The 2018 Research Productivity of the University of Zambia

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ABSTRACT
This paper presents the findings of a study on research productivity of the University of Zambia (UNZA) in the year 2018 using selected bibliometric indicators. Data was collected from Scopus, PubMed, Google scholar, UNZA Institutional Repository, UNZA Journals Online, and others. Five hundred and sixteen (516) publications were analysed using Microsoft Excel. VOSviewer was used to visualise research themes based on keywords. The study established that 366 academic staff participated in the total research output, giving a 39% participation rate. Results further revealed an overall staff-to-paper publication ratio of 0.6 and 0.8 degrees of collaboration among the researchers. The research output was characterised by journal articles (79.8%) as the most preferred medium of research dissemination while the majority (80%) of the publications were multiple-authored. The study recommends converting traditional journals into online open access journals to improve the impact of UNZA's research output while encouraging staff to engage in research.

Keywords: Bibliometric analysis, Research Output, Research Productivity, Research Assessment, Research Evaluation, Citations, Research Collaboration, University of Zambia, Zambia, 2018.

1. INTRODUCTION

A defining aspect of a university is its promise to scholarly activities leading to the creation of knowledge. Probably the most critical sign of research productivity is publication coupled with teaching and learning. The purpose of universities, among others, is to strengthen the effect of scientific research to contribute to knowledge

creation and scholarship to achieve national development (Zambia: Ministry of Higher Education, 2013). Consequently, scholars in academia are mandated to formally disseminate their research output through publishing in various publishing platforms such as journals and conference proceedings as these are not only critical components of their academic progression but that of their institutions too.

Recognising the value of research, UNZA has emphasised the need and provided for research in its strategic objectives of the 2018-2022 Strategic Plan, aimed at "enhancing excellence in research and publishing" (University of Zambia, 2018, p. 25). The strategic plan also provides avenues through which excellence in research and publishing should be measured, such as the number of publications in reputable journals, number of staff trained in grant/paper writing, number and number of research agreements signed at different levels of the University (University of Zambia, 2018, p.25).

Globally, it is an established norm that institutions measure their research output according to international standards. The most common way of measuring research output is by counting the number and type of scholarly publications an institution produces (De Bellis, 2009 & Byl *et al.*, 2016) using bibliometric indicators. Therefore, the research productivity of UNZA was measured in terms of total research output against current academic staff.

Although there is heightened interest by scholars in bibliometric analysis in academia globally, there is a dearth of empirical data on the research productivity of UNZA. This study, therefore, addresses this gap.

1.1 Objectives of the study

The main objective of the study was to assess the 2018 research productivity of UNZA while specific objectives were to:

(i) establish the overall research output of UNZA in 2018,
(ii) ascertain the publication-to-staff ratio at school and institutional levels,
(iii) determine academic staff level of collaboration,
(iv) establish research impact at the international level,
(v) determine the core subject areas of UNZA's research output in 2018.

1.2 Significance of the Study

Viewed together, a university's publications represent one of its greatest assets. Therefore, it is hoped that this study will enable UNZA to understand its research productivity, research patterns, trends and impact, and the level of participation of its academic staff in research and collaboration. Bibliometric indicators like research collaboration are being used in the ranking of universities at a global level. Realising the importance of being ranked in reputable world rankings, UNZA can use these results for such purposes.

2. LITERATURE REVIEW

Various studies have assessed the research productivity of universities. For instance, Zhang (2014) established that universities have constantly served as key players in the development of nations through scientific research. He further pointed out that governments and several organisations have invested huge amounts of money in the development of research in universities. Similarly, Nafukho, Wekullo, and Muyia (2019) examined the research productivity of the faculty of Kenyan public universities.

The analysis showed varying research productivity by gender, institution, terminal degree, rank, discipline, and years of work experience.

A study on research productivity by Swain, Rautaray, and Swain (2013) of the Institute of Industrial Technology, India concerning 361 papers indexed in Scopus from 2000 to 2013 found highly collaborative research mainly by three joint authors.

Jung (2012) explored the individual and institutional factors that contribute to research productivity among Hong Kong academics. Findings indicate that academics were highly internationalized in terms of research activities.

A related study by Migosi (2011) among business academic staff in selected universities in Kenya revealed that personal career development factors form the main factor that influenced their research productivity.

Using publication output as a major indicator to evaluate research performance and productivity in Nigerian universities, Onyancha and Ani (2012) found that the first-generation universities owned by the federal government were the five most productive universities in Nigeria.

3. METHODOLOGY

A quantitative research approach combining bibliometric techniques was deployed to collect data from various online and print-based sources. Quantitative techniques are essential to present the facts in a precise and definite form than qualitative tools. The data were extracted from 2018 Directorate of Research and Graduate Studies (DRGS) annual reports, 2018 UNZA Press publications, PubMed and Google scholar using Publish or Perish, UNZA Open Journal Systems (OJS) platform, UNZA academic human resource promotion system (Promotion Scoring System -UNZA PSS) and web-based academic social platforms such as LinkedIn, Research Gate, and academia.edu. Microsoft Excel software was used for data analysis whilst visualisation of the subject areas was done using VOSviewer. Data was presented in metrics based on study objectives.

3.1 Limitations

The multiple data sources used resulted in the duplication of data. This led to manual inspection to identify and delete the duplicates. It was also difficult to access publications from schools. The team therefore painstakingly extracted the data from sources cited under methodology. Access to SCOPUS was also limited due to a lack of access privileges. Google Scholar extracted publications for non-UNZA authors due to similar names, making it difficult to pinpoint UNZA publications. This was normalised by the use of man numbers. Additionally, data in Google Scholar did not provide some critical information such as publication type, list of co-authors, and their affiliation. These attributes had to be meticulously determined separately.

4. RESULTS AND DISCUSSION

The study revealed 946 academic staff employed on both full-time and part-time basis. The School of Humanities and Social Sciences (HSS) had the highest number of academic staff with 192 (20.3%), followed by the School of Education with 143 (15.1%) and the School of Natural Sciences (NS) with 125 (13.2%). The rest of the schools had less than 100 academic staff each, while the Graduate School of Business (GSB) had (0.4%) staff.

Of the 946 staff, the majority (532, 56.3%) held a master's degree while 314 (43.7%) had a doctorate (Ph.D.). The Veterinary school had the highest number of staff with a Ph.D., recording 100 percent, followed by the School of Medicine with 78 percent, the school of Mine with 65 percent, the school of Natural sciences, and GSB had 50 percent each. The rest had less than 50 percent (See Table 1 below).

Table 1: Distribution of academic staff by school/unit and qualification

School	Total staff		PhD		Masters	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Agricultural	69	7.3	33	48.0	36	52.0
Education	143	15.1	47	33.0	96	67.5
Engineering	82	8.7	25	30.0	57	70.0
GSB	4	0.4	2	50.0	2	50.0
Health Sciences	47	5.0	13	28.0	34	72.0
HSS	192	20.3	63	33.0	129	67.0
IDE	7	0.7	1	14.0	6	86.0
INESOR	14	1.5	4	29.0	10	71.0
Law	22	2.3	9	41.0	13	59.0
Library	16	1.7	0	0	16	100
Medicine	82	8.7	64	78.0	18	22.0
Mines	31	3.3	20	65.0	11	35.0
NS	125	13.2	63	50.0	62	50.0
Nursing	25	2.6	6	24.0	19	76.0
Public Health	41	4.3	18	44.0	23	56.0
Vet	46	4.9	46	100.0	0	0
Total	**946**	**100**	**414**	**43.7**	**532**	**56.3**

4.1 Research Output and Staff Nomalisation

The study measured the institutions' scholarly output using the institutional scholarly publications at the institutional and school levels. At the institutional level, the study reported five hundred and sixteen (516) publications in the year 2018. The study further revealed that only 366 out of 946 staff participated in the research output, representing a 39% participation rate and an overall staff-to-paper publication ratio of 0.6. This indicates that few researchers are involved in research and publishing. The Stellenbosch University Annual Integrated Report of 2018 (University, 2019) records a 1.68 staff-paper publication ratio in 2017, which is more than double that of UNZA a year later. However, although the results present a pattern similar to the performance of most countries in Sub-Saharan Africa, they also show an increase from previous studies (Confraria & Godinho, 2015; Blom, Lan & Adil, 2016). The results also point to the need to encourage academics to engage in research to build their academic reputation and that of the university.

4.2 Research Output at School, Directorate, and Unit Level

At the school and unit level, the School of Education had the highest number of publications (133, 14.7%), followed by the School of Veterinary (Vet) Medicine (127, 14%) and School of Public Health (120, 13.2%) as indicated in Table 2.

Table 2: Distribution of research output by school/directorate/unit & output ratio

School/Directorate/Unit	Publications	No. of staff	Output ratio
Education	133	143	0.9
Veterinary	127	46	2.8
Public health	120	41	2.9
Natural Sciences	102	125	0.8
Medicine	93	82	1.1
HSS	69	192	0.4
Agricultural Sciences	64	69	0.9
Nursing Sciences	51	25	2.0
Health Sciences	45	47	1.0
Engineering	43	82	0.5
IDE	19	7	2.7
Library	17	16	1.1
Law	11	22	0.5
Mines	10	31	0.3
INESOR	4	14	0.3
GSB	0	4	0
Total	**908**	946	

Further analysis of the staff-to-research output ratio at school, directorate, and unit levels established that the School of Public Health had the highest ratio of 2.9, followed by the School of Vet with (2.8), IDE with (2.7), Nursing Sciences with 2.0, while GSB recorded 0 ratios (See Table 2 above for detail).

The trend in the staff-to-paper ratio at the school level is similar to that staff-to-paper ratio at the instructional level, a pointer to the need to encourage academics to engage in research at both individual and institutional levels to build their academic reputation and that of the university

4.3 Types of Research Output

The study established that the research output type was dominated by journal articles (79.8%), followed by book chapters (9.1%) and conference papers (7%), while preprints were the least (0.4%). These findings are similar to other studies, which found journal articles as a leading model of scholarly communication among academics (Hofman *et al.*, 2009).

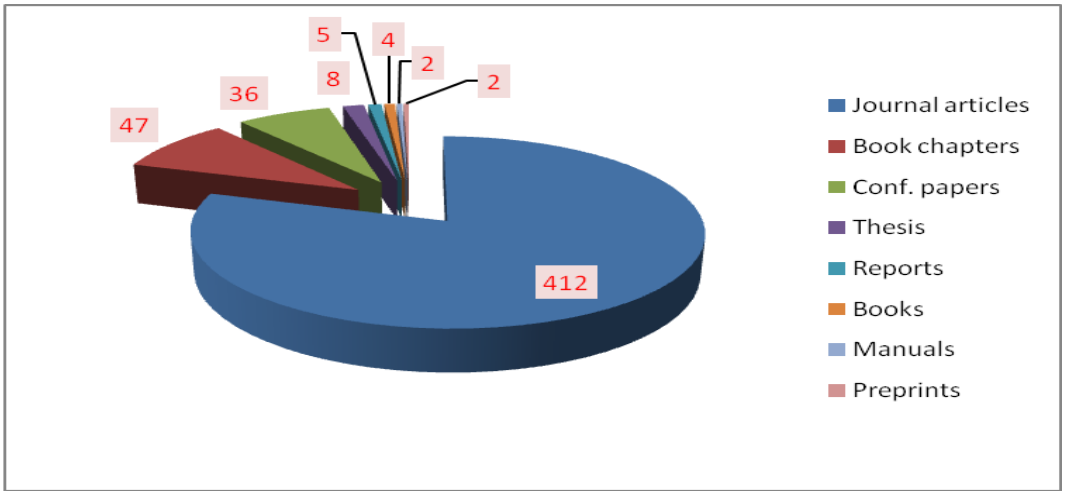

Figure 1: Types of research output

4.4 Authorship Patterns and Degree of Collaboration

UNZA's authorship patterns and degree of collaboration revealed that the majority (80%) of the publications were multi-authored, with five-ten authored publications leading at (28.9%) of the total non-duplicated research output, followed by the single-authored publications sharing 20%, while the four authored publications had the least (9.8%). This is an indication of high collaboration among academic staff both at institutional and international levels. This result is similar to other publishing patterns elsewhere in the world: in South Africa (South Africa. Department of Higher Education and Training, 2020), in Lesotho (Mugomeri *et al.*, 2017), and global (Sweileh, 2018; Sweileh & Moh'd Mansour, 2020). Refer to Table 3 below.

Table 3: Authorship patterns and degree of collaboration

Co-authorship	**Frequency**	**Percentage (%)**
Five to Ten Authored	149	28.9
Single Authored	103	20.0
Three Authored	84	16.3
Two Authored	76	14.7
More than ten Authored	53	10.3
Four Authored	51	9.8
Total	**516**	**100**

The degree of collaboration is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period, using the formula: C = Nm/ (Nm + Ns), where C is the degree of collaboration in a discipline, Nm is the number of multi-authored research papers published and NS is the number of single-authored papers in the discipline in a year. C = 413/516 = 0.8. These results reveal a degree of collaboration of 0.8 in 2018.

4.5 The Impact of UNZA 2018 Research Output

The impact of UNZA's research output was measured in terms of citations associated with the particular publications. Figure 2 reveals that out of the 516 total publications non-duplicated, the majority (336, 65.1%) had not been cited while only 180 (34.9%) had been cited. Of the 180 cited publications, 72 had been cited once, 31 had been cited twice, 25 had been cited five-to-ten times, 20 had been cited thrice, 17 had been cited four times and 14 had been cited more than ten times. This is expected

considering that the data was collected in 2019. Further, making research data freely and openly available is recommended to increase the research citation rate (Piwowar and Vision, 2013).

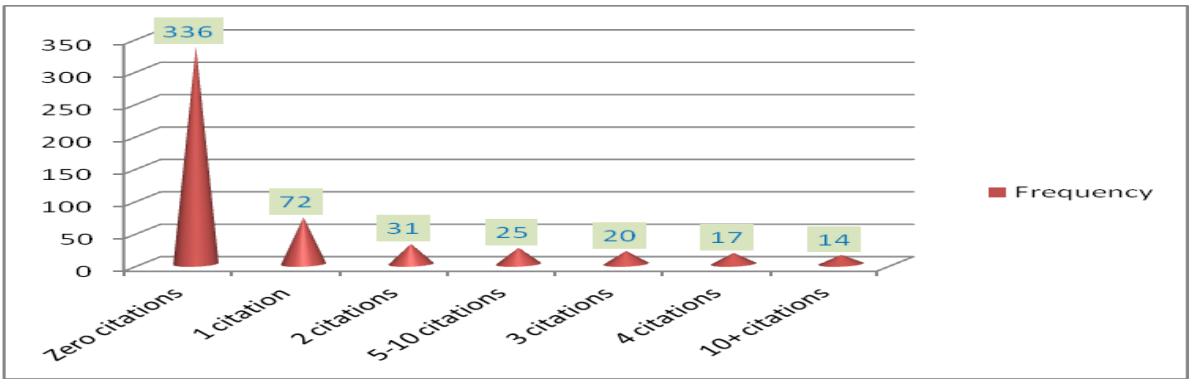

Figure 2: Research output citations

4.6 Research Output Themes

Figure three below presents a visual representation of the research themes of the 2018 UNZA research output using VOSviewer. Five major clusters were identified, namely: Education (green cluster), Medicine (red cluster), Life sciences (blue cluster), Social sciences (yellow cluster), and Interdisciplinary Research (purple cluster). Each theme has its own prominent research hot spots. For instance, prominent research hot spots within education were teacher, development, student, research, process, adolescent, facility, and access while prominent research hot spots in medicine were patient, group, mortality, test, and case. For interdisciplinary research, prominent research hot spots were performance, control, government, and implementation. It is also important to note that the research hot spots in red on the right side of the figure are the high-impact papers while the research hot spots on the bottom left are less cited papers.

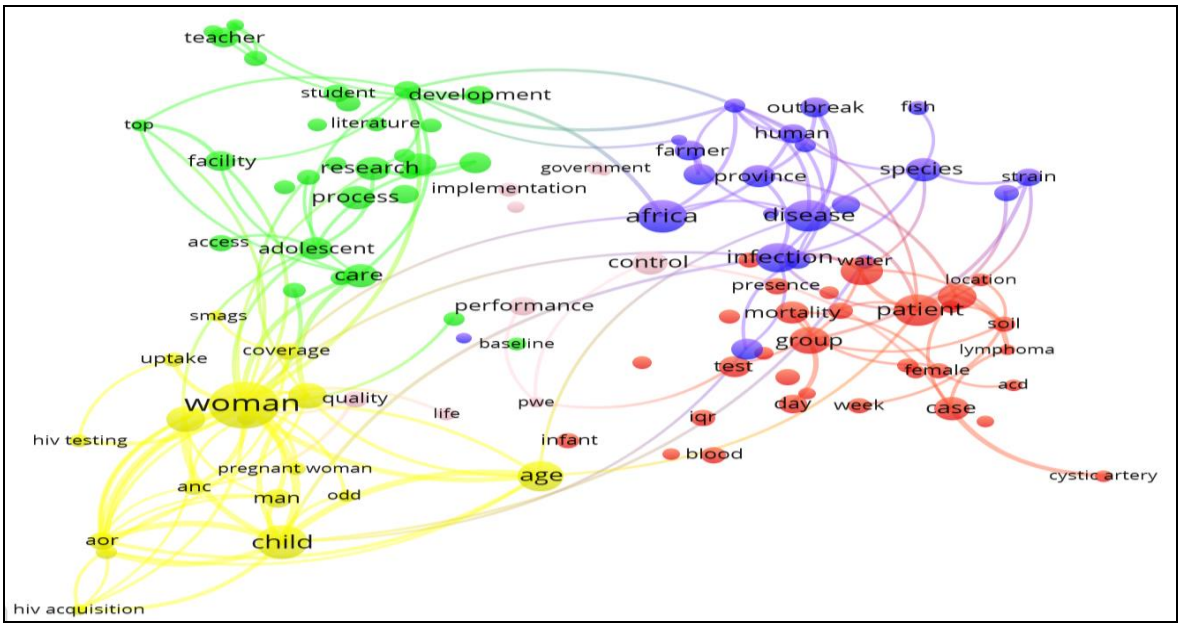

Figure 3: Research output network visualization

5. CONCLUSION AND RECOMMENDATIONS

During the year under review, UNZA comprised 946 academic staff, out of which only 366 participated in the 2018 research output. Consequently, the University recorded 516 total publications, giving a staff-to-research output ratio of 0.6. The majority (79.8%) of the publications were journal articles. The major research themes were clustered around education, medicine, life sciences, and social sciences. The study recommends the need to convert local journals into online open access journals to improve the visibility and impact of UNZA's research output while encouraging staff to engage in research.

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