2019. The data collection instrument (structured questionnaire in the form of google forms) was developed from literature and reviewed by a senior colleague before piloting it using staff from the Quality Assurance and Planning Office of one of the selected TUs. The necessary corrections were made before the final administration. The questionnaire had 20 items covering the following: (a) background information (e.g., name of TU), (b) staff qualification (for both teaching and administrative staff) and rank and (c) research output for the 2019/2020 academic year. The use of secondary data, in particular, reduced the cost of data collection and facilitated fast data access.

Validity and Reliability

To ensure validity, each google form was checked to see whether it was properly filled (some left some parts unfilled and had to be re-contacted). Moreover, a proper written record (notes) of all the challenges experienced during the piloting, were kept to improve the quality of the main data collection processes.

Statistical Treatment of Data

The responses received were transferred unto the Statistical Package for The Social Sciences (SPSS) software and analyzed using descriptive statistics – mainly, frequencies and averages.

Ethical Considerations

For quality's sake, access to the data was gained after the approval to conduct the study was given by the universities. This was followed by a verbal agreement with the Directors of the Human Resource Directorates (HRD) and Research and Innovation Directorate (RID), given that although the secondary data gathered technically belonged to the TUs, it was directly under the supervision of the two directorates.

In terms of confidentiality, every effort was made to ensure that the data collected and presented in this

article are not traceable to the universities. This was operationalized through anonymity whereby pseudo names (such as TU1, …TU4) were consistently used to hide the real identity of the universities. The raw data, on the other hand, was protected through passwords to prevent unauthorized access. The study was conducted independently, without any external influence.

Results and Discussion

Demographics of Teaching Staff

There were 1,069 teaching staff made up of 907 full-time (79% males and 21% females) and 162 part-time (83% males and 17%) in the four selected TUs.

Table 1: Overview of the quality of teaching staff

	TU1	TU2	TU3	TU4	Total	%
Status						
Full-time teaching staff (total)	304	137	261	205	907	100
Male	210	110	217	176	713	79
Female	94	27	44	29	194	21
Part-time academic staff (total)	17	32	108	5	162	100
Male	14	28	91	2	135	17
Female	3	4	17	3	27	83
Rank						
Full professors	0	0	0	1	1	100
Male	0	0	0	1	1	100
Female	0	0	0	0	0	0
Associate professors (total)	8	2	6	2	18	100
Male	7	1	6	1	15	83
Female	1	1	0	1	3	17
Rank						
Senior lecturers (total)	104	16	99	42	261	100
Male	77	16	87	37	217	83
Female	27	-	12	5	42	17
Lecturers (total)	94	36	142	112	384	100
Male	64	28	113	96	301	83
Female	30	8	29	16	83	17
Assistant Lecturers (total)	90	67	13	72	242	100
Male	55	53	11	66	185	76
Female	35	14	2	6	57	24
Qualification						
PhD (total)	55	20	80	37	171	100
Male	12	18	69	31	142	83
Female	10	2	11	6	29	17
Masters (total)	249	95	171	154	669	100
Male	170	76	139	133	518	77
Female	79	19	32	21	151	23
Bachelor (total)	31	13	2	1	47	100
Male	24	10	1	1	36	77
Female	7	3	1	-	11	23
Diploma (total)	20	-	-	-	20	100
Male	17	-	-	-	-	
Female	3	-	-	-	-	

Quality-wise (rank), there was only one full Professor (male); and 18 Associate Professors made up of 15 males and three females (one female in each of the three selected TUs). A total of 261 Senior Lecturers, 384 Lecturers and 242 Assistant

Lecturers who were full-time were counted. See Table 1.

The Regarding qualifications, the following qualifications were documented for the full time-teaching staff (data on part-time staff qualifications was not available): 171 PhDs (142 males and 29 females); 669 Masters (518 males and 151 females); 47 Bachelors (36 males and 11 females) and 20 Diplomas (all males). Thus, generally, the majority (73.8%) of the full-time teaching staff did not have terminal (doctorate) degrees. Those with diplomas however, were mostly technicians manning the various laboratories, workshops, studios etc. (See Table 1).

Demographics of Non-Teaching Staff

From the non-teaching perspective, the records provided showed that all 740 administrative staff were working full-time. In terms of rank, there were 17 Deputy Registrars (14 males & 3 females); 53 Senior Assistant Registrars (23 males & 30 females) and 271 Senior Staff (149 males, 122 females). Qualification-wise, there were seven PhDs (all males), 322 Masters, 168 Bachelors, 128 Diplomas and 115 Certificate qualifications. The majority of the administrative staff had Master's degree. See Table2.

Table2: Overview of the quality of teaching non-teaching staff

	TU1	TU2	TU3	TU4	TU5	%
Rank						
Deputy Registrars (total)	7	6	2	2	17	100
Male	6	5	2	1	14	82
Female	1	1	-	1	3	18
Senior Assistant Registrars (total)	24	8	17	4	53	100
Male	9	4	7	3	23	43
Female	15	4	10	1	30	57
Senior staff (total)	135	67	69	-	271	100
Male	85	37	27	-	149	55
Female	50	30	42	-	122	45
Qualification						
PhD (total)	1	-	3	3	7	100
Male	1	-	3	3	7	100
Female	-	-	-	0	0	0
Masters (total)	115	44	95	68	322	100
Male	69	28	62	45	204	63
Female	46	16	33	23	118	37
Bachelor (total)	34	22	69	43	168	100
Male	13	13	27	15	68	40
Female	21	9	42	28	100	60
Diploma (total)	29	45	44	10	128	100
Male	12	24	39	7	82	64
Female	17	21	5	3	46	36
Certificates (total)	4	-	111	-	115	100
Male	1	-	94	-	95	83
Female	3	-	17	-	20	17
Grand Total						**740**

Research Output

The total publication per year from the four selected TUs was 249; an average 62.25 publications per annum per TU. A comparison of the TUs, however, showed vast differences as indicated by the minimum and maximum number of publications per TU. There was a minimum of 20 publications and a maximum of 107 publications per year with the standard deviation of 41.40. Therefore, some TUs were making more research output than others as reflected in Table 3.

The average publication per TU per annum was 62.25. This statics, though relatively low when compared to global statistics, is not too different from happenings in other public Ghanaian universities. For example, in Iddris' (2017) study, the average publication per university per year was 65.74. These averages are quite similar although the years under review were different. The averages however, are low compared to happenings in other parts of the world. For instance, Mahala and Singh (2021) traced the science research output of Indian universities from 2015 to 2019 in the Web of Science (WOS) database. The research output consisting of journal articles, review papers and conference papers over the five-year period was 26,173, averaging 5234.6 publications per year and 1046.9 per university per year. For the year 2019, only 6,021 publications were produced averaging 1204.2 publications per university. This is far beyond the average of the TUs under study. Comparable studies in other parts of the world were almost non-existent as most studies were focused on citations and publications in specific journals in national rather than individual universities.

Table 3: The Research Output of the TUs for the 2019/20/2020 academic year

Technical university	Number of publications per year	Average per year
TU1	87	21.75
TU2	35	8.75
TU3	107	26.75
TU4	20	5.00
Total	249	62.25

There could be several reasons for the poor research output of the TUs but the first one could be limited number of senior academic staff with doctoral degrees. These statics suggests a poor potential for research. This is because universities with more professors tend to produce more quality research than those with little or none.

Even though there were some professors, these were too few to initiate and support research activities at the lower levels (e.g., department). Perhaps an increase in the number of these senior academics, who could act as research leaders, mentors and consultants for young academics, could contribute to an increase in the research output of the universities (Cloete & Van Schalkwyk, 2018; Mushemeza, 2016). It is also, possible that the few professors present were saddled with heavy teaching loads and other activities such as the development of courses/programs such that they had limited time to lead research at the faculty and department levels.

Fosci, Loffreda, Chamberlain and Naidoo (2019) further argue that, Ghana has half the average number of researchers per a million people in Sub-Saharan Africa. Funding for research and development also remains low (0.4% of Gross Domestic Product, GDP) and from one source – the government. Besides, the annual book and research allowance paid by the government is meagre and at the same time, a disincentive for increased research output in the universities because; it is paid to all staff regardless of whether they do research or not (Cloete, Maassen & Bailey, 2015). The lack of adequate dedicated funds from which researchers could source for additional funding prevents many Ghanaian researchers from partnering with highly skilled academics across the world for improved research output (Nguyễn, 2014). This indeed has pushed some researchers to rely on local and international donors whose priorities may not be in line with that of the government's. Besides, publications emanating from such sponsored research projects may not count for the universities of the researchers. It is also possible that some of the TUs have challenges with keeping accurate and reliable records on their research output from a central point as was evident during the data collection for this study. Moreover, training and infrastructure (e.g. laboratories, equipment, libraries and a system of information storage, retrieval and ICT) (what does this mean?) remains inadequate as suggested by Sawyer and Crowston (2004).

Additional challenges for the low research output may include: (a) The government's inability to train and sustain quality scientists because of poor remuneration and poor conditions of service ('brain drain'), (b) Inadequate ICT infrastructure, highly skilled ICT staff and limited electronic journals as most indicators used in world rankings rely on ICT to

a great extent (Ezema & Onyancha, 2017), (c) Poor coordination, evaluation and review of research projects (Fosci, et al., 2019) and (d) the fact that a large proportion of books, journals, thesis, dissertations, conference/seminar papers and inaugural lecture documents produced in Ghana are poorly distributed (Ezema, 2013; Nwagwu, 2013).

Conclusions and Recommendations

Conclusions

The study concludes that the total publication produced by the four selected TUs during the academic year under review (2019/2020) was 249. Thus, the average publications per year per TU were 62.25. Although the research output from the TUs is quite comparable locally, it is not very impressive globally.

Recommendations

While the importance of research in Ghanaian TUs cannot be overemphasized as it is expected to contribute to both institutional and national development, individual TUs must therefore be highly interested in the quantity of research produced each year for both institutional visibility and national developments. Furthermore, each TU should strategically increase the number of staff with PhDs and encourage all staff to research by implementing the government's system of promotion that prices academic publication and innovations. A policy directive in this sense would help university staff prioritize research as a way of contributing to the global knowledge economy, institutional quality and visibility. The value of government support by way of scholarships and other provisions (e.g., infrastructure/ICT and alternative research funds) would be immeasurable.

References

Abramo, G., D'Angelo, C. A., & Di Costa, F. (2011). University-industry research collaboration: a model to assess university capability. Higher Education, 62(2), 163-181.

Auranen, O., & Nieminen, M. (2010). University research funding and publication performance—An international comparison. Research policy, 39(6), 822-834.

Benneh, G. (2003) Research management in Africa. Higher Education Policy 15(5): 249–262.

Cloete, N., Maassen, P., & Bailey, T. (2015). Knowledge production and contradictory functions in African higher education (p. 310). African Minds.

Cloete, N., Bunting, I., & Van Schalkwyk, F. (2018). Research universities in Africa (p. 314). African Minds.

Dandona, L., Sivan, Y. S., Jyothi, M. N., Bhaskar, V. U., & Dandona, R. (2004). The lack of public health research output from India. BMC public health, 4(1), 1-12.

Effah, P. (2017). The Role of the New Technical Universities in the Improvement and Implementation of Technical Vocational Education and Training (TVET) in Ghana. African Journal of Technical Education and Management, 1(1), 85-85.

Ezema, I. J. (2013). Local contents and the development of open access institutional repositories in Nigeria University libraries: Challenges, strategies and scholarly implications. Library Hi Tech.

Ezema, I. J., & Onyancha, O. B. (2017). Open Access publishing in Africa: advancing research outputs to global visibility. African Journal of Library, Archives & Information Science, 27(2), 97-115.

Field, A. (2009). Discovering statistics using SPSS. Sage publications.

Fosci, M., Loffreda, L., Chamberlain, A., & Naidoo, N. (2019). Assessing the Needs of the Research System in Nigeria: Report for the SRIA Programme. London: The UK Department for International Development. [Google Scholar].

Hayward, F. M. (2006, June). Quality assurance and accreditation of higher education in Africa. In Conference on Higher Education Reform in Francophone Africa: Understanding the Keys of Success (pp. 1-61).

Hills, A. M. (2011). Foolproof guide to statistics using IBM SPSS.

Hox, J. J., & Boeije, H. R. (2005). Data collection, primary versus secondary.

Iddris, Faisal. (2017). Examining the Research output of Lecturers in Selected Public Universities in Ghana." 1st International Conference on Competency-Based Training and Research (ICCBTR), University of Education, Winneba & College of Technology Education, Kumasi, Ghana, 13-

15 September, 2017. 2017

Kruss, G., McGrath, S., Petersen, I. H., & Gastrow, M. (2015). Higher education and economic development: The importance of building technological capabilities. International Journal of Educational Development, 43, 22-31.

Mahala, A., & Singh, R. (2021). Research output of Indian universities in sciences (2015–2019): a scientometric analysis. Library Hi Tech.

Matovu, M. (2018). An analysis of quality assurance key performance indicators in research in Ugandan Universities.

Mensah, C. M. (2019). Reviewing the narrative concerning the impact of population growth in Africa. LeXonomica, 11(1), 43-56.

Mohamedbhai, G. (2012). The effects of massification on higher education in Africa. Report from the Working Group on Higher Education of the Association for the Development of Education in Africa.

Mushemeza, E. D. (2016). Opportunities and Challenges of Academic Staff in Higher Education in Africa. International Journal of Higher Education, 5(3), 236-246.

Nguyễn, H. T. L. (2014). A review of university research development in Vietnam from 1986 to 2019. Higher education in market-oriented socialist Vietnam, 63-86.

Nwagwu, W. E. (2013). Open access initiatives in Africa—structure, incentives and disincentives. The Journal of Academic Librarianship, 39(1), 3-10.

Owusu-Nimo, F., & Boshoff, N. (2017). Research collaboration in Ghana: patterns, motives and roles. Scientometrics, 110(3), 1099-1121.

Patel, P. (2019). Quantitative synthesis of published research: A study of gujarat university. Library Philosophy and Practice, 1-16.

Sawyer, S., & Crowston, K. (2004). Information systems in organizations and society: Speculating on the next 25 years of research. Information systems research, 35-52, 35-52.

Scimago Journal and Country Ranking for 2020. Retrieved from (https://www.scimago jr.com /journalrank.php).

Simpkin, V., Namubiru-Mwaura, E., Clarke, L., & Mossialos, E. (2019). Investing in health R&D: where we are, what limits us, and how to make progress in Africa. BMJ global health, 4(2), e001047.

The Technical Universities (Act 922) (2016). The Agenda 2030 of the United Nation and The Polytechnic Law (PNDC Law 321) of 1992.

Zeleza, P. (2014, April). The development of STEM in Africa: Mobilizing the potential of the diaspora. In the third annual conference on 'Effective US Strategies for African STEM Collaborations, Capacity Building, and Diaspora Engagement', University of Michigan (pp. 1-4).

Zia, S. (2021). An analysis of research output in open access journals in BRICS countries: a bibliometric study. Global Knowledge, Memory and Communication.

Zhou, L., & Nunes, M. B. (2016). Formulating a framework for desktop research in Chinese information systems. In Handbook of Research on Innovations in Information Retrieval, Analysis, and Management (pp. 307-325). IGI Global.