

# Tracing the Footprints of UNZA Researchers 50 Years of the University of Zambia Research Productivity

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## Acronyms

CC	Collaboration Coefficient
CD ROM	Compact Disc Read Only Memory
HIV/AIDS	Human Immune Virus/Acquired Immunodeficiency Syndrome
ICT	Information and Communication Technology
IF	Impact Factor
ISI	Institute for Scientific Information
JIF	Journal Impact Factor
LIS	Library and Information Studies
NIH	National Institute of Health
NUFU	Norwegian Programme for Development Research and Education
OECD	Organization for Economic Corporation and Development
SPSS	Statistical Package for the Social Sciences
UK	United Kingdom
UNZA	University of Zambia
USA	United States of America

## Foreword

Zambia's spectacular development in the education sector, including higher education, over the past 50 years has been the subject of many reports. On one hand, higher education is growing outwards with the construction of new institutions of high education and the expansion of older ones to enroll more undergraduate students while on the other hand, more undergraduate and postgraduate programs are being introduced to ensure a steady supply of qualified professionals in meet the growing needs of the country.

This process of expansion has also been accompanied by greater demands in terms of financial investment, educational policy and reform. For Zambia, the aim has not been just to accommodate more students; higher education has always been perceived to be a means to the larger goal of improving the livelihood of individuals and the socio-economic development of the Zambian society.

However, very little research has been done to evaluate Zambia's performance regarding research productivity of higher institutions of learning. Therefore, this monograph attempts to examine UNZA's research productivity in the 50 years of its existence. This report presents data and analysis to better understand the UNZA's performance regarding one of its key functions, which is conducting research. By looking at the research productivity of UNZA, the authors investigate the factors that influenced research, research collaboration, research trends, and impact of the research in terms of quality and reputation. Concerns also arise with the unintended consequences of being guided by international rankings to attract staff, students and even from international investment. Through a series of case studies, the authors provide valuable insights of the performance of the various schools, institutes and individual academics and researchers.

Another unique feature of this report is the diversity of data presented. This is the first UNZA study to rely on indicators from both the institution's local sources and from external data sources. This comprehensive approach better informs policy debates, such as the existing funding mechanisms, and the role of international collaboration in research productivity.

It is hoped that these studies will also be used by UNZA management to further improve the accuracy of our data, while laying the foundations to develop new indicators in the future. It is hoped that these reports will influence UNZA management to establish better mechanisms and strategies of documenting the institutions' research output. Furthermore, it is hoped that these

findings will influence the University to invest into ICT infrastructure, library, documentation and archival facilities; encourage modern communication channels such as electronic publishing, converting the current local journals into open access journals; encourage use of the existing electronic institutional repositories and its expansion to include grey literature and pre-prints; establish a robust institutional repository policy; and seek more linkages with international organizations and other universities in research. As a whole, these studies provide UNZA with an opportunity to look ahead and set strategies and research agenda for the years ahead.

## Preface

The present studies are an informetrics assessment of scientific research output of the University of Zambia during the years 1966 to 2015. The studies describe the growth, contribution and impact of research carried out by the academic faculty, researchers and students of the University of Zambia. They also attempt to analyse the growth and development of research activity of the University as reflected in publications output covered by various databases such as Web of Knowledge, Medline and Google Scholar, and from local sources such as bibliographies, annual reports, and curricula vitae, compiled during the period under study. The studies attempt to examine the content of papers published, including the annual average growth rate percentage, types of publications, authorship patterns, degree of collaboration, and organizational affiliation of papers. Various informetric formulas are used to analyse the data, including a) Subramanyam's formula to calculate degree of collaboration (CC), and b) Bradford's law to scattering of literature in the publication pattern of the University.

### **Objectives of the study**

The main objective of the monograph is to present the growth of literature and make the quantitative assessment of status of research at UNZA in the past 50 years of its existence by way of analyzing the following features of research output:

1. To determine the year-wise growth of publications,
2. To determine authorship and collaboration pattern in the publications,
3. To determine the extent of international collaboration,
4. To determine the channels of communications used by the scientists,
5. To determine distribution of research output by faculty (school), and
6. To determine the subject coverage (domain/field) of the publications

### **Significance of the Studies**

Evaluation is a very key component of any research and development activity. One well known productivity indicator is the number of publications produced by the scientists, institutions and countries. It is also intended to stimulate thinking, and to raise questions concerning the honest employment of labour, funds and material on research activities. Studies like this will provide some insight into the complex dynamics of research activity and enable UNZA faculty and

researchers, policy makers and administrators to provide adequate facilities and proper guidance in which direction the institution's research in the next fifty years.

It is also hoped that the results of this research productivity can be used to attract and retain highly qualified staff and research students, to attract research funds, and improve existing research policies and research direction, and in the allocation of facilities. Scientometric techniques are important tools for evaluating research performance of individuals, groups, institutions and countries.

### **Research Method and Materials**

The studies used bibliometric/informetric methods to undertake quantitative investigations of the research productivity and patterns of the faculty members of the University of Zambia. The method facilitates the measurements of publication output, forms of publications and authorship patterns among members. Bibliometric methods are very suitable for the description of research surrounding a particular field, or similarly, the quantity and focus of research output by a particular organization (Ziegler, 2009). As an evaluation method, it helps in the determination of the impact a technology or the effectiveness of an author or research organization. This research method is found to be very appropriate for these studies because as observed by Jacobs (2001), it facilitates ascertaining the exact number of research output published through counting and over a period of time. It also helps to assess research productivity performance at individual, unit and institutional levels.

The population comprises all members staff who have worked at UNZA since 1966 in all the nine schools and the three institutes and directorates. Lists of the staff were obtained from the Human Resources Database, University Council Office, responsible for staff recruitment, appoints and promotions. In order to ascertain faculty's research output, the following data collection sources were used:

- a) Curriculum Vitae providing staff profile and list of publication done
- b) Annual reports
- c) Bibliographic retrieval tools like catalogues, bibliographies, and electronic databases (e.g. Web of Science, Medline, and Google Scholar).

The table shows the categories and subcategories research output as defined by the University Human Resources Committee, Council Office. These include published peer-reviewed journal

articles, edited conference proceedings, unedited conference and seminar papers, posters, books, chapters in books, technical reports, and bulletins/magazines/newspaper articles.

Table 1: Categories of research output

Category	Sub-Category	Description and Examples of Inclusions	How to record in Research Outputs
1. Journal Article	a) Article	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Full research articles (which includes articles in professional journals which meet the definition of research output) in online and/or print format journals</li> <li>• Critical scholarly texts which appear in article form</li> </ul>	Category: Journal Article Sub-category: Article
	b) Letter	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Letters to the Editor in online and/or print format journals</li> </ul>	Category: Journal Article Sub-category: Letter
	c) Review	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Review articles in scholarly journals in online and/or print format journals</li> </ul> This category does not include book reviews, which should be listed in the "Other: Review" category.	Category: Journal Article Sub-category: Review
	d) Rapid Communication	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Short papers in scholarly journals presenting highly original and significant material in online and/or print format</li> </ul>	Category: Journal Article Sub-category: Rapid Communication
	e) Corrigendum	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• An author's correction to a journal article in online and/or print format journals</li> </ul>	Category: Journal Article Sub-category: Corrigendum
	f) Addendum	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• An author's addition to a journal article subsequent to its publication in online and/or print format</li> </ul>	Category: Journal Article Sub-category: Addendum
	g) Editorial comment	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Editorials in scholarly journals in online and/or print format</li> </ul>	Category: Journal Article Sub-category: Editorial Comment
	h) Discussion paper	This category includes, but is not limited to <ul style="list-style-type: none"> <li>• Short articles in scholarly journals that critically address specific results or data provided in a published research paper in online and/or print format</li> </ul>	Category: Journal Article Sub-category: Discussion paper

Table 1 continued

2. Conference contribution	a) Abstract	This category includes, but is not limited to <ul style="list-style-type: none"> <li>Abstracts of papers that appear in published conference proceedings.</li> </ul> The conference proceedings will usually have an ISBN or ISSN and may be published in a number of formats such as <ul style="list-style-type: none"> <li>Volume of proceedings</li> <li>Special or normal edition of a journal</li> <li>Book or a monograph</li> <li>CD-ROM</li> <li>Website</li> </ul>	Category: Conference Sub-category: Abstract
	b) Oral Presentation	This category includes, but is not limited to <ul style="list-style-type: none"> <li>Verbal presentations made at a conference including keynote or invited addresses, where these do not appear in a published conference proceedings or have a full written paper.</li> </ul>	Category: Conference Sub-category: Oral Presentation
	c) Conference paper not published in formal proceedings	This category includes, but is not limited to <ul style="list-style-type: none"> <li>Full written papers that do not appear in published conference proceedings.</li> </ul>	Category: Conference Sub-category: Conference paper
	d) Conference paper published in formal proceedings	This category includes, but is not limited to <ol style="list-style-type: none"> <li>Full written papers that appear in published conference proceedings.</li> </ol> The conference proceedings will usually have an ISBN or ISSN and may be published in a number of formats such as <ul style="list-style-type: none"> <li>Volume of proceedings</li> <li>Special or normal edition of a journal</li> <li>Book or a monograph</li> <li>CD-ROM</li> <li>Website</li> </ul>	Category: Conference Sub-category: Proceedings
	e) Poster	This category includes, but is not limited to <ul style="list-style-type: none"> <li>Poster presentations at conferences, symposia and other events</li> </ul>	Category: Poster
3. Book publications	a) monograph	This category includes a book publication	Monograph
	b) Book chapter		Book chapter
	c) Edited works		edited works
4. Technical reports	a) consultancy reports		consultancy reports
	b) Research/ survey reports		Research/ survey reports
Postgraduate research output	a) Master dissertations		Master dissertations
	b) PhD theses		PhD theses

## Data Analysis

Data extracted were recorded in computer files created in Microsoft Excel spreadsheets. Software used to analyze the data included Microsoft Excel, Statistical Package for the Social Science (SPSS) version 20, and VOSviewer, to produce frequency tables, graphs and charts, and to generate appropriate statistics.

## Limitations of the Studies

The limitation of these studies is that they only focus on publications that were retrieved from the various sources mentioned above. This means that publications that were not available from these sources were excluded from the study. In addition, data for the 2015 was incomplete due

time lag usually experienced in the publishing process; hence the total productivity of the year 2015 might be incomplete.

Among other forms of research which are not recognized in these studies are creative and performing outputs, artifacts, patents, reports and non-accredited journal articles. In this regard, the University policy should take cognizance of these research outputs.

### **Structure of the monograph**

The monograph is divided into the following chapters:

Introduction

A Synopsis of Fifty Years of the University of Zambia's Research Productivity, 1966-2015

Research Output of Faculty in the Agricultural Sciences

Research Output of Faculty in Education

Research Output of Faculty in Engineering and Mines

Research Output of Faculty in Law

Research Output of Faculty in Medicine

Research Output of Faculty in the Natural Sciences

Research Output of Faculty in Veterinary Medicine

Research Output of Faculty of the Institute of Economic and Social Research

Mapping Postgraduate Research Output

An Informetrics Analysis of UNZA Journals' Output

Scientometric Portraits of Selected UNZA Scholars

### **Authorship of the monograph**

A number of staff were co-opted to participate in this study. Each chapter was assigned staff to write it guided by the editors to ensure consistency regarding content and style of writing. Therefore the editors were responsible for organization and assembly of the entire monograph and also actively participated in the whole process, from data collection, data analysis and writing.

## Acknowledges

We express our gratitude to the Vice Chancellor and Deputy Vice Chancellor for inviting us to write this monograph as part of the commemoration of the University of Zambia's attainment of 50 years of existence. We thank them for providing resources to print this monograph. We also thank the Deans of Schools and Directors of Directorates and Institutes for their support when we were collecting data from their schools and institutes.

We would also like to thank the academic staff and researchers who responded to our request to submit their curricula vitae and thereby helped to produce the case studies by providing their perspective on university research. The case studies on various schools and institutes would not have been successful without their support and cooperation.

We would like to express our thanks to the members of staff who accepted to work with us in such a short period and worked tirelessly to collect data and author this work. Authors of this monograph include:

1. Dr. Akakandelwa Akakandelwa (University of Zambia)
2. Professor Ronald Rousseau (University of Antwerp, Belgium)
3. Ms. Christine W. Kanyengo (University of Zambia)
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19. Mr. Zachary Zulu (University of Zambia)
20. Mr. Fabian Kakana (University of Zambia)

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# The Role of Research at the University of Zambia

Akakandelwa Akakandelwa

## 1.0 Overview

This chapter serves as a background to the whole publication. It presents a brief history of the University of Zambia, its vision, mission and objectives; the role of research in university education; and bibliometrics as a tool for institutional evaluation.

## 1.1 A Brief History of the University of Zambia

The University of Zambia (UNZA) was established by Act of Parliament No. 66 of 1965. The first intake of students took place on 17th March 1966. UNZA is situated in Lusaka on two campuses. The main campus is the Great East Road Campus and it is situated on the Great East Road, 6km from the town centre. The other campus is the Ridgeway Campus catering for the Medical School. It is situated on John Mbita Road, 4km South East of Lusaka, opposite the University Teaching Hospital.

The motto of the University, *Service and Excellence*, has guided the development of the University since its inception. The vision of UNZA is to be a provider of world class services in higher education and knowledge generation while its mission is to provide relevant higher education through teaching, research and community service. The University was established on the principle that it should meet the “real needs” of the nation and that it should get its inspiration from the environment in which it is operating. Lockwood (1963) captures this inspiration thus:

The starting point of our enquiry into the establishment of a university has a two-fold conviction; first, that the university must be responsive to the real needs of the country; secondly, that it must be an institution which on merit will win the respect and proper recognition of the university world. Unless it satisfies these two criteria, it will fall short of meeting its national responsibility. It must combine practical service to the nation at a critical time in its life, with the fulfilment of the historic purposes of a university as a seat of learning, a treasure house of knowledge, and a creative centre of research.

The University of Zambia management in the 1989-1990 Calendar claims adherence to these principles, as indicated in the statement below:

This two-fold objective continues to guide the philosophy of the UNZA. Its goals of teaching, research, and service relevant to the needs of Zambia and a standard of excellence, which will ensure that, while these needs are properly and adequately served the University wins and holds international respect as a seat of scholarship. These objectives have been enshrined in the motto of the University, “Service and Excellence” and have continued to guide its development throughout the past 50 years.

Akakandelwa (2007) observes that the University Act of 1965, upon which UNZA was established, is more convincing in its approach to the University’s mission. Take for instance, the following quotation:

It shall be the general function of the University to encourage the advancement of learning and research throughout Zambia and hold out to all whatever their race, place of origin, political opinion, colour, creed or sex the opportunity of acquiring higher education, and for the purpose of carrying out such function it shall be the duty of the University so far as its resources permit:

- a) To provide facilities appropriate to a University of the highest standing for pursuit of learning and research and for the acquisition of a liberal education responsive to the needs of Zambia; and
- b) To make those facilities available on proper terms to such persons as are equipped to benefit from the use of the facilities.

Since then, UNZA has been expanding every year as a response to the ever-growing demand for higher education in the country. The goal of the University is to effectively contribute to national development by providing skilled human resource that can foster national development through teaching, research and service.

## 1.2 Growth of the Undergraduate Programs

Upon its establishment in 1965, the University embarked on an ambitious program of increasing programs and students enrolment. Table 1 shows a steady growth of programs mainly at undergraduate level. Three schools were established in 1966, namely: Education, Humanities and Social Sciences, and Natural Sciences. These were followed by the establishment of four schools in 1968: Agricultural Sciences, Engineering, Law, and Medicine. The School of Mines was established in 1974 while the School of Veterinary Medicine was established in 1986. Recently, in 2015, the University of Zambia launched a tenth school, the School of Business Management.

The University of Zambia has over 157 degree and postgraduate degree programmes. Other facilities established include the Institute for Social and Economic Research (INESOR), Institute of Distance Education (IDE), the Directorate of Research and Graduate Studies (DRGS), and the University of Zambia Library (UZL).

Table 1: Establishment of schools, directorates and institutes at UNZA

SN	School	Year of establishment
11	Institute of Economic & Social Research	1965
13	Institute of Distance Education	1966
1	School of Education	1966
2	School of Humanities and Social Sciences	1966
3	School of Natural Sciences	1966
5	School of Engineering	1968
6	School of Law	1968
7	School of Medicine	1968
4	School of Agricultural Sciences	1971
8	School of Mines	1974
9	School of Veterinary Medicine	1986
12	Directorate of Research & Graduate Studies	1994
10	School of Business Management	2015

### 1.3 Research at the University of Zambia

Research is one of the cornerstones of the University mission, which aspires to meet the needs of Zambia through excellence in teaching, research and service in order to foster sustainable development (2009). Since its inception, UNZA has been carrying out research. The research has been internally and externally supported. Internally supported research is funded by resources generated within the University and these include government grants, revenue from business ventures and donations. Externally supported research is funded by resources from commissioned research through Memorandum of understandings (MoUs) and agreements with local, regional and international bodies, with other universities, institutes, centres and units.

Until the late 1980s, UNZA had four fully-fledged research institutes coordinated by the Research Secretary. Due to mainly funding difficulties, three of the research institutes were abolished leaving the Institute of Economic and Social Research (INESOR), which was established in 1937. INESOR is currently the only institute mandated to conduct interdisciplinary social science research on fulltime basis. The Institute as well as schools and other units of the university have undertaken various research projects that address issues. Some of these research projects have resulted into various research outputs mainly in form of journal articles, technical reports, conference papers, unpublished papers (grey literature), books, book chapters, posters, and abstracts. Some of the research outputs have been published in international journals while others have been published in local journals.

UNZA recognizes the importance of research in the advancement of knowledge, provision of a repertoire of evidence-based information and facilitation of international academic collaboration. Furthermore, the University recognizes the need to derive tangible benefits from its intellectual output of its research and to ensure sustainable research activities at the University. The institution therefore has intentions of developing strategies to ensure that income is generated from the respective research findings through technology transfer and commercialization of its works, innovations and inventions. In order to achieve this the University has established an Intellectual Property Policy that allow for the protection, enforcement and commercialization of its research findings.

#### 1.4 Levels of Research Activities at UNZA

The University of Zambia has been involved in research at various levels as outlined below:

- a) Undergraduate
- b) Postgraduate
- c) Postdoctoral
- d) Academic staff
- e) Research Affiliation
- f) Collaborative Research.

The University of Zambia has established structures at various levels, including school and departmental levels, to coordinate research activities. Each school has a School Research Committee whose main mandate is to preside over research matters of the schools. The Directorate of Research and Graduate Studies (DRGS), in conjunction with schools and other units, oversees and coordinates postgraduate research activities. Postgraduate research is an integral part of the university research activities governed by postgraduate studies regulations. DRGS also administers a Research Affiliations Scheme that enables researchers from outside the University and/or from outside the country to be affiliated to the University of Zambia for the purpose of conducting research. The research conducted under this scheme is governed by the appropriate research affiliations regulations.

The Institute of Economic and Social Research (INESOR) carries out both basic (theoretical) and applied research that is either self-initiated or commissioned by Government, international organisations, nongovernmental organisations (NGOs), business organisations and individuals within Zambia, Southern African Region, the African continent and beyond. In addition, INESOR carries out consultancy services in relevant research programmes including, facilitating the organisation of workshops, seminars and conferences (UNZA 2009).

Academic members of staff from all the schools and INESOR are expected to conduct research and publish their findings in peer reviewed journals, present papers at conferences and seminar. Research productivity plays a critical role when considering promotion and recruitment and renewal of contracts of academic staff. Consequently, over the years, faculty in various schools have been conducting research. Academic staff have also been contracted as consultants, most in their individual capacities, by the Zambian Government, nongovernmental organizations, and industry to carry out specific research. Some of this research has resulted into various

products such as innovations, technologies, inventions, technical reports, monographs, book chapters, policy documents, and journal articles.

### 1.5 Research Policy

UNZA established an institutional research policy in 2009. The University of Zambia Research Policy has been necessitated by the requirement to coordinate the expanding research activities efficiently and effectively. The Research policy, therefore, is motivated by, inter alia, the following specific factors:

1. Growth of research programmes;
2. Need to enhance internally and externally sourced funding;
3. Need for improved research administrative infrastructure;
4. Need for research regulatory framework and oversight particularly with respect to ethical requirements;
5. Need to improve accountability and transparency for fiscal and administrative management of research activities;
6. Need to accelerate the development of research that ultimately results in improved decision-making for the betterment of the living standards of many Zambians, and
7. Collaboration and partnerships with other universities and institutions within Zambia and abroad.

### 1.6 Significance of Evaluating Research Productivity

It is widely believed that there are significant social benefits from increasing scientific research output. Because of the potential to increase economic growth, many governments around the world have increased resources devoted to university research. But the ability of increased resources to increase research output depends on the productivity of the research system. A key step towards increasing research productivity is to measure both the quality and the quantity of universities' research output. The importance of raising research productivity may explain why evaluation of university research outputs has been an increasing trend around the world over the last twenty years.

Universities established and functioning under acts of government and financed largely by public funds are usually classified as public institutions. They are thus subject to public accountability. Consequently, members of the public and politicians have for the above reasons every right to enquire whether research funds are being applied effectively and efficiently.

Scientific research at universities is arousing public concern world over, because it has become expensive and is competing for limited funds with essential public services such as education, health, welfare, agriculture, transport and communication infrastructure (e.g. roads,

telecommunications, rail, etc.), national security, energy, and environmental issues. The greater competition among the various interests leads to the situation where the research community has to account for the use of research funds by objective evaluation to justify the research successes or failures. Consequently, the public are demanding universities to show accountability on how they are spending government funds. Society is now demanding universities to use public funds and resources, including research funds, cost effectively. Furthermore, societies are confronted by enormous issues and have become dependent upon research for solutions. The search for alternative energy resources and the threat of HIV/AIDS are two examples. Thus the responsibility of spending university research funds efficiently has become a vital international issue.

Therefore, effectiveness, efficiency and public accountability are of paramount importance for research management. In the present severe financial constraints on universities worldwide, it can be assumed that universities central managements will accept the above qualities as objectives for research management performance. But then such performance must be evaluated to establish whether resources have been utilized effectively and efficiently. Effectiveness of action refers to the extent to which objectives have been attained. Efficiency is concerned with the care of applying limited resources to attain objectives. Public accountability requires that the actions of public functionaries can be examined in public. In Europe authorities endeavour to phase out disciplines at universities if academics fail to satisfy research demands. Pressure from the community, the government and funding bodies on research institutions for professional management to enhance greater efficiency is mounting. The critical review of academic research productivity is therefore an urgent requirement.

In the Organization for Economic Cooperation and Development (OECD) countries great pressure is being placed on research institutions by governments for the establishment of efficient research structures and activities (Irvine, Martin & Oldham, 1983:1). In the USA concern about university spending had as far back as 1973 already led to public insistence on the evaluation of university activities (Segerstedt, 1973:179).

In South Africa the Foundation for Research Development has instituted a research funding scheme according to which only academic researchers who have achieved specific standards receive financial aid. The Department of National Education considers subsidy only on research output which complies with specified international standards. The Government of the Republic of South Africa has established Policy and Procedures for the Measurement of

Research Output of Public Higher Education Institutions (2003) and conducts an annual evaluation of institutional research output. All public higher education institutions must annually submit their subsidy funding claims for research outputs, in the form of publications, to the Department of Higher Education and Training. The Department allocates research subsidy based on unit calculations for approved publications. The policy aims to ‘encourage research productivity by rewarding quality research output at public higher education institutions’. It hopes to ‘enhance productivity by recognising the major types of research output produced by higher education institutions and further use appropriate proxies to determine the quality of such output’.

Like many public universities worldwide, the University of Zambia was established by an Act of Parliament and enjoys autonomy with regard to freedom of thought, education, research, the way it spends funds from government sources, and the way it runs its operations including recruitment of staff and enrolment of students. As stated earlier, the founding fathers established the University on the premises that it will provide an environment in which offers a physical, social and psychological environment as well as educational services in which the processes of learning and generation of knowledge will flourish. It is therefore, justified that in order for UNZA to justify its continued existence must evaluate its effectiveness in teaching, learning and research. It would be in the University’s interest to demonstrate its efficiency and effectiveness by publishing output measures that are more comprehensive and meaningful to the public. In the absence of such reassurance, it is difficult to support claims that basic research leads to appreciable long-term benefits.

## 1.7 Challenges Relating to Undertaking Research at UNZA

UNZA like any other higher institution of learning has faced numerous challenges that have negatively impacted on its research productivity. Among the major challenges are inadequate funding, inadequate research infrastructure, poor coordination and lack of documentation of research output. There are many challenges UNZA faculty are faced with regarding conducting research and dissemination of the findings. Some of the challenges are discussed here.

### 1.7.1. Lack of linkages with industry

From the perspective of researchers in faculties the key challenge is developing and maintaining the linkages between researchers and the main users. This is a particular challenge as overall the university recognizes and rewards teaching rather than research and it up to the

individual researcher to find the time and resources to establish linkages. Once these linkages are established however the opportunities for Research Uptake increase.

### **1.7.2 Lack of funding**

Although the importance of research in the University is known and appreciated, the biggest challenge UNZA has been facing is the lack of funding allocated for research uptake. Funding for research has not been adequate to meet the research needs of the University. The University has relied on fewer sources for funding research and these include both internal and external sources. Internal sources of funds for research include; University Budget from Ministry of Education and other ministries; non-GRZ grants, NGOs, and private sector. External funding sources have included regional and international funding agencies mostly through collaborative research with foreign universities. UNZA staff are free to source external funds provided that such funds are administered by the University and the budget includes overheads. Changes in government policy and funding mechanisms towards higher education have resulted into reducing funding to the University of Zambia. Consequently very little funding is being allocated to research. Kelly reports that research activities have accounted for a little over 2 percent of the university's annual spending.

Research funding comes from different sources such as the government, bilateral agencies, international agencies and partners, non-governmental organizations and individual higher education institutions. The multiplicity of sources of research funding makes it difficult to establish how much funding goes to research function per annum. Government annual budgetary allocations to UNZA are minimal. Although the Ministry of Education has a research budget, it usually goes to planning unit or other specialized sections such as examinations, standards, teacher education, and curriculum. It is these units that collaborate with academicians to carry out research on identified issues.

Although academic staff and researchers are encouraged to participate in research dissemination both locally and internationally through attendance at local and international conferences, discussions with the general public and policy makers, and publications (UNZA supports publications in local journals, in addition to international journals), lack of funds has made it almost impossible for them to fully participate in these activities. Most often staff have to depend on their personal initiative to raise funds to attend local and international conferences and workshops, or source external funding to attend such professional gatherings.

### 1.7.3 Inadequate research infrastructure

The research infrastructures and facilities are resources that provide essential services to the researchers for both academic and/or industrial purposes. Research infrastructure includes buildings, office space and facilities, training centres, libraries, databases, laboratory equipment, instruments, computer networks, etc. The research infrastructure has not developed in line with the growing research needs of the University of Zambia, in particular and those of national development in general. Kelly reports that the University allocates about 2.5 percent of its annual spending on library resources and services. Consequently, library resources have been deteriorating over the years; leading to inadequate book purchases, cancellation of journal subscriptions, declining study space, etc. Robust research output at universities relies on constant access to current information, and this, in turn, requires a robust library and information resources. Chronic underfunding of research has resulted into failure to purchase the required laboratory equipment, chemicals and materials, making it difficult to conduct research. UNZA has failed to provide ICT hardware and software (e.g. SPSS, Stata) required to conduct research. Most often lecturers depend on personal initiative to acquire these resources. Inadequate research infrastructure leads to lack of opportunity and incentive to conduct research and in turn causes staff discontent, and is one of the factors contributing to staff wastage.

### 1.7.4 Low staffing levels

Kelly (1980) reports that, since its inception, the University of Zambia has had difficulty attracting and retaining academic staff in the numbers and specialties required. Because so little development of high level manpower had taken place at the time of Zambia's independence in 1964, the process of building up a cadre of local teaching and research staff was slow, and is not yet over. Approximately half the teaching and research staff are now Zambians; the remainder are recruited from abroad. Although the University programmes have been increasing both undergraduate and postgraduate levels, this has not been matching with the staffing levels. Poor conditions of service also led to staff attrition, with large numbers of staff leaving for greener pastures in government service, international organizations like the United Nations, and in the neighbouring Southern African countries. Most of those staff who left were senior experienced staff. Consequently, low staffing levels negatively affected research productivity at the University of Zambia.

### 1.7.5 Lack of continuous professional development

There is generally lack of established continuing professional development (CPD) at the UNZA. CPD is the means of improving knowledge and skills of personnel throughout their working lives. Lack of CPD programs deprives academic staff and researchers to update their knowledge and skills, prepare for changing roles and responsibilities, and increase general competence. Most of the few CPD programs conducted are usually ad hoc, inadequate, are not conducted based on identified needs of the staff, and tend to be offered by donors.

### 1.7.6 Lack of appropriate research policy

Until 2009, UNZA had UNZA has not had a coherent research policy document to guide and regulate the conduct of research for academic members of staff, postgraduate and undergraduate students (UNZA, 2009). Consequently, most of the research outputs have not fed into national development, enhanced teaching and curricula development in the university. Although UNZA has provided the policy environment and framework within which faculty can conduct research and increase research output, the challenge is how to operationalize the policy so that research productivity can be increased, disseminated, used to influence government policy, reforms and practice.

### 1.7.7 Poor documentation and dissemination mechanisms of the research output

The University of Zambia lacks a comprehensive mechanisms for data processing, documenting, storage, disseminating, and retrieval of its research outputs. Although efforts have been made, these efforts have not been fully embraced by management and faculty. For instance, although the University of Zambia Library has established an electronic institutional repository, most faculty have shown apathy and are not depositing their publications. This has made it difficult to quantify UNZA's annual research output. Consequently, UNZA's ranking at international level with regard to research output and visibility is very low. Attendance at local and international conferences has been very low due to lack of sponsorship by the Management. UNZA has been unable to hold regular local and international conferences where its research findings could be disseminated.

## 1.8 Methods used to evaluate research productivity

Evaluation methods have been employed around the world and this section will present a brief discussion of the most widely used methods, concentrating on bibliometrics. Various efforts towards the meaningful assessment of research productivity have been made, amongst others

with the use of mathematical, statistical and computer aids (Tauss, 1975:13). Other methods are the judgment of peers, bibliometric indicators and a combination of the above two (Irvine et al., 1983:3-7).

Friedlander applied factor analytical techniques with ten achievement criteria to distinguish groups of researchers. He found that is potentially prejudicial and misleading to use only one criterion for the evaluation of all scientists. According to him few multi-criteria studies have been done, and there is an indication that such an approach will yield more reliable results in the efforts to determine research achievement (Edwards & McCarrey, 1973:39). Irvine et al. (1983:7-8) came to a similar finding. Lopez offers an evaluation method with the approach of observing specific phenomena, a suitable method to distinguish between phenomena and expression of the phenomena in terms of numerical values (Lopez, 1968:170-173). In the following paragraphs such phenomena, which seem to be widely acceptable, will be discussed briefly.

### **1.8.1 Peer evaluation as an indicator of research productivity**

Peer evaluation involves the evaluation of a scientist's work for a specific purpose by other scientists who work in the same or related fields. Motives for peer evaluation include gaining an independent and unbiased judgment of the scientific quality of research contributions; considering arguments for or against continued financial support for research programmes; allocating funds to various new research projects; determining research priorities; and offering a judgment on the measure of success of individuals or groups of scientists.

Advantages of peer evaluation are that it is relatively inexpensive and can be done expeditiously; it does not make excessive demands on peers and specific norms can be set and maintained; it is the best mechanism to divide research funds, to monitor research and to evaluate research results. On the other hand peer evaluation can usually be applied successfully in one field but problems occur when evaluative reports have to be used as comparative norms between different fields of study. The danger also exists that evaluation can be coloured by the evaluator's group interests or school of thought (Irvine et al., 1983:4). There is also an unavoidable tendency among scientists to weigh up the value of scientific contributions in comparison with their own research interests and, or to value contributions highly because of a relationship with a successful group or university of renown. Finally, a good "advocate" can swing the result of an issue in the favour of his cause, and peer groups can tend to apply double standards between various disciplines or groups (Martin & Irvine, 1983:73).

Martin and Irvine (1983:73) argues that peer evaluation is, as a result of the foregoing disadvantages, not an undisputed criterion for scientific achievement but at most a supplementary criterion.

### **1.8.2 Bibliometric evaluation as an indicator of research productivity**

A scientist's written work is the most important and the most general proof of his productivity, because it is visible and the researcher's most important instrument through which new ideas' and results can be disseminated to other scientists (Irvine & Martin, 1983:64) and the number of publications can indicate scientific activity (Carpenter & Narin, 1981:430). However, it is questionable what is measured by the quantity of publications, because even if this should indicate to reasonable extent research productivity, the significance as scientific contributions is still uncertain. Some researchers have found that there is a correlation between the number of publications and the quality of these, while others have found that there is no correlation at all (Martin & Irvine, 1983:65-66). The problem is that various publications differ in their contributory value to science.

The worldwide preoccupation with "value for money" in science requiring the rationalization of dwindling support for scientific research, has led to increased use of quantitative data by policy makers. Indicators based on the statistical analysis of quantitative data provided by the scientific and technological literature have been used to measure scientific activity since the beginning of the 20th century. The term "bibliometrics" was first introduced in 1969 as a substitute for statistical bibliography used up until that time to describe the field of study concerned with the application of mathematical models and statistics to research, and quantify the process of written communication. Evaluative bibliometrics is a term coined in the seventies to denote the use of bibliometric techniques, especially publication and citation analysis, in the assessment of scientific activity.

Research evaluation is not the only area of science studies where bibliometrics has a traditional role to play. These techniques are also used extensively for studying the interaction between science and technology, in the mapping of scientific fields, and for tracing the emergence of new disciplines, as well as in the development of foresight indicators for competitive advantage and strategic planning. Bibliometrics is also relevant to other fields. Economists and historians of science, for example, use bibliometric indicators to measure productivity and eminence.

Bibliometric analysis of scientific activity is based on the assumption that carrying out research and communicating the results go hand in hand. Scientific progress is attained by researchers getting together to study specific research topics, steered by the previous work of colleagues. The classic input-output model used to describe the scientific research process suggests that publications can be taken to represent the output of science. Publications, most commonly in the form of the refereed article and the scholarly monograph, are regarded as the definitive statements of the results of research projects. This production can be quantified and analyzed to the size and nature of the research carried out. Studies can be performed at macro level to measure global, regional, or national trends or at the micro level of institutions or groups.

Indicators of scientific research can be divided into two main groups: the input indicators such as money spent, equipment used or personnel employed while output indicators such as the literature-based indicators already mentioned, represent the results and outcomes of the research process. Indicators are either absolute or relative. Absolute indicators refer to one particular characteristic of research activity such as number of articles published, number of citations or the amount of money spent while relative indicators show the relationship between two or more aspects such as number of articles per research group or the number of citations per paper. The latter set of indicators is generally more useful in research evaluations due to their ability to establish compound relationships between inputs and outputs such as the amount of money spent per group per article or the productivity of research groups in terms of the number of articles published per group.

Bibliometric indicators are more powerful at higher levels of aggregation and are more suitable for analyzing patterns in a large set (a faculty or large research team) and less suitable for the evaluation of individuals or small research teams. Consequently, the validity of bibliometric indicators when applied to small data sets is questionable making peer review judgments imperative at this level. Whatever their level of aggregation literature based indicators should not be used by non-peer policy makers who do not have the necessary background knowledge of the research area or research groups concerned. Interpretation of quantitative data must go hand in hand with qualitative assessment procedures.

At all levels of evaluation no indicator should be taken in isolation. A series of indicators representing the different facets of scientific activity should be employed. When these partial indicators converge to give a unified picture, their validity is strengthened. Some examples of these partial indicators refer both to input into the research process, such as the level of research

funding, and also to impacts resulting from the research process. Examples of the latter are non-bibliometric impact indicators such as recognition in the form of prizes or invitations as keynote speakers in major international meetings.

Conceptual and methodological problems associated with finding appropriate output measures arise from the intangible nature of much of the output of basic research activities. Nonetheless, publication and citation data have proved meaningful for measuring scientific output and its impact on the course of scientific research. The number of publications that a research group produces is taken to represent their scientific production and their primary contribution to the generation of new knowledge. Contributions to scientific knowledge take the form of new facts, new hypotheses, new theories or theorems, new explanations or new synthesis of existing facts. The number of times this new information is cited by the authors of later publications measures the impact of their work on the advancement of research in their specialized field, and sometimes, even in other areas of knowledge. It is also indicative of the amount of recognition they enjoy from other members of the scientific community. The reward system theory of science implies that scientists must share their results in order to gain recognition from their peers. Furthermore, the number of publications and citations a research group receives is associated with their visibility as scientists. However, not all published scientific work is equally visible. The level of visibility depends greatly on the place and language of publication as well as the field in question. Work that is not internationally visible will have little chance of being picked up by scientists other than those in close communication with the authors in question. The inclusion of the group's publications in international databases is also a factor affecting their visibility, particularly as these sources are used extensively for the generation of bibliometric indicators.

Over the last decade impact factors (IF) of scientific journals have gained importance in scientific work and information management, as well as in research management and policy. IF is used as an indicator of journal performance and as such has a role to play in the evaluation of research groups, institutes and even countries. Quality journals in science generally contain coherent sets of articles with respect to content as well as professional standards. This coherence stems from the fact that most journals are nowadays specialized in relatively narrow sub-disciplines and their 'gatekeepers' (editors and referees) share views on questions like relevance, validity and quality with the invisible college to which they belong.

An important consideration, therefore, in bibliometric studies are the channels used for the dissemination of research work and their coverage in widely accessible bibliographic databases. This latter point is even more important when considering impact indicators due to the fact that only one series of databases, the Citation Indexes produced by the Institute for Scientific Information (ISI) (Philadelphia, USA), is available for citation analysis and for the production of journal impact factors. This service includes only a small proportion of journals published worldwide, restricting its coverage to a few thousand highly cited, and mainstream journals.

In the present study we look at one important application of bibliometric indicators, institutional research evaluation based on the analysis of the publication and citation outputs of groups of researchers. The role of journal characteristics, such as the journal impact factor, in literature based evaluations is also described. We concentrate our discussion on the natural and life sciences where bibliometric indicators have reached a higher level of development than in other areas of human knowledge. Special attention is paid to the theoretical foundations of indicator production and the different methodologies available for their construction.

### 1.8.3 Citation Analysis

Another meaningful indicator of research productivity is the number of times the work of a researcher is referred to in the research publications of other researchers. The number of citations can be quantified and there are extensive data banks for that purpose. As the number of publications can be an indication of the quantity of a researcher's work, so citation analysis can provide an indicator of the quality of a researcher's work and the scientific impact that it is making (Irvine et al., 1983:6-7). According to Edwards and McCarrey a count of references such as those revealed in Science Citation Index (SCI) is the most general and the most objective method of gaining a qualitative indication of scientific achievement.

The point of departure for such an approach is that there is a high positive correlation between the number of citations and the quality of the research described in the relevant article (Edwards & McCarrey, 1973:37). There is, however, a difference in quality, in importance and in impact of a publication which must be observed in order to establish the full significance of citations. Quality refers to research characteristics such as lack of visible errors, originality of modus operandi and conclusions and creative and critical thinking.

The importance of a publication refers to its potential influence on related research activities such as the promotion of scientific knowledge whereas impact is the real influence it has at a given time. ". . . a paper creating a great impact represents a major contribution to knowledge at that time (although its impact may . . . alter with time)" (Martin & Irvine, 1983:70).

#### **1.8.4 Other indicators of research productivity**

Honorary awards on the basis of research achievements can also serve as indicators to research productivity. Irvine et al. (1983:5-6) mention, in this regard, prizes, medals and honorary degrees. Other indicators of research productivity are: formal acknowledgements, such as election to an office, for example as president of a professional association; success in raising research funds and invitations to read papers at scientific conferences. Acknowledgement which scientists have gained for the above achievements have the advantage that it has already been evaluated by peers.

No single indicator of research productivity discussed so far can be applied in isolation. They are all contributory factors in assessing research productivity as everyone illuminates different aspects of the comprehensive function of research.

With the advent of "Big Science" bibliometric techniques found a new application in the realm of science administration as a research management and policy tool. Previously, bibliometrics had been the little known domain of librarians, sociologists and historians of science. The need for a relatively quick, easy and inexpensive alternative to peer review for evaluating research performance led to the "discovery" of bibliometrics by science policy specialists and the emergence of a new field of study dedicated to the quantitative study of all aspects of science activity. This new field of scientometrics attracted specialists from different backgrounds, such as mathematicians, information professionals, computer scientists, psychologists, as well as researchers from the natural and medical sciences with a special interest in the study of their own disciplines. The widespread interest in this new field led to the creation in 1978 of its own journal, aptly named *Scientometrics*, and in 1995 to the formation of its own international professional society, the International Society for Scientometrics and Informetrics. Early in the 1960s the introduction of the Science Citation Index (SCI) had given bibliometrics a great methodological push. Science indicators research has also been instrumental in the development of the field of scientometrics from the seventies onwards.

Apart from the theoretical and applied research aspects of the field, bibliometrics and scientometrics also give support to countless evaluation exercises performed by tenure, promotion, and awards committees all over the world, as well as by government science policy-makers. While never intended to replace peer review the adjunct of bibliometric indicators make for better-informed expert decisions with respect to budget allocations and in the definition of research agendas and strategic goals. Most bibliometric evaluations of papers, journals and institutions correlate well with peer review appraisals suggesting that bibliometric indicators are generally accordant with the intuitive notions of knowledgeable scientists, as well as with the cognitive state of the art of particular research fields. Nonetheless, rather than bibliometrics being championed as a cheap alternative to peer review, the two methods offering different viewpoints on a common problem, should be considered complimentary and, wherever possible, used concurrently, especially in small scale evaluations.

The expansion of automated bibliographic information services linked to the exponential increase in the volume of scientific literature has presented greater opportunity for the application of bibliometric indicators in research evaluation. This, in turn, has required the design and implementation of better systems design and software development for the handling of large quantities of data and the application of algorithms for the calculation of a wide range of indicators. As these indicators have become more accessible, their weaknesses and strengths have become better understood.

An important and relatively recent application of bibliometrics is in program evaluation. Mapping a field, for instance, before a program is launched, immediately after the end of the program and, perhaps, a few years later furnishes relevant information on many aspects of the field under study, such as the occurrence of cognitive and structural changes. In funding programs too, analysis of scientific publications before and after the funding period can give important insights into its effect on the generation of publishable results.

Although bibliometrics is now a routine tool in evaluations, its use still has its critics. The fact that hard techniques are applied to one important field of human activity, namely the search for new knowledge that are subject to certain social control and coercion, is frequently the basis for censure. Quantitative studies of science then are often reproved for a reputed lack of theoretical foundation. In particular, the absence of a theory of citing is frequently debated, suggesting the need for a more secure epistemological footing to support this practice. Nonetheless, the extensive body of experience gained in the application of bibliometrics in

different disciplinary contexts has proved effective for the provision of reliable and useful data for science policy decisions. Interestingly enough, applied techniques, such as the mapping of science, when based on clearly formulated assumptions, have given rise to new theoretical perceptions of the structure and development of science. Useful insights have come also from an increasingly critical user group. Given that the applied side is an important driving force in scientometrics, user feedback has undoubtedly helped to advance the field. For this reason, current research is focused on the development of new and more powerful literature based indicators required by the user population, as well as on the advancement of fundamental aspects of the field validating it as a bona fide research area respected by the broader scientific community.

Research evaluation and research excellence are bywords in today's academic climate. Traditionally, assessment of scientific research has been limited to peer-review during the grant awarding process or during evaluations for promotion or tenure. Today bibliometric techniques are increasingly used as an intrinsic component of a wide range of evaluation exercises. The present tendency is for institutions to be graded more on the visibility of their products than on their long-term reputation or resources.

An important consideration in any exercise of institutional evaluation is that results and recommendations to policy makers should have the general acceptance of the researchers concerned. Consequently, scientists and research managers should be included in the team responsible for the planning, execution and analysis of the research activity. Without the involvement of these key players, the evaluation exercise is unlikely to receive validation by the other members of the research community.

Institutional evaluation should be a continuous process. Ideally, procedures should be in place for the systematic monitoring of research performance and other fundamental scholarly activities. To accomplish this, institutions should develop their own data-system and make it available through the local intranet. In this way information is continually available for consultation by academic staff and other internal users, as well as for providing the raw data for the periodic generation of bibliometric and other scientometric indicators required for evaluation exercises. In practice, most evaluations are focused on the short-term, often covering only three or four years. This is understandable otherwise results span too long a period for them to be useful for science managers. Nonetheless, their ultimate value can be measured only over the medium and long term.

In institutional evaluation exercises, scientific output and impact are related to input measures, such as research expenditure and the number and categories of academic staff. When carrying out comparative studies, other factors are considered, such as differences in the institutional academic and administrative structures, educational models, etc. Consequently, before deciding upon the procedure for collecting bibliometric data it is necessary to consider the internal institutional research structure. While research administration of many universities follows the traditional departmental structure, the increase in multi and interdisciplinary research, often organized in a program structure, has given rise to research groups formed by members of different departments. Research groups, rather than individual scientists, are today targeted for the allocation of research funds. For this reason, the research group is the most common unit for bibliometric analysis in institutional evaluations. This in turn has produced a wave of interest in scientometric research focused on the identification of research groups by coauthor analysis and its corroboration by expert opinion. Notwithstanding, the research performance of any aggregate of scientists can be assessed using bibliometrics. This aggregate is often termed a "unit" which can be taken to represent any given set or sets of scientists depending upon the objective of the evaluation.

While no absolute quantification of research performance is possible, valid and useful comparisons can be made between research groups working in the same fields. When making comparisons between groups it is essential to apply indicators to matched groups, comparing like with like, as far as possible, and to give careful thought to what the various indicators are actually measuring. It is also important to study not only the similarities between groups but also the differences, especially those that could be directly influencing the research performance.

### 1.9 Literature Review

In this section our primary task is to review several literatures that are related with the analysis institutional research productivity, encompassing mainly university level, by using bibliometric methods. Quite a few reported studies have so far been carried out on analysis of research productivity of individual institutions and published literature of journals.

Jeevan and Gupta (2002) analyzed research productivity of nine departments of IIT, Kharagpur by analyzing proportion of papers covered in SCI, Impact rate, Proportion of high quality papers and Publication Effectiveness Index (PEI), degree of collaboration among authors and such other parameters. One of the major findings of the study depicted that only four

departments have received the PEI value just above one. Lee (2003) found that IMCB researchers have been very selective in where they publish and the articles received an average of 25 to 35 citations per article, and the percentage of uncited articles is 11.6%. Four articles received more than 200 citations, and 18 received between 100 to 200 citations.

Maharana and Sethi (2013) conducted a bibliometric assessment of scientific research output of Sambalpur University during the 2007 to 2011. The main objective was to investigate the growth, contribution and impact of research carried out by the faculty members, researchers or students of Sambalpur University. It also attempts to analyze the growth and development of research activity of the university as reflected in publications output covered by ISI Web of Science during the period under study. The study attempted to examine the content of papers published, including the annual average growth rate percent, authorship pattern, degree of collaboration, distribution of citations, and organizational affiliation of papers. Subramanyam's formula is used to calculate degree of collaboration (C), Bradford's law used to determine scattering of literature in the publication pattern of the university.

Swain, Rautaray and Swain (2013) conducted a study to examine the research productivity of KIIT University, Odisha, India in regard to 361 papers indexed in Scopus from the year 2000 to till February, 2013. The study attempted to measure authorship pattern, degree collaboration, Year wise distribution of articles and corresponding citations, domain wise distribution of articles, ranking of authors, ranking of highly cited papers, collaborating countries and such other parameters. The study finds that the major chunk of research is contributed by three joint authors and the trend of collaborative research is rightly at its peak. The study further reveals that authors of this University have published maximum number of articles in Communications in Computer and Information Science, followed by World Academy of Science, Engineering and Technology, Comparative Clinical Pathology, and International Journal of Information and Management. The top author of this university had published 25 articles that had been indexed in Scopus. Taken together all the articles published during this period the university had h index of 11.

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# A Synopsis of Fifty Years of Research at the University of Zambia: 1966-2015

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## 1.0 Abstract

This study analyses the growth and development of the research activity of the University of Zambia as reflected in publications covered by Thomson Reuters' Web of Science from the year 1966 till 2015. The study examines the content of published papers, including authorship patterns, author productivity; subject-wise rank distribution of publications, collaborative patterns, source journal titles, most prolific authors, and most prolific disciplines. The results indicate that the growth of research has steadily increased from four articles in 1966 to 2692 articles in 2015. Multi-authored publications predominate amongst the pattern of authorship. Journal publications are the largest contributor and main determinants of the growth pattern. They account for 68.6% of the total units, while book reviews account for 12% and meeting abstracts for 5.3%.

**Keywords:** Bibliometrics, research productivity, research output, University of Zambia, authorship pattern, collaborative measures, h-index

## 1.1 Introduction

Nowadays universities have three major roles to play: research, education and community services, i.e. reaching out to the society by actively contributing to the public debate on matters of importance to the society at large. To these three one may add a fourth one, namely preservation in the sense of caring for the cultural memory of the region or nation (Hardin, 2008). Of course many persons working at universities perform other roles such as management, administration, and maintenance duties. All these roles are essential and mutually

dependent. Especially the first three define the mission of a university and distinguish it from other institutions.

In this contribution we will focus on the role played by universities, and in particular the University of Zambia, in the domain of research, i.e. knowledge creation. Universities, institutes for higher education and research institutes all over the world play a crucial role in the generation and application of new knowledge. As such they are essential for the development of the region in which they are situated, and for the country as a whole. Knowledge generated from research can be used as building blocks for products and processes in industry, leading to increased prosperity.

This contribution is an expanded and revised version of (Akakandelwa, 2009). The aim of this study is to analyse the research productivity of the University of Zambia from 1966 to 2015, a period spanning the 50 years of the university's existence.

## 1.2 Applications of Bibliometrics

Bibliometrics is one of the major research areas in the field of library and information science. Bibliometric analysis is used for evaluating qualitative and quantitative research output of scientific fields mainly through the analysis of publications and citations. The term *statistical bibliography* was first employed by Hulme in 1922 to refer to the application of quantitative techniques to libraries. Unaware of the introduction of the word *bibliometrics* by Otlet (1934), Alan Pritchard (1969) popularized the term through his article in the *Journal of Documentation*. The term *bibliometrics* refers to a research methodology employed in library and information sciences, which utilizes quantitative analysis and statistical methods to describe distribution patterns of articles about a given topic, or within a field, institute or country. These methods have, among other applications, been used to investigate research trends of specific fields. The field of bibliometrics flourished in the early 20th century with the works of Lotka (1926), Bradford (1934) and Zipf (1949) who observed power-law distribution patterns in word frequency, author and journal productivity. This line of enquiry culminated in Egghe's book on so-called *Lotkaian Informetrics* (Egghe, 2005). Since the 1970s bibliometric methods, under the name of scientometrics, have been used in East European countries to monitor science and scientists. The major focus of this contribution is to apply bibliometric methods to analyse the performance of the research output of the University of Zambia as included in Thomson

Reuters' Web of Science (WoS). It examines the research output, trends in authorship and collaboration, core periodicals and author productivity of the university.

### 1.3 Literature Review

Quite a few quantitative studies based on informetric/bibliometric techniques have been reported to evaluate the research productivity of individuals, institutions, and countries worldwide. Studies are also available to analyse productivity and impact of research conducted in various countries. These studies are very much helpful to assess the development of science as well as in their application to library and information resource management.

Already in the seventies Narin applied bibliometrics for research evaluation, coining the term Evaluative Bibliometrics (Narin, 1976). In the eighties several breakthroughs in terms of the use of bibliometric indicators took place (Van Raan, 2004). Martin and Irvine applied science indicators to study the position of British science (Irvine et al., 1985). They moreover studied research groups in the context of Big Science (Irvine & Martin, 1983, 1985; Martin & Irvine, 1983). The Leiden based unit CWTS began its work on evaluating research groups (Moed et al., 1985a, b), while Braun et al. (1985) studied the strength of countries. Besides publications and citations in the journal literature, citations have also been studied in patents as an important link between academia and industrial applications (Narin, 1994). As international evaluation exercises and comparisons were mainly based on the Web of Science (and its precursor the Science Citation Index) developing countries were underrepresented in those studies. This holds even more for countries that have no tradition in publishing in English, such as China and the Latin American countries. Soon these countries developed their own publication and citation databases. It is no surprise that also in Africa voices have been raised in favour of developing local databases (Ani & Onyancha, 2012).

One may say that nowadays Africa is often represented in international scientometrics studies through South Africa, as part of the BRICS (Brazil, Russia, India, China, South Africa) countries, such as in (Bornmann et al., 2015) and (Wong & Wang, 2015). These articles, and similar ones, stress the fact that these countries show an increasing participation in science and technology. Moreover, Tijssen (2007) studied the contribution of Africa as a whole to the worldwide research literature. He points out that input statistics, such as number of research personnel, are often missing for African countries, and hence he focusses on the output, in the form of publications as covered by the WoS. However, he admits that it is not clear to which extent these 'elite' journals are the best choice to describe the state of science in Africa and

notes that some African journals, not listed in the WoS, have nevertheless a significant impact on worldwide science. His study, covering the period 2001-2004 places Zambia at the 20<sup>th</sup> place according to numbers of publications among African countries, but 7<sup>th</sup> according to the number of citations per publication. African medical journals and their contribution to AJOL (African Journals OnLine) are discussed in (Akakandelwa & Ocholla, 2011). The quality of participatory research in Zambia is discussed in (Gladwin et al., 2002). Finally we mention a contribution by S.F.C. Zulu from the University of Zambia about the difficult issue of bibliographic control of reports (Zulu, 1993).

#### 1.4 The University of Zambia

The University of Zambia (UNZA) was established by the Act of Parliament No. 66 of 1965, during the first year after the country's independence. The first intake of students took place on 17th March 1966. UNZA is situated in Lusaka, the country's capital, on two campuses. The main campus is the Great East Road Campus and it is situated on the Great East Road, 6km from the town centre. The other campus is the Ridgeway Campus catering for the Medical School. It is situated on John Mbita Road, 4 km South East of Lusaka, opposite the University Teaching Hospital.

The motto of the University, *Service and Excellence*, has guided the development of the University since its inception. The vision of UNZA is to be a provider of world class services in higher education and knowledge generation while its mission is to provide relevant higher education through teaching, research and community service.

The University of Zambia has over 157 degree and postgraduate degree programmes. It is divided into the following schools:

1. School of Agricultural Sciences
2. School of Engineering
3. School of Education
4. School of Humanities and Social Sciences
5. School of Law
6. School of Mines
7. School of Medicine
8. School of Natural Sciences
9. School of Veterinary Medicine

The University of Zambia is expected to launch the School of Business Management in 2015. Other facilities include the Institute for Social and Economic Research, Institute of Distance

Education, the Directorate of Research and Graduate Studies and the University of Zambia Library.

## 1.5 Research

It makes no sense to do research and not to communicate the results. Hence publication of research results is an important duty of any researcher. Yet, it is not enough to publish research: whatever is published should be read as widely as possible. Research is communicated and disseminated in various ways, including publishing in journals, in edited books, in monographs, through presentation at conferences, and nowadays via blogs on the Internet. Research of great public importance may even be disseminated through television documentaries.

University personnel have a professional and moral duty to contribute to the progress and wellbeing of its university. Similarly, universities as a whole must contribute to the progress of the country. Consequently, personnel and universities as such, are regularly submitted to evaluation exercises. Nowadays, such evaluations are key components of any research and development activity. Number of research publications is clearly one of the quantitative measures for basic research activity in a research institution such as a university. Moed (2006, p. 2) observes that “*to assess the size of research activities within a university, it is appropriate to consider the volume of an institution’s article output*”. Until now, very little attention has been paid to evaluating the research performance of the University of Zambia. This bibliometric study, therefore, provides an assessment of the research activities at UNZA.

Lastly, the University of Zambia, just like many other universities, has been receiving research funding from many sources, including government, companies, and non-governmental organizations. One way of accounting for this research funding is by way of evaluating the research output, mainly publications, and its impact.

## 1.6 Objectives of the Study

The main objective of this study is to provide an overview of UNZA faculties’ research productivity from 1966 to 2015. The specific objectives of the study are to:

1. Study the yearly distribution of publications
2. Find the most-used publication types
3. Identify the nature of authorship patterns and collaboration
4. Determine the university’s most prolific authors

5. Put funding agencies in the spotlight
6. Find the most active research areas
7. Find the most-used journals
8. Determine the university's h-index and its citation distribution

One well-known indicator of research productivity is the number of publications produced by the scientists, institutions and countries. It is therefore hoped that this study will provide some insight into the complex dynamics of research activity at UNZA and enable the researchers, faculty, policy makers and administrators to make decisions that further enhance research productivity at the institution for the coming years. We also hope that this study will introduce regular assessments of UNZA's research productivity, as research is becoming increasingly important for the faculty evaluation process in Zambian universities and research institutes.

### 1.7 Source Database and Methodology

This is a case study of the research productivity of the University of Zambia using informetric techniques using data obtained from the Web of Knowledge database. In order to obtain the necessary data we searched for 'University of Zambia' as keyword in the affiliation (address) field with PY=1966-2015. Further results were refined for Research Area, Source Titles, Subject Categories, etc. The data so obtained referring to type of document, subject category, journal, country, faculties, keywords and h-index were further analysed using an MS Excel Spreadsheet. Authorship patterns and author productivity are examined to identify patterns of research contribution. Our study is mainly exploratory in nature.

### 1.8 Results

#### 1.8.1 H-index and relation with Zambia as a whole

During the period 1966 to 2015 Zambian researchers (co)-authored 5952 publications in the WoS, which led to an h-index (Hirsch, 2005) of 92, i.e. 92 publications received at least 92 citations, while the 93th ranked article did not receive 93 citations. Among these 5952 publications 2692 have an author from the University of Zambia, or about 45%. The set of UNZA publications on its own has an h-index of 56.

#### 1.8.2 Yearly distribution of research output

Table 1 shows the yearly research output from 1966 to 2015. A total of 2692 scholarly papers were published within the period of review (two articles have no publication year). Not

surprisingly, the lowest number of papers published was recorded in 1966 while recent years show the highest number of papers per year. Table 1 reveals fluctuating research productivity over the whole period, characterized by frequent peaks and troughs. For this reason we do not calculate an annual growth rate and calculated five-year moving averages, shown in Figure 1. In this figure the year  $y$  refers to the average number of publications during the period  $y - y+4$ . Figure 1 clearly shows a steady growth in the earlier years, followed by a decline ending around 1982. From then on the university published about 40 publications a year till the year 2004. From 2004 on we see again a steady increase (and note that the year 2015 was not yet complete when data were collected). During this latest period the 5-year moving averages can be described by a perfect linear line ( $R=0.994$ ).

**Table 1: Yearly distribution of publications**

Year of publication	Frequency	Cumulative Percentage
1966	4	.1
1967	15	.7
1968	22	1.5
1969	32	2.7
1970	26	3.7
1971	30	4.8
1972	27	5.8
1973	43	7.4
1974	53	9.4
1975	53	11.3
1976	88	14.6
1977	81	17.6
1978	64	20.0
1979	78	22.9
1980	62	25.2
1981	49	27.0
1982	24	27.9
1983	37	29.3
1984	48	31.1
1985	46	32.8
1986	35	34.1
1987	39	35.5

Table 1 continued

Year of publication	Frequency	Cumulative Percentage
1988	46	37.2
1989	39	38.7
1990	40	40.2
1991	28	41.2
1992	38	42.6
1993	43	44.2
1994	35	45.5
1995	42	47.1
1996	30	48.2
1997	47	50.0
1998	46	51.7
1999	34	52.9
2000	35	54.2
2001	45	55.9
2002	41	57.4
2003	40	58.9
2004	34	60.2
2005	57	62.3
2006	58	64.5
2007	72	67.1
2008	93	70.6
2009	84	73.7
2010	83	76.8
2011	103	80.6
2012	127	85.4
2013	138	90.5
2014	132	95.4
2015	124	100.0
Total	2690	

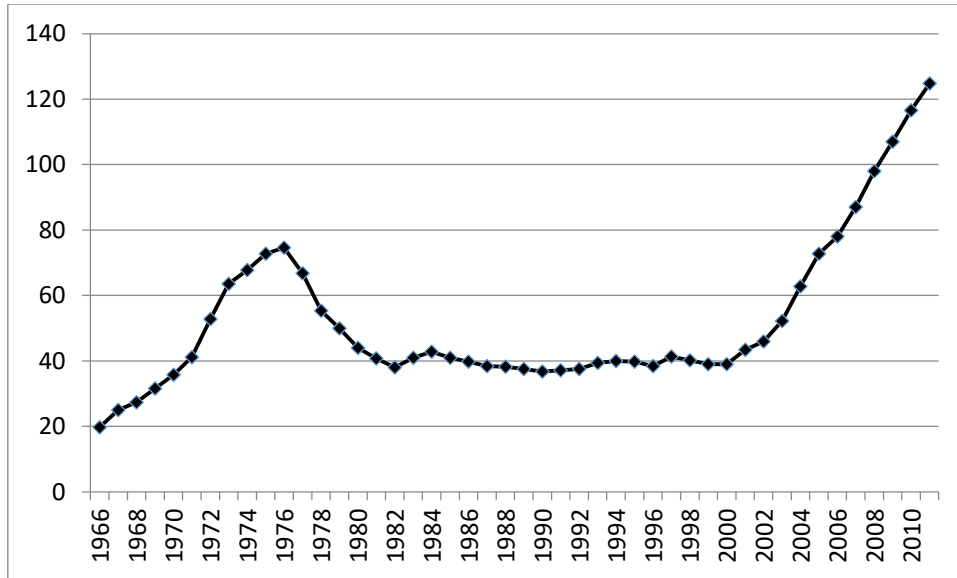


Figure 1: Research output 1966-2015: 5-year moving averages

From the year-wise publication data we can obtain the year-based h-index (Mahbuba & Rousseau, 2013) for UNZA: it is 35, which means that there are 35 years in which the number of publications is at least 35, and during the 36<sup>th</sup> year (as ranked by number of publications) there were less than 36 publications.

### 1.8.3 Types of Publication

Table 2 shows that out of total 2692 publications published by UNZA in the period 1966-2015, articles are the most favoured document type with 1847 (68.6%) documents, followed by book reviews with 331 (12.3%) documents, meeting abstracts with 142 (5.3%) documents, proceedings paper with 461 (7.546%) documents, notes with 83 documents (3.1%), letters with 73 (2.7%), and reviews (journal) with 55 (2.0%) documents. Other document types are published much less by UNZA researchers.

Table 2: Publication types

	Frequency	Percent	Cumulative Percent
Article (journal)	1847	68.6	68.6
Book Review	331	12.3	80.9
Meeting Abstract	142	5.3	86.2
Note	83	3.1	89.3
Letter	73	2.7	92.0
Review (journal)	55	2.0	94.0
Proceedings Paper	49	1.8	95.8
Article; Proceedings Paper	47	1.7	97.6
Editorial Material	41	1.5	99.1
Poetry	9	.3	99.4
Discussion	5	.2	99.6

Article; Book Chapter	4	.1	99.8
News Item	3	.1	99.9
Fiction, Creative Prose	1	.03	99.9
Item About an Individual	1	.03	100.0
Review; Book Chapter	1	.03	100.0
Total	2692	100.0	

Figure 2 shows the distribution of the publication types from 1966 to 2015. The relative number of publications of article type increases over the decades. During the first decade the relative number of book reviews is almost equal to that of articles, but the contribution of book reviews decreases over the decades. We further observe that there was a notable increase in the relative number of meeting abstracts with the highest number being recorded in 2013. These meeting abstracts are a typical output for medical fields, yet they universally receive few citations (Hu & Rousseau, 2013).

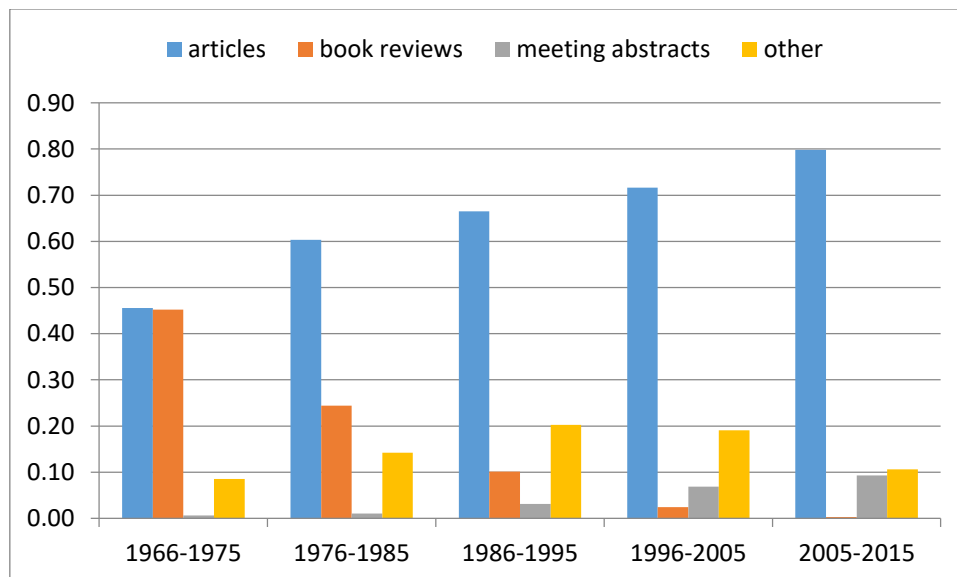


Figure 2: Distribution of document types from 1966-2015

#### 1.8.4 Collaboration

Research collaboration is commonly measured by co-authorship of publications (Katz & Martin, 1997; Onyancha and Ocholla, 2007; Onyancha, 2009). Several studies have employed this technique to measure research collaboration in different countries and/or institutions, e.g. (Hartinah, Davis, Hydari & Kent, 2001; Lewison & Must, 2001; Narvaez-Berthelemot, Russell, Arvanitis, Waast & Gaillard, 2001). Some of the approaches of measuring research collaboration are: determining (a) the number of papers that are single- and/or co-authored; (b) the number of papers that are authored by x number of authors each; (c) the proportion of multi-

authored papers, called the degree of collaboration (DIC) by Subramanian (1983). More refined methods can be found in (Ajiferuke et al., 1988) and (Egghe, 1991).

Table 3 provides the number of publications that were authored by  $x$  ( $x=1,2,3,\dots$ ) authors. One-author papers were the majority and totalled 1019 followed by papers authored by more than five authors (767), two-author papers, three-author papers, four-author papers and five-author papers. Several publications were authored by an unusually high number of authors: we even found a paper with 678 authors from 473 different addresses; only one of the authors being from UNZA (School of Medicine). It was published in *The Lancet* in 2015 and is entitled: *Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013*. The earliest publications from 1966 to 1968 were all singled authored. As there were 1019 single-authored papers out of 2692 the DIC for UNZA over the whole period under study is 0.62.

Figure 3 shows that the early years 1966-1998 were dominated by single authored publications, marked a steady increasing of two-authored publications, while the years that followed were dominated by multi-authored publications; publications co-authored by more than five authors took up the dominant position from 2005 onwards. An examination of the degree of collaboration (DIC) reveals that there is an increasing collaboration over the years, from 0.00 in 1966 to 0.97 in 2015. Rapid collaboration was observed from 2005 to 2015, i.e. with DICs ranging from 0.82 to 0.97, respectively (Figure 4).

Table 3: Number of authors per publication

Number of authors	Frequency	Percent
1	1019	37.9
2	306	11.4
3	232	8.6
4	202	7.5
5	166	6.2
> 5	767	28.5
Total	2692	100.0

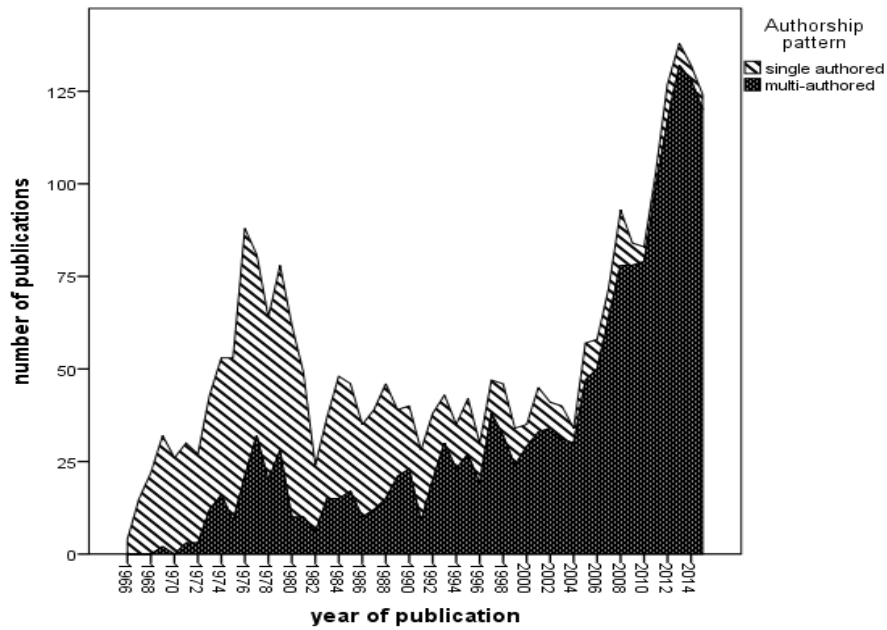


Figure 2.3: Author collaboration trends 1966-2015

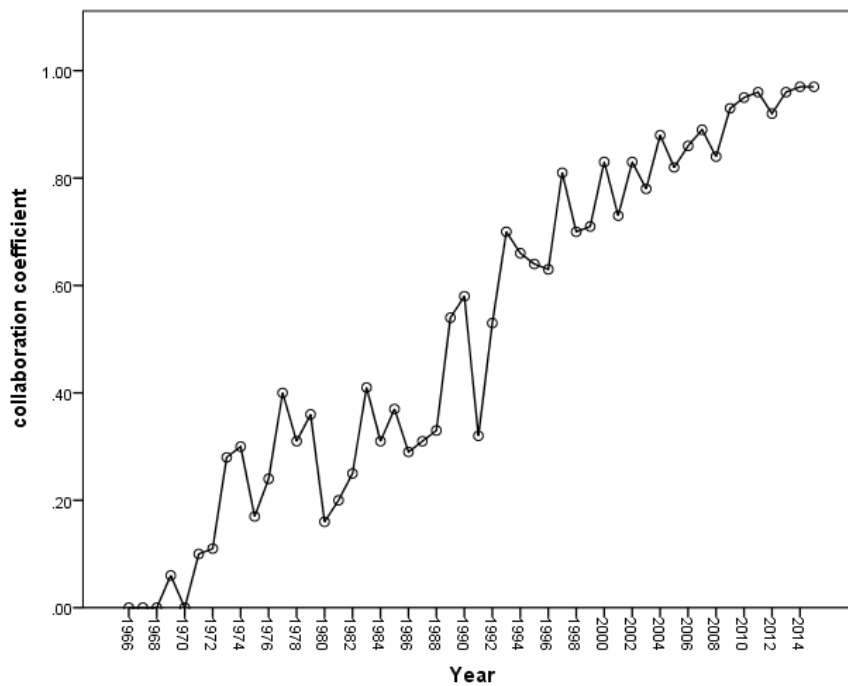


Figure 2.4: Distribution of the degree of collaboration during the period 1966-2015

### 1.8.5 Most prolific authors

Table 4 gives the top 25 most prolific authors in terms of productivity during 1966-2015 and their school affiliations. The list is ranked in order of decreasing productivity. Prof. P. M. Kelly, School of Education occupies the first rank with 93 publications; followed by C. Kankasa (59), School of Medicine, M. Sinkala (58), E. Chomba (56), A. Zumla (55), S. Siziya (46), I. Zulu

(42), J.B. Muma (40), L. Kuhn (39), C. Chintu (39), J.S.A. Stringer (37), I.K. Phiri (37), C. Michelo (37), D.M. Thea (36), B. Namangala (35), P. Mwaba (35), R. Serpell (34), A. Haworth (34), A.S. Mweene (33), M. Munyeme (33), G.M. Aldrovandi (33), H. Ayles (31), M. Atadzhanov (30), C. Sugimoto (29, and M.J.G. Farthing (29).

Table 4: The 25 most productive authors

Rank	Authors	# of publications	% of 2692	School
1	Kelly P	93	3.455	Medicine
2	Kankasa C	59	2.192	Medicine
3	Sinkala M	58	2.155	Medicine
4	Chomba E	56	2.080	Medicine
5	Zumla A	55	2.043	Medicine
6	Siziya S	46	1.709	Medicine
7	Zulu I	42	1.560	Medicine
8	Muma JB	40	1.486	Vet Medicine
9	Kuhn L	39	1.449	Medicine
	Chintu C	39	1.449	Medicine
11	Stringer JSA	37	1.374	Medicine
	Phiri IK	37	1.374	Vet Medicine
	Michelo C	37	1.374	Medicine
14	Thea DM	36	1.337	Medicine
15	Namangala B	35	1.300	Vet Medicine
	Mwaba P	35	1.300	Medicine
17	Serpell R	34	1.263	Humanities & Social Sciences
	Haworth A	34	1.263	Medicine
19	Mweene AS	33	1.226	Vet Medicine
	Munyeme M	33	1.226	Vet Medicine
	Aldrovandi GM	33	1.226	Medicine
22	Ayles H	31	1.152	Medicine
23	Atadzhanov M	30	1.114	Medicine
24	Sugimoto C	29	1.077	Vet Medicine
	Farthing MJG	29	1.077	Medicine

### 1.8.6 Most collaborative countries

Distribution of research output by geographical regions illustrates the collaboration between the faculty/researchers of UNZA and foreign colleagues. The major collaborative contributors come from the USA (19.1%), England (13.1%), South Africa (5.2%), Japan (5.2%), Norway (3.6%), Belgium (3.2%), Sweden (3.1%), Switzerland (2.6%), Denmark (2.6%), Uganda (2.4%), Tanzania (2.4%), Canada (2.3%), and Kenya (2.1%). Other countries can be seen in Table 5. Collaboration with neighbouring countries is not very high, Tanzania being the highest ranks at the 11<sup>th</sup> place.

Table 5: The forty-nine most collaborating countries

Ranks	Countries/Territories	Records	% of 2692
1	USA	514	19.1094
2	England	359	13.1336
3	South Africa	159	5.1906
4	Japan	155	5.1758
5	Norway	98	3.640
6	Belgium	85	3.158
7	Sweden	83	3.083
8	Switzerland	69	2.563
9	Denmark	66	2.452
10	Uganda	65	2.415
11	Tanzania	62	2.303
12	Canada	61	2.266
13	Kenya	57	2.117
14	Scotland	52	1.932
15	Zimbabwe	51	1.895
16	Malawi	49	1.820
	Australia	49	1.820
18	India	43	1.597
19	Netherlands	41	1.523
20	Germany	36	1.337
21	France	35	1.300
22	Italy	30	1.114
23	Nigeria	29	1.077
24	People's R China	27	1.003
25	Pakistan	22	0.817
	Botswana	22	0.817
	Austria	22	0.817
28	Egypt	19	0.706
29	Brazil	18	0.669
30	Mexico	16	0.594
31	Namibia	15	0.557
	Israel	15	0.557
	Ethiopia	15	0.557
	Argentina	15	0.557
35	Rwanda	14	0.520
36	Thailand	13	0.483
	Spain	13	0.483
	Ireland	13	0.483
39	Zaire	11	0.409
	Mozambique	11	0.409
	Ghana	11	0.409
	Cameroon	11	0.409
43	Turkey	10	0.371
	Singapore	10	0.371
	Finland	10	0.371
46	Russia	9	0.334
	Portugal	9	0.334
	New Zealand	9	0.334
	Czech Republic	9	0.334

### 1.8.7 Funding Agencies

Table 6 shows the major research funding agencies for UNZA research conducted in the past 50 years. Occupying the first position is the National Institute of Health (USA), followed by the Ministry of Education Culture Sports Science and Technology of Japan, the Bill and Melinda Gates Foundation, the Wellcome Trust, J-GRID (the Japan Initiative for Global Research Network on Infectious Diseases), the Norwegian Programme for Development Research and Education NUFU, the European Union and so on.

Table 6: Thirty-seven leading research funding agencies

Rank	Funding Agencies	# Publications	% of 2692
1	National Institutes of Health (NIH)	39	1.449
2	Ministry of Education Culture Sports Science and Technology Japan	37	1.375
3	Bill Melinda Gates Foundation	25	0.928
4	Wellcome Trust	18	0.669
5	J-GRID: Japan Initiative for Global Research Network on Infectious Diseases	17	0.632
6	Norwegian Programme for Development, Research and Education (NUFU)	15	0.558
	European Union	15	.0557
8	Ministry of Health Labour and Welfare of Japan	13	0.483
	Swiss National Science Foundation (SNSF)	13	0.483
10	Fogarty International Center	12	0.446
11	UBS Optimus Foundation Switzerland	11	0.409
12	UK Medical Research Council (MRC)	9	0.335
	Doris Duke Charitable Foundation	9	0.334
14	Japan Society for the Promotion of Science	8	0.297
	International AIDS Vaccine Initiative	8	0.297
16	University of Zambia	7	0.260
	National Institute of Neurological Disorders and Stroke	7	0.260
	National Institute of Child Health and Human Development	7	0.260
	International Geoscience Programme (IGCP)	7	0.260
20	National Institute of Mental Health	6	0.223
	Elizabeth Glaser Pediatric AIDS Foundation	6	0.223
	Czech Science Foundation	6	0.223
	Canadian Institutes of Health Research	6	0.223
24	Research Council of Norway	5	0.186
	Perinatal Health and Human Development Research Program	5	0.186
	Global Coe Program	5	0.186
	Eunice Kennedy Shriver National Institute of Child Health And Human Development	5	0.186
	Elizabeth Glaser Pediatric AIDS Foundation Scientist Award	5	0.186
	Children of Alabama Centennial Scholar Fund of the University of Alabama at Birmingham	5	0.186
30	Zambian Ministry of Health	4	0.149
	University College London Hospitals Comprehensive Biomedical Research Centre UCLH CBRC	4	0.149
	National Institute of Allergy and Infectious Diseases	4	0.149
	National Cancer Institute	4	0.149
	Johns Hopkins University	4	0.149
	Foundation of Sumitomo	4	0.149
	Foundation of Heiwa Nakajima	4	0.149
	Foundation for Innovative New Diagnostics Find	4	0.149

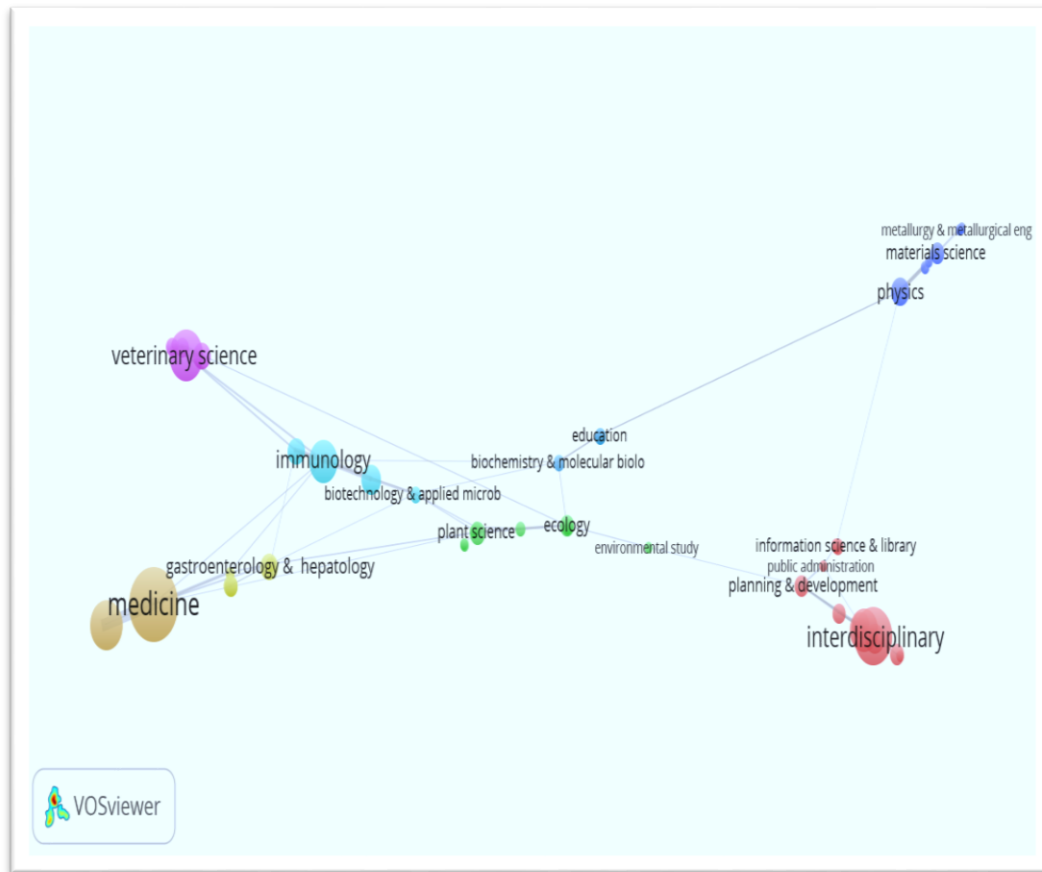
### 1.8.8 Research Areas

Table 7 shows the 50 major research areas in which UNZA was involved in the past 50 years. Leading this table, those with a percentage higher than 5, are: public environmental occupation health (10.996%), social sciences and related topics (9.547%), tropical medicine (7.132%),

general internal medicine (6.984%), veterinary sciences (6.947%), infectious diseases (6.612%), area studies (5.089%), immunology (5.015%).

Table 7: Research Areas

Research Areas	# records	% of 2692
Public environmental occupational health	296	10.996
Social sciences other topics	257	9.547
Tropical medicine	192	7.132
General internal medicine	188	6.984
Veterinary sciences	187	6.947
Infectious diseases	178	6.612
Area studies	137	5.089
Immunology	135	5.015
Parasitology	126	4.681
Agriculture	93	3.455
Environmental sciences ecology	91	3.380
Psychology	87	3.232
Health care sciences services	82	3.046
Virology	69	2.563
Geology	68	2.526
History	66	2.452
Science technology other topics	61	2.266
Government law	61	2.266
Microbiology	53	1.969
Gastroenterology hepatology	53	1.969
Paediatrics	50	1.857
Physics	49	1.820
Engineering	47	1.746
Education educational research	47	1.746
Biomedical social sciences	47	1.746
Business economics	44	1.634
Plant sciences	42	1.560
Obstetrics gynaecology	42	1.560
Chemistry	42	1.560
Public administration	39	1.449
Literature	35	1.300
Respiratory system	34	1.263
Neurosciences neurology	34	1.263
Psychiatry	33	1.226
Materials science	30	1.114
Geography	30	1.114
Water resources	29	1.077
Entomology	27	1.003
Biochemistry molecular biology	24	0.892
Mathematics	23	0.854
Biotechnology applied microbiology	23	0.854
Zoology	22	0.817
Geochemistry geophysics	22	0.817
Nutrition dietetics	21	0.780
International relations	20	0.743
Information science library science	20	0.743
Pharmacology pharmacy	18	0.669
Oncology	18	0.669
Forestry	16	0.594
Surgery	15	0.557



### 1.8.9 Preferred Journals for Publication

UNZA faculty and researchers have published in a total of 948 journals included in the WoS. Table 8 presents a list of top 50 ranking source journal titles with their total number of publications. These 50 journals contributed 43.6% of the total 2692 publications produced by UNZA faculty and researchers in the period under review. Ten of these are African journals. The results reveal that the *African Social Research* recorded the highest number of publications with 234 publications, followed, on a respectable distance, by *Lancet* with 52 publications, the *Medical Journal of Zambia* with 47 publications, *Journal Modern African Studies* with 38, *East African Medical Journal* with 38 publications, and *PLOS One* with 37 publications. Other journals can be seen in Table 8.

Table 8: The fifty most used source titles (journals)

Rank	Titles (journals)	#Publications	%
1	African Social Research	234	8.692
2	Lancet	52	1.932
3	Medical Journal of Zambia	47	1.746
4	Journal of Modern African Studies	38	1.412
	East African Medical Journal	38	1.412
6	PLOS One	37	1.374
7	Tropical Medicine International Health	32	1.189
8	Veterinary Parasitology	31	1.152
9	Transactions of The Royal Society of Tropical Medicine and Hygiene	29	1.077
	Journal of Southern African Studies	29	1.077
11	AIDS	28	1.040
12	American Journal of Tropical Medicine and Hygiene	27	1.003
13	Tropical Doctor	25	0.929
	African Affairs	25	0.929
15	International Journal of Psychology	23	0.854
16	Journal of Veterinary Medical Science	22	0.817
	J AIDS Journal of Acquired Immune Deficiency Syndromes	22	0.817
	International Journal of African Historical Studies	22	0.817
19	Gut	21	0.780
	BMC Public Health	21	0.780
21	Tropical Animal Health and Production	20	0.743
22	Journal of African History	18	0.669
23	Acta Tropica	16	0.594
24	Social Science Medicine	15	0.557
	Gastroenterology	15	0.557
	BMC Health Services Research	15	0.557
27	Journal of African Earth Sciences	14	0.520
28	Preventive Veterinary Medicine	13	0.483
	Onderstepoort Journal of Veterinary Research	13	0.483
	Malaria Journal	13	0.483
	International Journal of Tuberculosis and Lung Disease	13	0.483
	AIDS Care Psychological and Socio Medical Aspects of AIDS HIV	13	0.483
33	Parasitology	12	0.446
	Japanese Journal of Veterinary Research	12	0.446
	Canadian Journal of African Studies / Revue Canadienne des Etudes Africaines	12	0.446
36	Journal of Tropical Pediatrics	11	0.409
	Journal of Infectious Diseases	11	0.409
	Journal of Helminthology	11	0.409
39	Tropical and Geographical Medicine	10	0.371
	Obsidian Black Literature in Review	10	0.371
	Journal of General Virology	10	0.371
	Insect Science and Its Application	10	0.371
	Human Resources For Health	10	0.371
	Clinical Rheumatology	10	0.371
46	Central African Journal of Medicine	10	0.371
	PLOS Neglected Tropical Diseases	9	0.334
	Journal Of Tropical Medicine And Hygiene	9	0.334
	Health Policy and Planning	9	0.334
	Clinical Infectious Diseases	9	0.334
	BMC Infectious Diseases	9	0.334

### 1.8.10 Impact of UNZA Publications

We already observed that the h-index for UNZA publications is 56. Table 9 presents the distribution of citations of the UNZA publications published during the period under review. The average number of citations received was 8.45 citations. The most cited publication was published in 1985 and received 394 citations, or on average of about 12.7 a year (Serwadda et al., 1985). A more recent article (Samb et al., 2009) received already 215 citations, which is more than 30 a year. On the one hand, nine hundred and eighty-eight (36.7%) publications did not receive any citations, while on the other hand, 174 (6.5%) publications received more than 30 citations. Two articles are missing in this list as their number of received citations is not included in the WoS. A Kruskal-Wallis test was conducted to establish whether there was an association between the number of citations received and the type of publication. The results ( $\chi^2=811.337$ ;  $df=8$ ;  $p=.001$ ) revealed a significant difference in citation received between the various document types; the results further revealed that 30.44% of the variability in the mean rank scores is accounted for by the document type. The most cited publication types, in their order of importance were: journal articles, conference papers, review papers, notes, letters, and editorial materials.

Table 9: Number of citations received

#Citations received	Frequency	Percent	Cumulative Percent
0	988	36.7	36.7
1	268	10.0	46.7
2-5	524	19.5	66.2
6-10	314	11.7	77.8
11-15	179	6.6	84.5
16-20	111	4.1	88.6
21-25	84	3.1	91.7
26-30	48	1.8	93.5
> 30	174	6.5	100.0

### 2.8.11 Key findings

1. This study has shown that UNZA's research output during the period 1966-2015 has been rather irregular, characterized by peaks and lows. The number of publications contributed by the research community of UNZA started in 1966; this was followed by a period of steady growth from 1966 to 1976; followed by a rapid decline and stabilization on a rather low level. However, a steady upward growth was observed from 2008 on. The study found that 884 of 2692 publications appeared between 2008 and November 2015 (i.e. 32.84%).

2. The most prolific authors were associated with the School of Medicine. Indeed: 18 out of the 25 most prolific authors are from the School of Medicine, six are from the School of Veterinary Medicine, and one is from the School of Humanities.
3. The majority of the research output document types were journal articles (68.6%), followed by book reviews (12.3%), and meeting abstracts (5.3%). Together these constituted 86.2% of the publications.
4. Analysis of the subject areas indicated that medicine and health sciences (58.43%), is the dominant research area, followed by public/environmental occupation health, and tropical medicine.
5. Evaluation of research communication channels indicated that *African Social Research* and the *Lancet* are the most used journals by UNZA researchers.
6. Co-authorship patterns and collaboration trends show that more than 80% of UNZA publications were co-authored. While the first 25 years of UNZA's publications were dominated by single-authorship the last 25 years were dominated by multi-authored publications with more and more publications being authored by more than five authors.
7. Our findings show that UNZA collaborates with foreign authors from a large number of countries worldwide. Topping the list are the USA (19.11%) and England (13.13%), followed at some distance by South Africa (5.19%) and Japan (5.18%).
8. Results show that the majority of funding agencies are foreign, funding mostly research in medicine and veterinary medicine. Leading are the National Institute of Health (NIH), the Ministry of Education, Culture, Sports, Science and Technology (Japan), the Bill and Melinda Gates Foundation, and the Wellcome Trust.
9. Citation analysis provides evidence that 63.3% of the UNZA publications have been cited at least once, leading to a total of 22,720 citations. The other 36.7% were not cited, at least not in the WoS. This does not mean that they were not cited at all, or did not have any influence as they can be cited in other sources, or used but not cited. A Kruskal-Wallis test revealed a significant difference in citation received between the various document types.

## 1.9 Discussion

It should be noted that although the citation analysis and the criteria used for selection of indexed journals by Thomson Reuters are under criticism, data derived from this database are able to draw an acceptable picture of the status of medical research at UNZA.

Yet, we have to point out that using the Web of Science as an assessment tool that may lead to biased findings. For instance, international databases have a Western bias. In addition to the

percentage of publications, other indicators may be used, such as the number of academic staff, the student/staff ratio, and the number of undergraduate and graduate students. Moreover, the Web of Science does not cover Zambian journals nowadays.

The results of the present study confirm (Aksnes & Sivertsen, 2004), that citation distributions are extremely skewed. In other words, a large part of the scientific papers are never or seldom cited in subsequent scientific literature. These authors found that “the average citation rates in major subfields are highly determined by one or only a few highly cited papers”.

Seeking international recognition and visibility, faculty members of UNZA publish many of their papers in international journals, including the *Lancet*, *Nature*, etc. As shown by this study, as well as others, international research collaboration generally leads to publication in mainstream journals rather than in national journals. Yet, more than half of the papers published by UNZA were never cited by other research. It is not surprising that all of the highly cited papers were published in journals, as the majority of the publications were journal articles. This study also discovered that the 25 highly cited papers were cited 484 times, representing 47% of all the citations (484 of 1,020). This indicates a concentration effect, whereby a relatively small number of papers earn most of the citations.

The research productivity of the faculty members in the University of Zambia using selected bibliometric indicators revealed variable publication patterns throughout the study period. The yearly growth of research output shows that no uniform pattern of literature growth has been observed, although a steady upward trend was observed in the past decade. These results tend to agree with Kelly’s (1991) observation that UNZA lacked a comprehensive research program and therefore much of the research done was dependent on either the interests of individual researchers or external funding agencies.

The period stretching from the 1980s to the early 2000s coincides with a period during which the university experienced severe financial constraints and brain drain (Kelly, 1991). Kelly (1991) reports that UNZA experienced a loss of experienced more experienced and highly qualified staff in the 1980s at rate of 6% per annum mainly due to brain drain within and outside the country. UNZA lost 123 staff between 1983 and 1987 (Kelly, 1991) and over 300 staff between 1993 and 1998 (Njobvu, 2012). Among the reasons advanced for this loss of staff were poor salaries and conditions of service, subordination of teaching and research to administration concerns, poor funding, lack of research facilities, and excessive teaching loads

(Kelly, 1991; Njobvu, 2012; Panapress, 2012). Unfortunately, this situation has continued to haunt the institution up to now.

### 1.10 Limitations of the Study

This investigation gives a bibliometric description of the research performance of UNZA faculty and researchers from 1966 to 2015. Research productivity of UNZA can be measured by the counting of research publications in journals and proceedings, and the number of citations received in those publications. Although leading faculty members of UNZA contribute much of their work in international journals covered by the Web of Science, a significant number of publications of UNZA appear in national journals and are not covered by the Web of Science. Thus, papers of the University of Zambia published in other channels not indexed by the Web of Science are excluded from our research. In addition, data for the 2015 was incomplete as data was extracted in November before the year ended; hence the total productivity of the year 2015 might be incomplete. The present study can be improved by including more data from other bibliographical tools and databases.

### 1.11 Recommendations

The following recommendations are offered:

1. Periodic assessment should be tied to a reward system that acknowledges contributions made by individuals and units to boost the number of published papers, shared experiences, and participation in research activities.
2. To increase citations and visibility of publications from UNZA and to improve their research impact, we suggest establishing policies that encourage faculty and researchers to deposit their research output in the existing UNZA Library Electronic Repository. The main purpose of digital repositories is to increase the availability, accessibility and visibility of knowledge that has been produced by academic staff at UNZA. Open access repositories can significantly increase research and citation impact of publications contributed by the faculty members. The university website should announce the existence and promote the achievements of research groups, departments, institutes and faculty members.
3. The existing UNZA journals should be converted into electronic open access electronic journals.
4. UNZA should pay special attention to policy-relevant aspects of its research:

- a) to guide the conduct of research in its schools and departments;
- b) to encourage the conduct of research on high priority issues;
- c) to improve the quality of research; and
- d) to establish strong linkages with governmental, non-governmental organizations, and industry for effective research result utilization.

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# A Bibliometric Analysis of Research Productivity of the University of Zambia School of Agricultural Sciences

Akakandelwa Akakandelwa, Dickson Yumba, and Christine W. Kanyengo

## 1.0 Abstract

The chapter provides a picture of the University of Zambia School of Agricultural Sciences academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by School of Agricultural Sciences academic staff published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

## 1.1 Background

The School of Agricultural Sciences was established in 1971 at the Great East Road Campus in Lusaka with only 5 students enrolled. Vision statement: "To be a model of excellence in teaching, learning, research and service Mission statement: "To provide leadership in the development of quality human resource, innovative & impact oriented technologies & in provision of professional services for sustainable agricultural development".

The School of Agricultural Sciences is made up of five departments, namely 1) Animal Science, 2) Plant Science, 3) Agricultural Economics and Extension Education, 4) Soil Science, and 5) Food Science and Technology. It has three undergraduate degree programs namely, Bachelor of Agricultural Sciences, Bachelor of Human Nutrition and Bachelor of Food Science and Technology. Students following Bachelor of Agricultural Sciences program major in Animal Science, Plant Science, Soil Science, Agricultural Economics or Agricultural Extension.

The school provides both undergraduate and postgraduate programs in agriculture sciences. It also conducts research in order to provide evidence-based information important for both curriculum development and technological advancement. Over its period of existence, the School has produced more than one thousand five hundred (1,500) undergraduate and about a hundred and thirty MSc graduates most of them now in key positions in public and private sectors dealing with different aspects of natural resources management at national, regional, international and the Diaspora.

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Agricultural Sciences (SAS) from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to the School of Agricultural Sciences was obtained from the Registrar; and formers faculty were also traced from the University calendars of the past years from 1975 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in an MS Excel spreadsheet. The data later was transferred into SPSS version 20 for analysis.

## 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the faculty members publish in local languages or in local non-agricultural science journals with the possibility of not being cited due to non-visibility. The trend of self-citation and citation of

close colleagues was found in some authors with the possibility of making their scores higher than others.

## 1.5 Results and Discussions

### 1.5.1 Growth of Literature

A total of 542 publications were retrieved and collated from the various sources. The publications were grouped into ten 5-year periods (Table 1). The publication trend started low at 7 during the embryonic period (1975-1979), where only a few authors had begun to publish their works. The number of publications began to increase from 1985 and continued at a steady rate up to 2015. Publication contributions in SAS peaked between 2010 and 2015. The average publications produced per year was about 67. When the distribution of publications was plotted graphically with calculated trendline (Figure 1), the 31-year period generally indicated a positive upward trend of publication productivity and it is further predicted that this trend could continue in the future. The moving average depicted a stable, upward trendline ( $y = 0.9828x - 0.7004$ ,  $R_2 = 0.7809$ ). Cumulatively the period between 2010 and 2015 was the most productive period for SAS contributors (Table 3.1), with an annual average of 33.67.

Table 1: Research productivity of SAS faculty in five-year bands

		Frequency	Percent	Valid Percent	Cumulative Percent
	1975-1979	7	1.3	1.3	1.3
	1980-1984	9	1.7	1.7	3.0
	1985-1989	39	7.2	7.2	10.2
	1990-1994	63	11.6	11.7	21.9
Valid	1995-1999	44	8.1	8.2	30.1
	2000-2004	77	14.2	14.3	44.4
	2005-2009	97	17.9	18.0	62.5
	2010-2015	202	37.3	37.5	100.0
	Total	538	99.3	100.0	
Missing	System	4	.7		
Total		542	100.0		

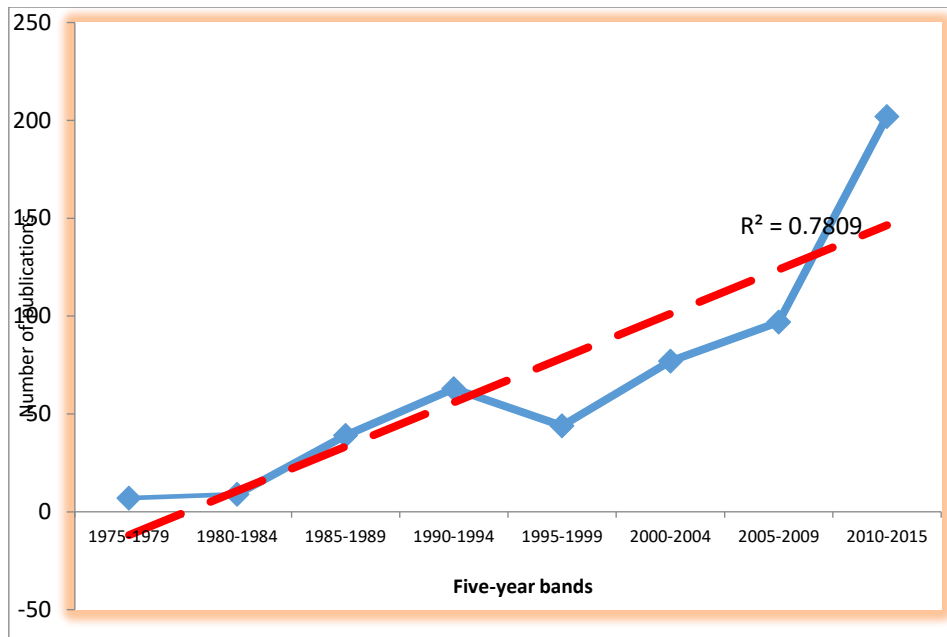


Figure 1: Five year-wise distribution of publications

### 1.5.2 Type of Publications

Table 2 reveals that scholarly journal articles (46.1%) were the most popular channel for communication amongst SAS authors, followed by monographs (19.6%), conference papers (19.0%), and technical reports (10.3%). Other publications include abstracts (1.8%), oral presentations (1.1%), rapid communication (1.1%), poster presentations (0.6%), and discussion papers (0.4%). Figure 6.2 shows the research publication trends regarding the type of publication preferred by the SAS faculty. On one hand, journal articles have dominated the types of publications produced by SAS faculty during the 31-year period. On the other hand, publication of monographs (books) and conference papers has seen a general upward trend. Publication of technical reports, which had dominated the early years, has been on decline.

Table 2: Type of publication

	Frequency	Percent	Cumulative Percent
Article	250	46.1	46.1
Monograph	106	19.6	65.7
Conference paper	103	19.0	84.7
Technical report	56	10.3	95.0
Abstract	10	1.8	96.9
Oral presentation	6	1.1	98.0
Rapid communication	6	1.1	99.1
Poster	3	.6	99.6
Discussion paper	2	.4	100.0
Total	542	100.0	

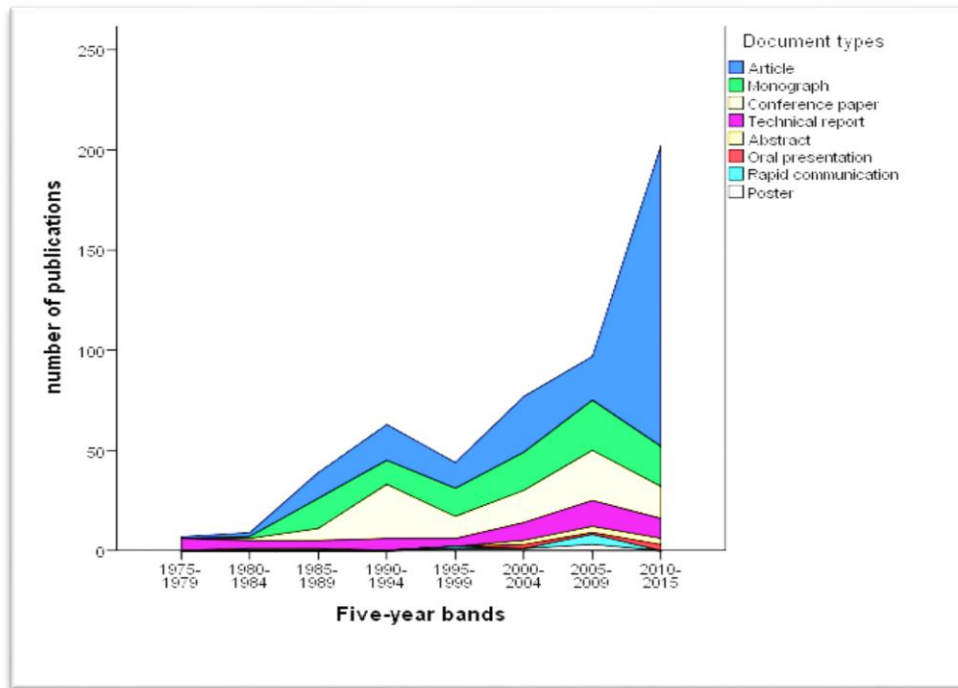


Figure 2: Trends in publication of types

### 1.5.3 Authorship Patterns

Table 3 shows that most of the published works were multi-authored works (429; 79.3%); only 20.7% (112) of publications were single-authored. Ninety-five (17.6%) publications were two-authored, 133 (24.6%) were three-authored, 87 (16.1%) were four-authored, 55 (10.2%) were five-authored, and 59 (10.9%) were authored by more five authors each.

Table 3: Number of authors per publication

	Frequency	Percent	Cumulative Percent
1	112	20.7	20.7
2	95	17.6	38.3
3	133	24.6	62.8
4	87	16.1	78.9
5	55	10.2	89.1
6	24	4.4	93.5
7	13	2.4	95.9
8	3	.6	96.5
9	2	.4	96.9
10	7	1.3	98.2
11	9	1.7	99.8
19	1	.2	100.0
Total	541	100.0	

When the authorship pattern was crossed tabulated against five-year bands for the 31-year period, the overwhelming predominance of multi-authored works was clearly indicated (Table 3.4). The number of joint authored works increased rapidly from 1985 to 2015, and this trend is expected to increase in future.

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the HSS researchers, using the formula:

$$C = \frac{Nm}{Ns}$$

Where C=collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.79. This result reveals that there is very high degree of collaboration among faculty in the School of Agricultural Sciences. Table 4 also shows the collaboration coefficient of SAS faculty over the 31 years under review. The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented in Table 4. In the first five year period (1975-1975) there was very low collaboration (CC=0.33). The collaboration coefficient over the years, 1975-2015, varied from 0.33 to 0.79, with a mean value of 0.66.

Table 4: Authorship patterns of the SAS faculty, 1975-2015

	Authorship patterns		Total	CC <sup>a</sup>
	single-authored	multi-authored		
1975-1979	6	3	9	0.33
1980-1984	5	4	9	0.44
1985-1989	17	22	39	0.56
1990-1994	23	40	63	0.63
1995-1999	11	33	44	0.75
2000-2004	10	68	78	0.87
2005-2009	19	78	97	0.80
2010-2015	21	181	202	0.90
	112	429	541	0.79

<sup>a</sup>CC= collaboration coefficient

#### 1.5.4 Core Journals

Table 5 shows the 16 journals in which 40.3% (90) of the articles of the SAS faculty were published. These include the Zambia Journal of Agricultural Sciences (8.7%), Journal of Science and Technology (3.2%), Agronomy (2.8%), Journal of Sustainable Development (2.8%), Journal of Agricultural and Biomedical Sciences (2.13%), University of Zambia Journal of Science and Technology (2.3%), Zimbabwe Journal of Science and Technology (2.3%), African Journal of Environmental Science and Technology (1.8%), Agroforestry Systems

(1.8%), Asian Journal of Agricultural Sciences (1.8%), Livestock Research for Rural Development (1.8%), Productive Farming (1.8%), Research Journal of Animal Science (1.8%), Sustainable Agriculture Research (1.8%), and UNISWA Journal of Agriculture, Science and Technology (1.8%).

Table 5: Top journals in which SAS faculty publish

SN		Frequency	Percent
1	Zambia Journal of Agricultural Sciences	19	8,7
2	Journal of Science and Technology	7	3,2
3	Agronomy	6	2,8
4	Journal of Sustainable Development	6	2,8
5	Journal of Agricultural and Biomedical sciences	5	2,3
6	Journal of Agricultural Science	5	2,3
7	University of Zambia Journal of Science and Technology	5	2,3
8	Zimbabwe Journal of Agricultural Research	5	2,3
9	African Journal of Environmental Science and Technology	4	1,8
10	Agroforestry Systems	4	1,8
11	Asian Journal of Agricultural Sciences	4	1,8
12	Livestock Research for Rural Development	4	1,8
13	Productive Farming	4	1,8
14	Research Journal of Animals Science	4	1,8
15	Sustainable Agriculture Research	4	1,8
16	UNISWA Journal of Agriculture, Science and Technology	4	1,8
	Total	90	41.3

## 1.6 Conclusion

The results of this study have drawn a number of conclusions. Firstly, although research output in the School of Agricultural Sciences began at a very small scale between 1975 and 1979, there was a remarkable steady increase over the years. Overall, research output in the 31-year period under study is characterized by an exponential growth. Secondly, the journal is the primary channel of communication by most SAS researchers. Thirdly, SAS research output is predominantly multi-authored resulting into a high collaboration coefficient. Collaborative effort among researchers is expected to remain high in the future as the number of multi-authored works is continuing to dominate each year even though while single-authorship is slowly decreasing.

This study has revealed much information that may be useful to researchers and scholars in HSS, as well as policy makers to provide adequate facilities to support research activities towards the development and growth of HSS research publications at UNZA. Moreover, hopes to encourage other researchers to explore other local areas of possible improvement and expansion in the field.

The current study has only focused on SAS publications obtained from online databases, library holdings as reported in online library OPACs. As such, it is suspected that publications that have not been reported or deposited in libraries may have been missed. Publication outputs in the form of theses, dissertations and final year graduation exercises have been excluded. It is realized that limiting the data sources may have led to inaccurate analysis and rankings. Further studies, covering all SAS published works that has been incorporated into foreign and local databases, could greatly complement this study and provide a more complete picture of HSS publication contributions in the field of library and information science.

## References



# Research Productivity of the Faculty of the University of Zambia School of Education: A Retrospective Assessment

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## 1.0 Abstract

The chapter provides a picture of the University of Zambia Education academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by Education faculty published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies. The results indicated that (a) Education scholars preferred to publish in journals (511, 48.9%), books and conference papers (474, 45.4%); (b) the publication distribution fluctuated over the 50 year period but the moving average depicted a steady incremental trend; (c) a total of 506 authors contributed to 1,045 publications and 309 are one-time authors' (d) the active authors in HSS were in the Department of Economic, Department of Psychology, Department of Population Studies, Department of History, and Department of Social Development Studies; (e) most of the research output was single-authored; and (f) the main subject areas actively researched upon were developmental issues to governance, economics and gender studies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

## 1.1 Background

The School of Education was opened in April 1966. The school provides both undergraduate and postgraduate programs. Currently, the School is the biggest in the University with nine academic departments, namely:

1. Department of Library Studies
2. Department of Educational Administration and Policy Studies (EAPS)
3. Department of Educational Psychology, Sociology and Special Education (EPSSE)
4. Department of Language and Social Sciences Education (LSSE)
5. Department of Mathematics and Science Education (MSE)
6. Department of Adult Education and Extension Studies (AEES)
7. Department of Religious Studies
8. Department of Primary Education
9. Advisory Unit for Colleges of Education (AUCE)

The school contributes to the University's research effort in two ways: through research conducted by members of staff and by training postgraduate students to carryout research.

### 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Education (SE) from 1966 to 2015. The specific objectives were to:

5. To investigate the growth of literature
6. To investigate the types of literature mainly published the faculty
7. To investigate authorship productivity by department
8. To investigate authorship patterns and research collaboration patterns

### 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to School of Education was obtained from the Registrar; and formers faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

### 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports.

As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the faculty members publish in local languages or in local non-LIS journals with the possibility of not being cited due to non-visibility. The trend of self-citation and citation of close colleagues was found in some authors with the possibility of making their scores higher than others.

## 1.5 Results and Discussions

### 1.5.1 Growth of Literature

### 1.5.2 Research Productivity by Department

### 1.5.3 Type of Publications

### 1.5.4 Author Productivity

### 1.5.5 Authorship Patterns

### 1.5.6 Degree of Author Collaboration

## 1.6 Conclusion

## References



# An Investigation into the Research Output of University of Zambia Faculty of School of Engineering and School of Mines

Chikwekwe Nkatya, Francina N. Makondo and Christine W. Kanyengo

## 1.0 Abstract

The chapter provides a picture of the School of Engineering and the School of Mines academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by two schools published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

## 1.1 Background

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Engineering and the School of Mines from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to School of Engineering and

School of Engineering was obtained from the Registrar; and former faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

#### 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it.

#### 1.5 Results and Discussions

##### 1.5.1 Growth of Literature

A total of 202 publications were retrieved and collated from the various sources (Table 1). The School of Engineering produced 134 publications while the School of Mines produced 68 publications. The School of Engineering started publishing in 1974 while the School of Mines started publishing in 1996. The School of Engineering had 20 publications in 1974 but from 1996 to 2011 the number of publications was very low; ranging from 1 to 11 publications per year, with an average of 4 publications per year. During number of publications increased to 11 in 2013 and 20 in 2014, and dropped to 8 in 2015. Similarly, the number of publications in the School of Mines was extremely low during the period 1996-2015, with an average of 3 publications per year. The highest number of publications was recorded in 2014 (11 publications).

Table 1: Year-wise distribution of publications

Year of publication	School		Total
	Engineering	Mines	
1974	20	0	20
1996	1	1	2
1997	2	1	3
1998	2	2	4
1999	6	6	12
2000	2	0	2
2001	3	3	6
2002	1	0	1
2003	3	3	6
2004	4	4	8
2005	2	2	4
2006	6	5	11
2007	7	5	12
2008	8	6	14
2009	9	7	16
2010	5	2	7
2011	8	2	10
2012	6	1	7
2013	11	3	14
2014	20	11	31
2015	8	4	12
	134	68	202

### 1.5.2 Type of Publications

Table 2 reveals that scholarly journal articles (64.6%) were the most popular channel for communication amongst HSS authors, followed by books (15.3%), conference papers (7.8%), book chapters (3.8%), and miscellaneous publications (8.5%), consisting of technical reports, unpublished reports, book reviews, poster presentations, contribution to an encyclopedia, abstracts, and modules. Figure 6.2 shows the research publication trends regarding the type of publication preferred by the HSS faculty. On one hand, journal articles have dominated the types of publications produced by HSS faculty during the 50 year period have revealed an increasing trend. On the hand, publication of books has seen an up-and-down trend while there is been stagnation in book chapters miscellaneous publications.

### 1.5.3 Author Productivity

### 1.5.4 Authorship Patterns

### 1.5.5 Degree of Author Collaboration

## 1.6 Conclusion

## References

## Research Productivity of University of Zambia School of Humanities and Social Sciences

Akakandelwa Akakandelwa, Silumesii Kabilwa and Hangooma Moonga

### 1.0 Abstract

The chapter provides a picture of the University of Zambia Humanities and Social Science academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by Humanities and Social Science faculty published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies. The results indicated that (a) Humanities and Social Science scholars preferred to publish in journals (511, 48.9%), books and conference papers (474,45.4%); (b) the publication distribution fluctuated over the 50 year period but the moving average depicted a steady incremental trend; (c) a total of 506 authors contributed to 1,045 publications and 309 are one-time authors' (d) the active authors in HSS were in the Department of Economic, Department of Psychology, Department of Population Studies, Department of History, and Department of Social Development Studies; (e) most of the research output was single-authored; and (f) the main subject areas actively researched upon were developmental issues to governance, economics and gender studies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

### 1.1 Background

The School of Humanities and Social Sciences is one of the foundation Schools of the University. The purpose of establishing the School was to alleviate the national manpower shortage in the fields of social sciences and humanities by providing a broadly-based degree that would equip graduates to respond constructively and flexibly to the developing

requirements of the public and private sectors. The School of Humanities and Social Sciences consists of the following departments:

1. Department of Development Studies and Mass Communication
2. Department of Economics
3. Department of History
4. Department of Literature and Languages
5. Department of Philosophy and Applied Ethics
6. Department of Psychology
7. Department of Social Development Studies
8. Departments of Political and Administrative Studies

The School offers both four-year undergraduate and postgraduate programs. Up to 2004 the School had awarded more than 2,766 degrees and about 250 diplomas.

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Humanities and Social Sciences (HSS) from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to SHSS was obtained from the Registrar; and formers faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in an MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

## 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this

study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Also there may be papers which had been cited and were available online but the software did not retrieve those. For example, there are seven papers of Mumtaz A. Anwar which had been cited in one paper (Khan, et al, 1998) but the software did not count those citations. Some of the faculty members publish in local languages or in local non-humanities and social science journals with the possibility of not being cited due to non-visibility. The trend of self-citation and citation of close colleagues was found in some authors with the possibility of making their scores higher than others.

## 1.5 Results and Discussions

### 1.5.1 Growth of Literature

A total of 1249 publications were retrieved and collated from the various sources. The publications were grouped into ten 5-year periods (Table 1). The publication trend started low at 47 during the embryonic period (1966-1970), where only a few authors had begun to publish their works. The number of publications began to increase from 1977 and continued at a steady rate up to 1999. Publication contributions in HSS peaked between 1997, 2007, 2013 and 2015. The average publications produced per year was about 24. When the distribution of publications was plotted graphically with calculated trendline and moving average (Figure 1), the 50-year period generally indicated a positive upward trend of publication productivity and it is further predicted that this trend could continue in the future. The moving average depicted an unstable, upward trendline ( $y = 0.9828x - 0.7004$ ,  $R_2 = 0.7186$ ). Cumulatively the period between 1996 and 2015 was the most productive period for SHSS contributors (Table 1).

Table 1: Research productivity of HSS faculty by year of publication

	Frequency	Percent	Valid Percent	Cumulative Percent
	1966-1970	47	3.8	3.9
	1971-1975	14	1.1	5.0
	1976-1980	35	2.8	7.9
	1981-1985	83	6.6	14.7
	1986-1990	114	9.1	24.1
Valid	1991-1995	161	12.9	37.3
	1996-2000	163	13.1	50.7
	2001-2005	162	13.0	64.0
	2006-2010	175	14.0	78.3
	2011-2015	264	21.1	100.0
	Total	1218	97.5	100.0
Missing	System	31	2.5	
Total		1249	100.0	

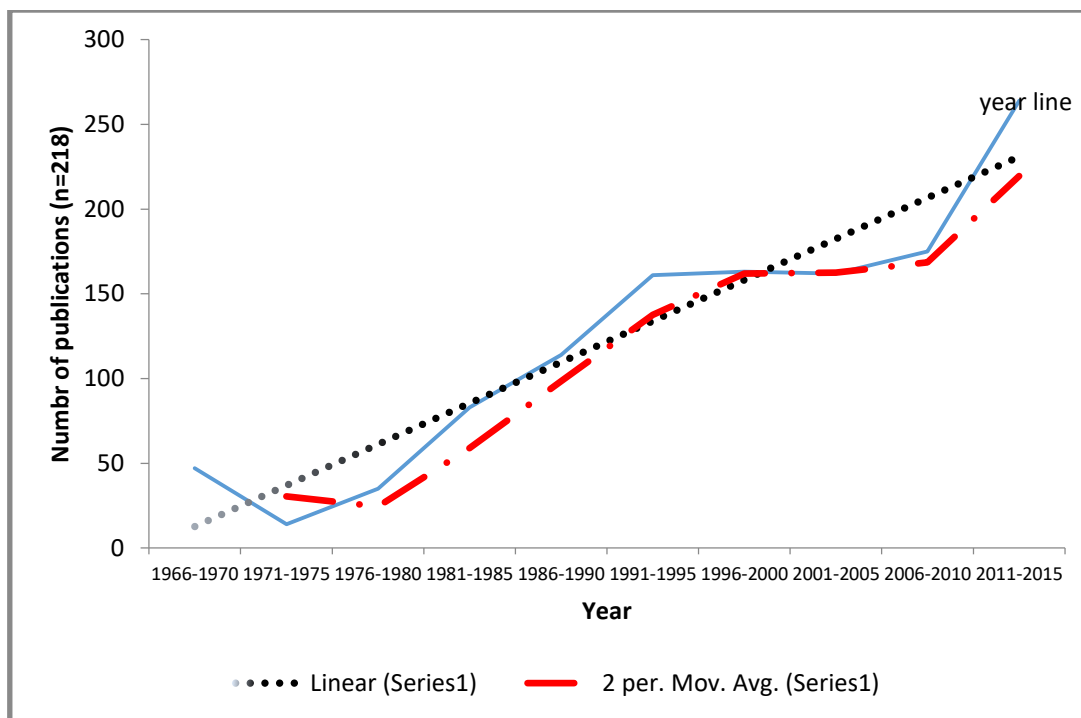


Figure 1: Five year-wise distribution of publications

### 1.5.2 Type of Publications

Table 2 reveals that scholarly journal articles (64.6%) were the most popular channel for communication amongst HSS authors, followed by books (15.3%), conference papers (7.8%), book chapters (3.8%), and miscellaneous publications (8.5%), consisting of technical reports, unpublished reports, book reviews, poster presentations, contribution to an encyclopedia, abstracts, and modules. Figure 2 shows the research publication trends regarding the type of publication preferred by the HSS faculty. On one hand, journal articles have dominated the types of publications produced by HSS faculty during the 50 year period have revealed an increasing trend. On the hand, publication of books has seen an up-and-down trend while there is been stagnation in book chapters miscellaneous publications.

Table 6.2: Type of publication

	Frequency	Percent	Cumulative Percent
Articles	807	64.6	64.6
Monographs	191	15.3	79.9
Miscellaneous	106	8.5	88.4
Conference papers	98	7.8	96.2
Book chapters	47	3.8	100.0
Total	1249	100.0	

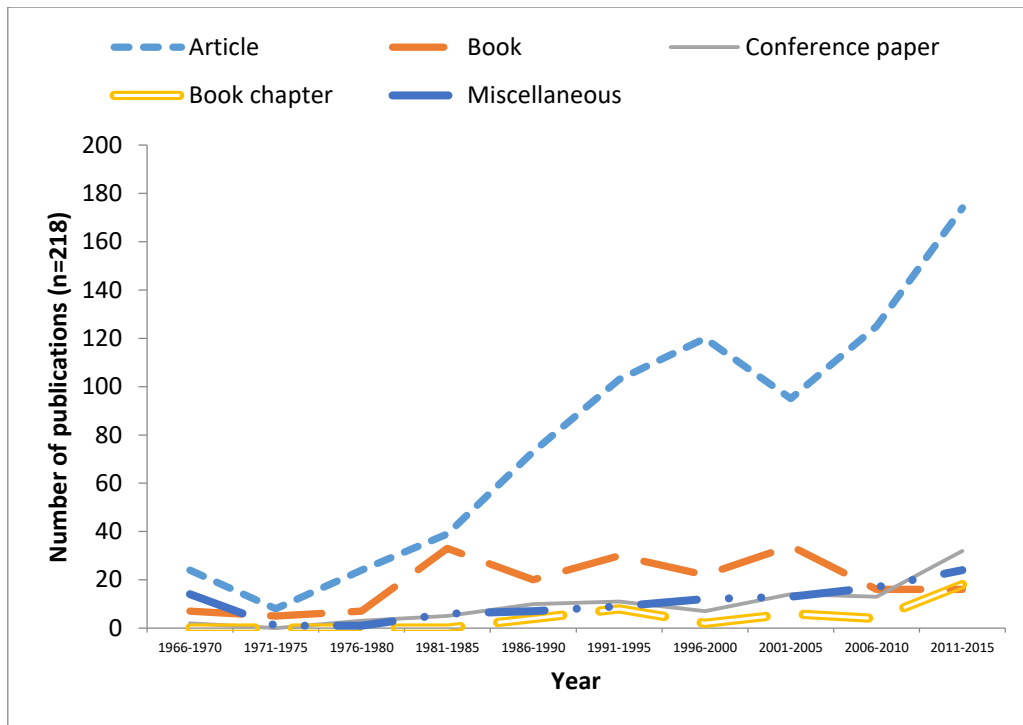


Figure 2: Trends in publication of types

### 1.5.3 Research Productivity by Department

Table 3 shows the distribution of publications by department. The most productive department was Psychology (23.3%), followed by Social Development Studies (15.4%), History (13.2%), Development Studies (11.8%), Economics (9.0%), Political and Administrative Studies (7.6%), Mass Communication (5.4%), and Literature and Language (5.0%).

Table 3: Departmental wise distribution of publications

	Frequency (n=1249)	Percent	Cumulative Percent
Psychology	291	23.3	23.3
Social Development Studies	192	15.4	38.7
History	165	13.2	51.9
Development Studies	147	11.8	63.7
Economics	113	9.0	72.7
Political & Administrative Studies	95	7.6	80.3
Mass Communication	68	5.4	85.7
Literature & Language	63	5.0	90.8
Philosophy	44	3.5	94.3
Population Studies	41	3.3	97.6
Gender Studies	30	2.4	100.0
Total	1249	100.0	

### 1.5.4 Authorship Patterns

Table 4 shows that most of the published works were single authored works (975; 78.1%). About 21.9% (274) of publications were multi-authored. One hundred and twenty-four (9.9%) publications were authored by two authors while the rest were authored by three or more authors. One conference paper was authored by 12 authors and another two was authored by five co-authors (Figure 3). When the authorship pattern was plotted graphically and chronologically for the 50-year period, the overwhelming predominance of single authored works was clearly indicated (Figure 6.3). The number of joint authored works seemed to be increasing steadily right from 1966 onwards and this number is expected to increase in future.

Table 4: Number of authors per publication

	Frequency	Percent	Cumulative Percent
1	975	78.1	78.1
2	124	9.9	88.0
3	64	5.1	93.1
4	32	2.6	95.7
5	25	2.0	97.7
6	13	1.0	98.7
7	6	.5	99.2
8	4	.3	99.5
10	4	.3	99.8
11	1	.1	99.9
12	1	.1	100.0
Total	1249	100.0	

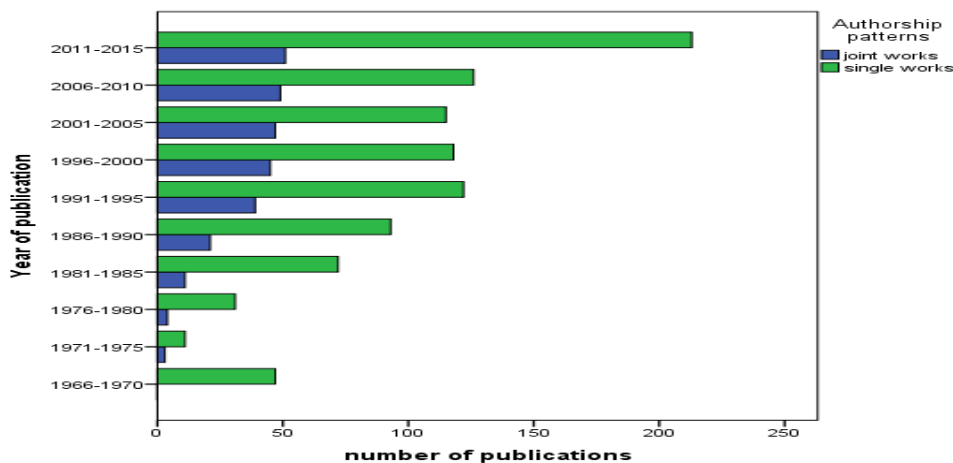


Figure 3: Authorship patterns in the five-year bands

### 1.5.5 Degree of Author Collaboration

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the HSS researchers, using the formula:

$$C = \frac{Nm}{Ns}$$

Where C=collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.22. This result reveals that there is very little collaboration among faculty in HSS. Further analysis was conducted to determine whether there were any significant differences between departments regarding the degree collaboration among the HSS faculty. Kruskal-Wallis test results of  $\chi^2=166.476$ ;  $df=10$ ;  $p=0.001$  revealed that there were significant differences between HSS departments regarding their degree of collaboration. However, Table 6.5 reveals that collaboration coefficient (CC) was significant only in Department of Economics (0.53). The rest of the nine departments recorded collaboration coefficients less than 0.05. The Department of History and the Department of Literature and Languages recorded the lowest collaboration coefficient of 0.02 each.

Table 5: Collaboration coefficient across departments

		Authorship patterns		Total	CC
		single works	joint works		
Department	Psychology	201	90	291	0.31
	Social Development Studies	135	57	192	0.30
	History	162	3	165	0.02
	Development Studies	121	26	147	0.18
	Economics	53	60	113	0.53
	Political & Administrative Studies	83	12	95	0.13
	Mass Communication	63	5	68	0.07
	Literature & Language	62	1	63	0.02
	Philosophy	42	2	44	0.05
	Population Studies	31	10	41	0.24
	Gender Studies	22	8	30	0.27
Total	975	274	1249	0.22	

The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented in Table 6.6. In the first five year period (1966-1970) there was no collaboration. The collaboration coefficient over the years, 1966-2015, varied from 0.11 to 0.29, with a mean value of 0.1994.

Table 6: Degree of collaboration over the five-year bands

		Authorship patterns		Total	CC <sup>a</sup>
		single works	joint works		
Year of publication	1966-1970	47	0	47	0.00
	1971-1975	11	3	14	0.21
	1976-1980	31	4	35	0.11
	1981-1985	72	11	83	0.13
	1986-1990	93	21	114	0.18
	1991-1995	122	39	161	0.24
	1996-2000	118	45	163	0.28
	2001-2005	115	47	162	0.29
	2006-2010	126	49	175	0.28
	2011-2015	213	51	264	0.19
Total		948	270	1218	0.22

<sup>a</sup>CC= collaboration coefficient

### 1.5.6 Core Research Areas

Two thousand, seven hundred and thirty-six keywords (terms) were extracted from the 948 titles using the VOSviewer software. The terms were subject to further a filtration process to select only terms that met a minimum occurrence of 5 times. One hundred and twenty-nine terms met this threshold. For each of the 129 terms, a relevance score was calculated based on this score 77 most relevant terms were selected. These 77 terms were grouped into 10 clusters (Figure 4). These are: cluster 1 consisting of studies relating to democracy (26), experience (17), history (15), medium (13), ethics (12), governance (11), third republic (9), comparative studies (7), independence (7), death (6), reality (6), bullying (5), and Zambians (5). Cluster 2 consisted of studies to environment (16), change (10), employment (8), human development (8), constraints (7), urban i8nformal sector (7), opportunities (7), decentralization (6), Lusaka city (6), focus (6), and studies relating to psychological development (5). Cluster 3 consisted of 10 items: culture (24), disability (17), country (15), cooperation (11), aspect (11), disabled child (8), young person (7), intelligence (6), and reproductive health (5). Cluster 4 consisted of 9 items: studies on care (23), effect (19), adolescents (13), quality of life (6), mental health (5), removal (5), stress (5), Malawi (5), and user fees (5). Cluster 5 consisted of 7 items: context (21), students (15), gender (11), schooling (7), rural Zambia (6), participatory appropriation (5), and study designs (5). Cluster 6 consisted of 7 items: AIDS (24), attitude (15), youth (13), results (9), knowledge (8), behaviour (8), and pilot studies (7). Cluster 7 consists of 7 items: Sub-Saharan Africa (15), Southern Africa (15), influence (13), HIV (12), treatment (9), effectiveness (8), and association (7). Cluster 8 consisted of 5 items: studies relating to the African university (6), issues (23), psychology (11), person (9), and contributions (6). Cluster 9 consisted of 4 items: child (57), perceptions (20), difficulties (11), and Zambian child (5). Cluster 10 consisted of 3 items relating to studies on behaviour (15), health (14), and young women (5).

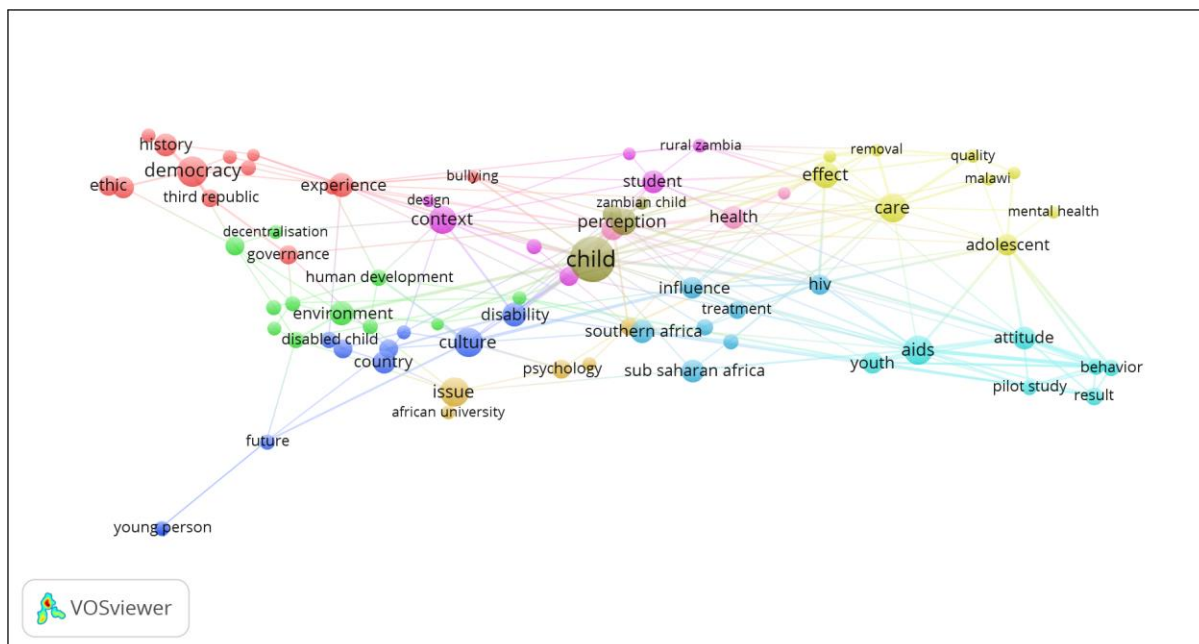


Figure 4: An interdisciplinary network of the 77 most productive subject areas in humanities and social sciences research

## 1.6 Conclusion

The results of this study have drawn a number of conclusions. Firstly, research output in HSS began at a very slow rate between 1966 and 1970 and slightly increased over the years. Overall, research output in the 50-year period under study is characterized by irregular upward increase. Secondly, the journal is the primary channel of used to communicate research output by most HSS researchers. Thirdly, HSS research output is predominantly single-authored resulting into a low collaboration coefficient. Collaborative effort among researchers is expected to remain low in the future as the number of single-authored works is still dominates each year even though multi-authorship is slowly increasing.

This study has revealed much information that may be useful to researchers and scholars in HSS, as well as policy makers to provide adequate facilities to support research activities towards the development and growth of HSS research publications at UNZA. Moreover, hopes to encourage other researchers to explore other local areas of possible improvement and expansion in the field.

The current study has only focused on HSS publications obtained from online databases, library holdings as captured by Google Scholar, UNZA Library OPACs and on a few faculty's resumes. As such, it is suspected that publications that have not been reported or deposited in libraries may have been missed. Publication outputs in the form of theses, dissertations and final year graduation exercises have been excluded. It is realized that limiting the data sources

may have led to inaccurate analysis and rankings. Further studies, covering all HSS published works that has been incorporated into foreign and local databases, could greatly complement this study and provide a more complete picture of HSS publication contributions in the field of library and information science.

## References

## Bibliometric Analysis of Research Activity of University of Zambia School of Law

Christine W. Kanyengo, Silimesii Kabilwa, Ellah Twaambo and Fatima Mandu

### 1.0 Abstract

The chapter provides a picture of the University of Zambia School of Law academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by School of Law academic staff published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

### 7.1 Background

The School of Law has been operational for over forty years and continues to enjoy recognition not only as one of the oldest schools in the University but also as the most prestigious law school in the country. The School has during its existence educated and graduated the majority of our prominent lawyers currently in Government and the private sector. Many of its alumni also enjoy recognition as outstanding scholars in the diaspora.

The vision of the School of Law is to be nationally and internationally a respected leading academic centre totally dedicated to the pursuit of excellence in teaching, in learning, and in research and other creative endeavours aimed at the advancement of the frontiers of knowledge; and to be a significant contributor in the qualitative and quantitative continuous development and improvement of the human resource capacity of the nation, Africa and the world at large. The School offers both undergraduate and postgraduate programs.

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Law from 1972 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to School of Law was obtained from the Registrar; and former faculty were also traced from the University calendars of the past years from 1972 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

## 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the faculty members publish in local journals with the possibility of not being cited due to non-visibility.

## 1.5 Results and Discussions

### 1.5.1 Growth of Literature

A total of 185 publications were retrieved and collated from the various sources. The average publications produced per year was about 4. The highest number (13) of publications was recorded in 1998 while in some years only one publication was produced. The publications were grouped into nine 5-year periods (Table 1). The publication trend started at 18 during the period 1972-1976, but dropped to 9 in the period 1977-1981. The number of publications picked up again from 1987-1991 to 1992-1996 period. Thereafter the research productivity began to decline. When the distribution of publications was plotted graphically with calculated trendline (Figure 1), the 44-year period generally

indicated an up and downward trend of publication productivity. The results depicted a very unstable trendline ( $y = 0.9828x - 0.7004$ ,  $R_2 = 0.7809$ ).

Table 1: Research productivity of SAS faculty by year of publication

	Frequency	Percent	Valid Percent	Cumulative Percent
1972-1976	18	9.7	9.8	9.8
1977-1981	9	4.9	4.9	14.7
1982-1986	13	7.0	7.1	21.7
1987-1991	11	5.9	6.0	27.7
1992-1996	25	13.5	13.6	41.3
1997-2001	37	20.0	20.1	61.4
2002-2006	34	18.4	18.5	79.9
2007-2011	26	14.1	14.1	94.0
2012-2015	11	5.9	6.0	100.0
Total	184	99.5	100.0	
Missing	1	.5		
Total	185	100.0		

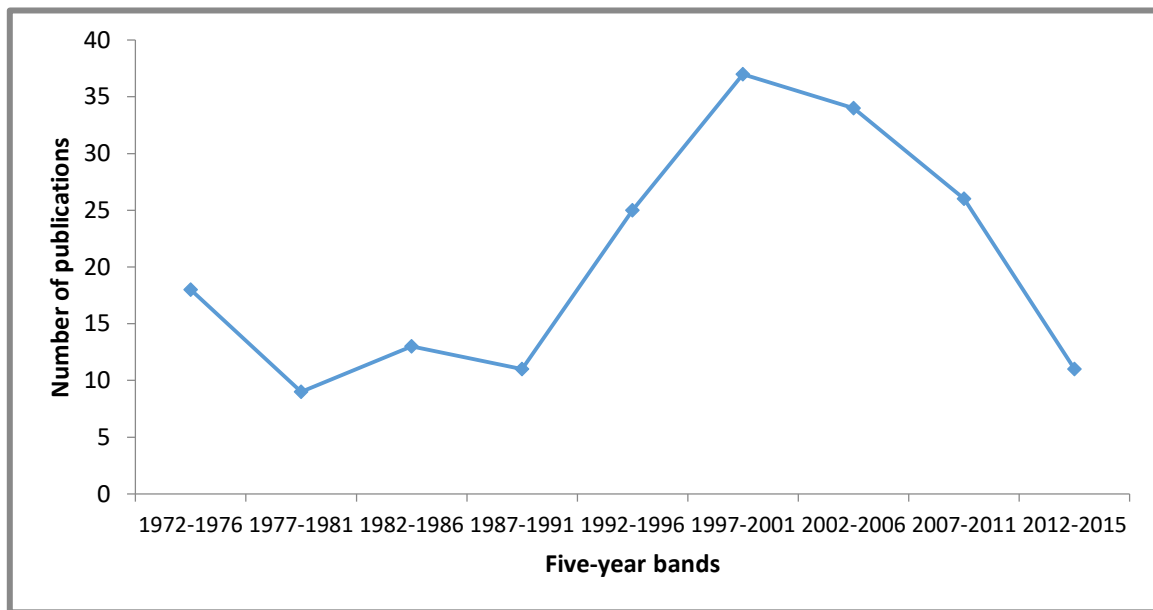


Figure 1: Five-year-wise distribution of research output of the School of Law

### 1.5.2 Type of Publications

Table 2 reveals that scholarly journal articles (46.1%) were the most popular channel for communication amongst SAS authors, followed by monographs (19.6%), conference papers (19.0%), and technical reports (10.3%). Other publications include abstracts (1.8%), oral presentations (1.1%), rapid communication (1.1%), poster presentations (0.6%), and discussion papers (0.4%). Figure 6.2 shows the research publication trends regarding the type of publication preferred by the SAS faculty. On one

hand, journal articles have dominated the types of publications produced by SAS faculty during the 31-year period. On the other hand, publication of monographs (books) and conference papers has seen a general upward trend. Publication of technical reports, which had dominated the early years, has been on decline.

Table 7.2: Type of publication

### 1.5.3 Author Productivity and authorship Patterns

Table 3 shows that most of the published works were single-authored works (148; 80.0%); only 20.0% (37) of publications were multi-authored. Nineteen (10.3%) publications were two-authored, 9 (4.9%) were three-authored, 5 (2.7%) were four-authored, 2 (1.1%) were five-authored, one publication was eight-authored, and another publication was ten-authored.

Table 3: Number of authors per publication

	Frequency	Percent	Cumulative Percent
1	148	80.0	80.0
2	19	10.3	90.3
3	9	4.9	95.1
4	5	2.7	97.8
5	2	1.1	98.9
8	1	.5	99.5
10	1	.5	100.0
Total	185	100.0	

### 1.5.5 Degree of Author Collaboration

When the authorship pattern was cross-tabulated against five-year research productivity bands for the 44-year period, the overwhelming predominance of single-authored works was clearly indicated (Table 4). This trend is expected to increase in the future.

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the HSS researchers, using the formula:

$$C = \frac{Nm}{Ns}$$

Where  $C$ =collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.20. This result reveals that there is very high degree of lack of collaboration among faculty in the School of Law. Table 4 also shows the collaboration coefficient of the faculty in the School of Law over the 44 years under review. The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented in Table 4. The collaboration coefficient over the years, 1972-2015, varied from 0.00 to 0.32, with a mean value of 0.15. No collaborative publications were produced in the periods 1977-1981 and 1987-1991.

Table 4: Authorship patterns of the School of Law faculty, 1972-2015

Distribution of research output in five-year bands	Collaboration patterns		Total	CC
	single-authored	multi-authored		
1972-1976	17	1	18	0.06
1977-1981	9	0	9	0.00
1982-1986	12	1	13	0.08
1987-1991	11	0	11	0.00
1992-1996	19	6	25	0.24
1997-2001	27	10	37	0.27
2002-2006	23	11	34	0.32
2007-2011	19	7	26	0.27
2012-2015	10	1	11	0.09
Total	147	37	184	0.20

## 1.6 Conclusion

The results of this study have drawn a number of conclusions. Firstly, research output in the School of Law has been characterized by up-and-down trends over the 44-year period under review. Secondly, the journal is the primary channel of communication by most School of Law researchers. Thirdly, the School of Law research output is predominantly single-authored resulting into a very low collaboration coefficient. Collaborative effort among researchers is expected to remain very low in the future as the number of single-authored works has continued.

This study has revealed much information that may be useful to researchers and scholars in the School of Law, as well as policy makers to provide adequate facilities to support research

activities towards the development and growth of School of Law research publications at UNZA. Moreover, it is hoped this study will encourage researchers to explore other local areas of possible improvement and expansion in the field of law.

The current study has only focused on the School of Law publications obtained from online databases, and the library holdings as reported in online library OPACs. As such, it is suspected that publications that have not available on the Web or deposited in UNZA Library may have been missed. Furthermore, publication outputs in the form of theses, dissertations and final year graduation exercises have been excluded in this study. It is realized that limiting the data sources may have led to inaccurate analysis and rankings. Further studies, covering all School of Law published works that has been incorporated into foreign and local databases, could greatly complement this study and provide a more complete picture of the School of Law publication contributions.

## References



# Mapping Research Output of the University of Zambia School of Medicine

Akakandelwa Akakandelwa and Christine W. Kanyengo

## 8.0 Abstract

The chapter provides a picture of the University of Zambia School of Medicine academic staff's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by School of Medicine academic staff published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

## 1.1 Background

The School of Medicine was established in 1965, with its first intake in 1966. It obtained its establishment as an independent School of the University Zambia in 1970. The first output of graduates with full medical qualification was in 1973. Since then, the School has presented over 1 200 medical doctors 1 the award of its joint degrees of Bachelor of Medicine and Bachelor Surgery. In 1981 it commenced postgraduate programmes leading to high degrees in a number of Clinical areas. The Master of Medicine programme is now offered in Surgery, Obstetrics and Gynaecology, Paediatrics: Child Health, Medicine and Orthopaedic Surgery. A Master of Public Health programme has been offered since the 1994/95 academic year. The School is also responsible for the higher level training and education of nurses and offers a four-year programme leading to the award of Bachelor of Science degree in Nursing.

The School has the following departments:

1. Anatomy
2. Biomedical Sciences
3. Nursing Sciences
4. Medical Education Development
5. Obstetrics and Gynaecology

6. Paediatrics and Child Health
7. Pathology and Microbiology
8. Pharmacy

9. Physiotherapy
10. Psychiatry
11. Public Health
12. Surgery
13. Internal Medicine

## 8.2 Study Objectives

The main objective of the study was to establish research productivity of the academic staff in the School of Medicine from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from PubMed. A list of members of staff belonging to School of Medicine was obtained from the Registrar; and formers faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from PubMed by searching using the search terms “University of Zambia” and School of Medicine” in the Affiliation field. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

## 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from PubMed. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. Some of the academic staff publish in local journals with the possibility of not being cited due to non-visibility.

## 1.5 Results and Discussions

### 1.5.1 Growth of Literature

A total of 341 publications were retrieved and collated from Medline. The publications were grouped into ten 5-year periods (Table 1). The publication trend started low at 20 during the period 1988-1992). The number of publications increased to 35 in the 1993-1997 period, but dropped to 23 in the 1998-2002 period. Publication contributions in School of Medicine peaked between 2013 and 2015. The

average publications produced per year was about 12. When the distribution of publications was plotted graphically with calculated trendline (Figure 8.1), the 28-year period generally indicated a positive upward trend of publication productivity and it is further predicted that this trend could continue in the future. The moving average depicted a stable, upward trendline ( $y = 21.2x - 17.3$ ,  $R^2 = 0.6814$ ). Cumulatively the period between 2013 and 2015 was the most productive period for School of Medicine contributors (Table 1), with an annual average of 48. Faculty produced the highest number (82) of publications in the year 2015.

Table 1: Five year-wise distribution of publications of Medical faculty

	Frequency	Percent	Cumulative Percent
1988-1992	22	6.5	6.5
1993-1997	39	11.4	17.9
1998-2002	24	7.0	24.9
2003-2007	35	10.3	35.2
2008-2012	74	21.7	56.9
2013-2015	147	43.1	100.0
Total	341	100.0	

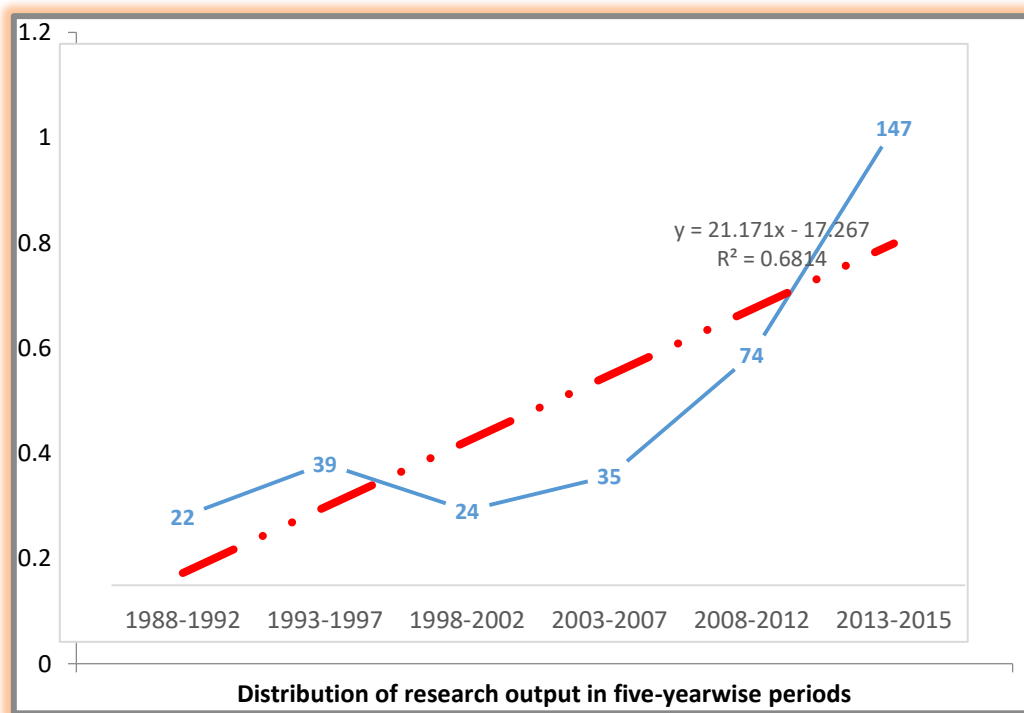


Figure 1: Five year-wise distribution of publications

### 1.5.2 Type of Publications and channels of communications.

All of the publications produced by faculty in the School of Medicine were journal articles. The most preferred communication channel for staff in the School of Medicine is therefore journals. Researchers published their research output in 341 journals. Table 8.2 shows the top 20 journals ranked accordingly. These are the Trop Doct, PLoS One, BMC Health Serv Res, BMC Infect Dis, BMC Public Health, J Acquir Immune Defic Syndr, Lancet, Am J Trop Med Hyg, Clin Infect Dis, Int J Tuberc Lung Dis, Malar J, Trans R Soc Trop Med Hyg, BMC Res Notes, J Trop Med Hyg, Trop Med Int Health, AIDS, Br J Urol, Epilepsy Behav, Med J Zambia, and Vet Parasitol. It is gratifying to observe that among these twenty journals is a local journal, the Med J Zambia.

Table 2: Top 20 journals in which faculty frequently publish their research output

Rank		Frequency	Percent
1	Trop Doct	15	4.4
2	PLoS One	13	3.8
3	BMC Health Serv Res	7	2.1
	BMC Infect Dis	7	2.1
	BMC Public Health	7	2.1
	J Acquir Immune Defic Syndr	7	2.1
	Lancet	7	2.1
4	Am J Trop Med Hyg	6	1.8
	Clin Infect Dis	6	1.8
	Int J Tuberc Lung Dis	6	1.8
	Malar J	6	1.8
	Trans R Soc Trop Med Hyg	6	1.8
5	BMC Res Notes	5	1.5
	J Trop Med Hyg	5	1.5
	Trop Med Int Health	5	1.5
6	AIDS	4	1.2
	Br J Urol	4	1.2
	Epilepsy Behav	4	1.2
	Med J Zambia	4	1.2
	Vet Parasitol	4	1.2

### 1.5.3 Author Productivity and Collaboration Patterns

Table 3 shows that most of the published works were multi-authored works (306; 89.7%); only 10.3% (35) of publications were single-authored. Thirty-two (9.4%) publications were two-authored, 46 (13.5%) were three-authored, 35 (10.3%) were four-authored, 38 (11.1%) were five-authored and 155 (45.5%) were authored by more than five authors each.

Table 3: Number of authors per publication

Number of authors	Frequency	Percent	Cumulative Percent
1	35	10.3	10.3
2	32	9.4	19.6
3	46	13.5	33.1
4	35	10.3	43.4
5	38	11.1	54.5
6	33	9.7	64.2
7	30	8.8	73.0
8	22	6.5	79.5
9	17	5.0	84.5
10	21	6.2	90.6
11	11	3.2	93.8
12	3	.9	94.7
13	7	2.1	96.8
14	2	.6	97.4
16	3	.9	98.2
17	1	.3	98.5
18	1	.3	98.8
19	1	.3	99.1
22	1	.3	99.4
24	1	.3	99.7
26	1	.3	100.0
Total	341	100.0	

When the authorship pattern was crossed tabulated against five-year bands for the 28-year period, the overwhelming predominance of multi-authored works was clearly indicated (Table 4). The number of joint authored works increased rapidly from 1985 to 2015, and this trend is expected to increase in future.

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the HSS researchers, using the formula:

$$C = \frac{Nm}{Ns}$$

Where C=collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.90. This result reveals that there is a very high degree of collaboration among faculty in the School of Medicine. Table 4 also shows the collaboration coefficient of the School of Medicine faculty over the 28 years under review. The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented

in Table 4. The results reveal that the collaboration coefficient over the entire period increased steadily from 0.68 to 0.90, with a mean value of 0.82. The highest collaboration coefficient (0.99) was recorded in 2013-2015 when, out of 146 publications, only one publication was single-authored.

Table 4: Authorship patterns of the SAS faculty, 1975-2015

Five year bands	Collaboration patterns		Total	CC <sup>a</sup>
	Single-authored	Multi-authored		
1988-1992	7	15	22	0.68
1993-1997	10	29	39	0.74
1998-2002	6	18	24	0.75
2003-2007	5	30	35	0.86
2008-2012	6	68	74	0.92
2013-2015	1	146	147	0.99
Total	35	306	341	0.90

<sup>a</sup>CC= collaboration coefficient

Further analysis was conducted to establish the extent to which the School of Medicine faculty collaborated with other researchers outside Zambia. Table 5 below shows that the School of Medicine faculty collaborated with researchers from 17 countries. The major collaborators can from USA (36; 45.0%), followed by UK (21; 26.3%), South Africa (6; 7.5%), Malawi (3; 3.8%), and Zimbabwe (2; 2.5%). Other countries were Canada, China, Denmark, France, Germany, Nigeria, Norway, Pakistan, Saudi Arabia, Tanzania, and Uganda. These results demonstrate that faculty in the School of Medicine collaborate with researchers at international level, mainly in Europe and USA. This main due mainly due to the availability of expertise, laboratory facilities and funding from these regions.

Table 5: Country of origin of researchers collaborating with School of Medicine faculty

SN		Frequency	Percent
1	USA	36	45.0
2	UK	21	26.3
3	South Africa	6	7.5
4	Malawi	3	3.8
5	Zimbabwe	2	2.5
6	Botswana	1	1.3
7	Canada	1	1.3
8	China	1	1.3
9	Denmark	1	1.3
10	France	1	1.3
11	Germany	1	1.3
12	Nigeria	1	1.3
13	Norway	1	1.3
14	Pakistan	1	1.3
15	Saudi Arabia	1	1.3
16	Tanzania	1	1.3
17	Uganda	1	1.3
	Total	80	100.0

#### 1.5.4 Subject Coverage

Eight thousand, one hundred and thirty-nine keywords (terms) were extracted from the 341 articles' abstracts, using the VOSviewer software. The terms were subject to further filtration process to select only terms that met a minimum occurrence of 10 times. One hundred and sixty terms met this threshold. These terms were grouped into 5 clusters (Figure 2). Cluster 1 had 58 terms consisting of studies relating to access (23), attitude (20), availability (18), barriers (17), caregivers (17), challenges (28), communities (72), cost (33), disclosure (13), and epilepsy (21), health facility (29), health system (37), health worker (32), HIV status (22), HIV testing (39), implementation (27), mental distress (28), mental health (15), perceptions (21), practice (58), problems (51), processes (52), health care provision (17), quality (39), relationships (26), stigma (17), stroke (12), and training (29). Some terms relate to research methodologies used. For instance: focus group discussion (12), and in-depth interviews (14); while other terms relate to site of studies such as district (72). Cluster 2 consisted of studies on adherence (23), BMI (12), breastfeeding (19), couple (22), condom use (10), diarrhoea (77), efficacy (27), HIV disease (12), HSV (15), infant (29), man (84), mother (53), pregnancy (40), sex (40), spouse (13), partner (42), and disease transmission (56). Terms related to research methodologies used include placebo (16), trial (39), and baseline studies (16). Other terms relate to treatment e.g. dose (17), ny mil (12), nitazoxanide (13), VMMC (12), antiretroviral therapy (69), day (68), visit (21), and week (58). Cluster 3 consisted of 51 items relating mainly to studies on AIDS (51), cancer (12), fever (22), HIV epidemic (14), HIV negative patients (19), HIV positive patients (32), HIV (36), Kaposi sarcoma (43), maternal death (10), patient (340), response (61), tuberculosis (127), and tuberculosis lymphadenitis (29). Terms related to study sites include UTH (78) while terms related to research methodology included case study (119), trends (21), and time periods like April (12), December (21), and decade (21). Cluster 4 consisted of 25 terms relating to studies on alcohol (13), cigarette and cigarette smoking (91), tobacco (13), truancy (14), diabetes (10), prevalence (130), predictors (20), schistosomiasis (13), hypertension (15), exposure (22) and risk factors (158). The focus of most studies in this cluster was adolescents (70), boys (13), females (38), males (48), pregnant women (23), students (31), and parents (11). Study sites included schools (39). Cluster 5 consisted of 11 terms relating to studies on blood (18), sensitivity (15), testing (29), performance (15), cattle (25), experts (13), PCR (16), DBS (16), and TB patients (15); and includes one study site Kafue (11).

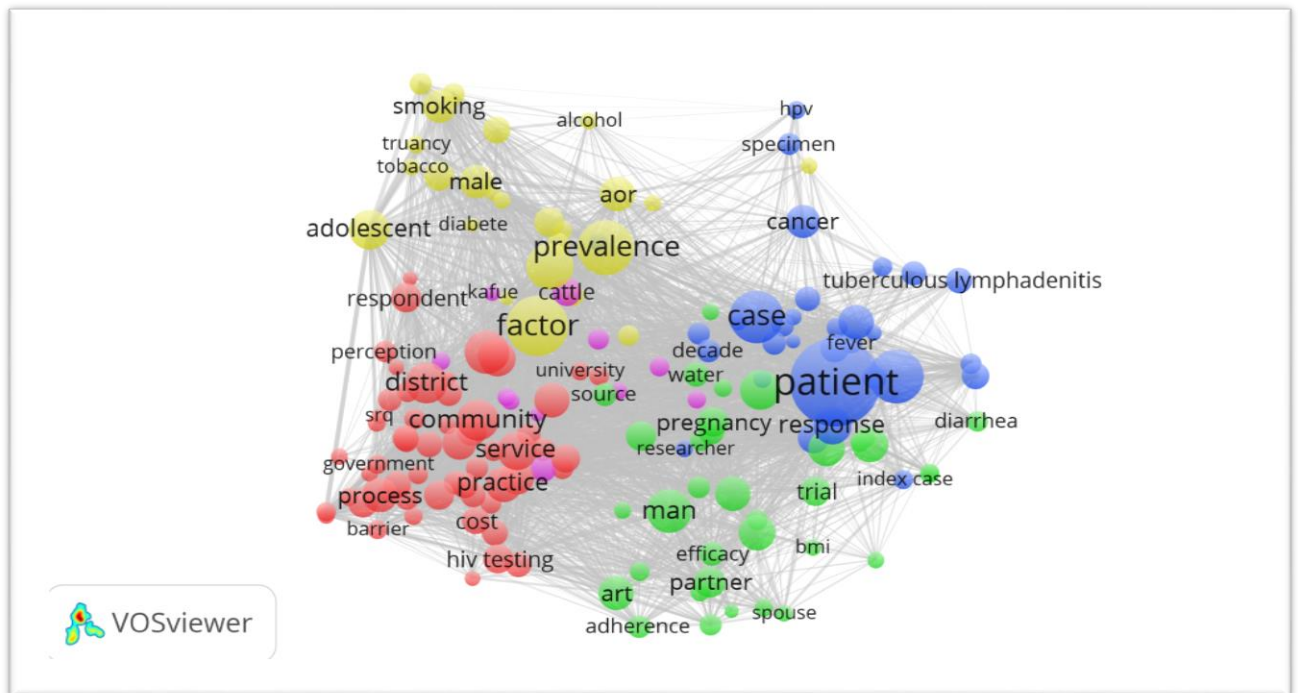


Figure 2: An interdisciplinary network of the 17 most productive medical subject areas in the postgraduate research

## 1.6 Conclusion

This Chapter has reviewed the School of Medicine research output from 1988 to 2015. The research output has increased over the years from two publications in 1988 to 82 publications in 2015 and productivity is expected to continue increasing an exponential rate of 0.7 per annual. The researchers prefer to communicate their research as journal articles mainly in international journals like the Trop Doct, PLoS One, BMC Health Serv Res, BMC Infect Dis, BMC Public Health, J Acquir Immune Defic Syndr, and Lancet. Nearly 90.0% of the published works are multi-authored with a collaboration coefficient of 0.90. The research output covers a wide range of subjects ranging from HIV/AIDS to mental health, drug abuse and staff training.

## References



# Retrospective Analysis of Research Productivity of the University of Zambia School of Natural Sciences Faculty

Akakandelwa Akakandelwa, Kimbo L. Shameenda and Francina N. Makondo

## 1.0 Abstract

The chapter provides a picture of the University of Zambia School of Natural Sciences academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by Natural Sciences academic staff published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

## 1.1 Background

The School of Natural Sciences was established in 1965. The School also offers both undergraduate and postgraduate programs. The School has six departments, namely:

1. Department of Biological Sciences
2. Department of Chemistry
3. Department of Computer Studies
4. Department of Geography
5. Department of Mathematics and Statistics
6. Department of Physics

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Natural Sciences (NS) from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

### 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to School of Natural Sciences was obtained from the Registrar; and former faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

### 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the academic staff publish in local journals with the possibility of not being cited due to non-visibility.

### 1.5 Results and Discussions

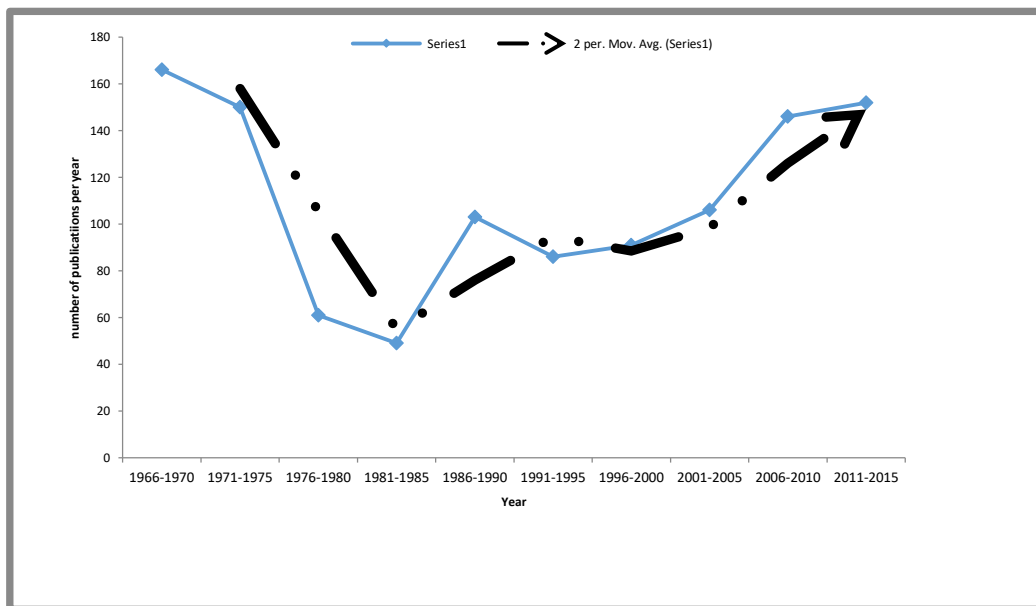
#### 1.5.1 Growth of Literature

A total of 1114 publications were retrieved and collated from the various sources. The publications were grouped into eleven 5-year periods (Table 1). The publication trend started high at 166 during the embryonic period (1966-1970), where a reasonable number of authors had begun to publish their works. However, the number of publications began to drop from 1971 and continued at a rapid rate up to 1985; then slightly increased to 103 publications in the period 1986-1990. Publication contributions in NS recorded an uneven increase from 1986 to 2015. The average publications produced per year was about 22. When the distribution of publications was plotted graphically with calculated trendline and moving average (Figure 6.1), the 50-year period indicated a downward trend of publication productivity from 1966 to 1985 and then a positive upward trend from 1986 to 2015. It is further predicted that this trend

could continue in the future. The moving average depicted an unstable, downward and upward trendline ( $y = 0.92238x - 0.021$ ,  $R^2=0.0239$ ). Cumulatively the period 2001-2015 was the most productive period for SHSS contributors (Table 1).

Table 1: Year of publication

	Frequency	Percent	Valid Percent	Cumulative Percent
1966-1970	166	14.5	15.0	15.0
1971-1975	150	13.1	13.5	28.5
1976-1980	61	5.3	5.5	34.0
1981-1985	49	4.3	4.4	38.4
1986-1990	103	9.0	9.3	47.7
Valid 1991-1995	86	7.5	7.7	55.4
1996-2000	91	7.9	8.2	63.6
2001-2005	106	9.2	9.5	73.2
2006-2010	146	12.7	13.2	86.3
2011-2015	152	13.2	13.7	100.0
Total	1110	96.7	100.0	
Missing System	38	3.3		
Total	1148	100.0		



### 1.5.2 Type of Publications

Figure 1 reveals that scholarly journal articles (90.8%; 1042) were the most popular channel for communication amongst NS authors, followed by conference papers (5.1%; 58), and books (4.2%; 48). Figure 2 shows the research publication trends regarding the type of publication preferred by the NS faculty. On one hand, journal articles have dominated the types of publications produced by NS faculty during the 50 year period have revealed a downward and upward trend. On the hand, publication of

conference papers and books has been extremely low, almost negligible, throughout the whole 50 year period.

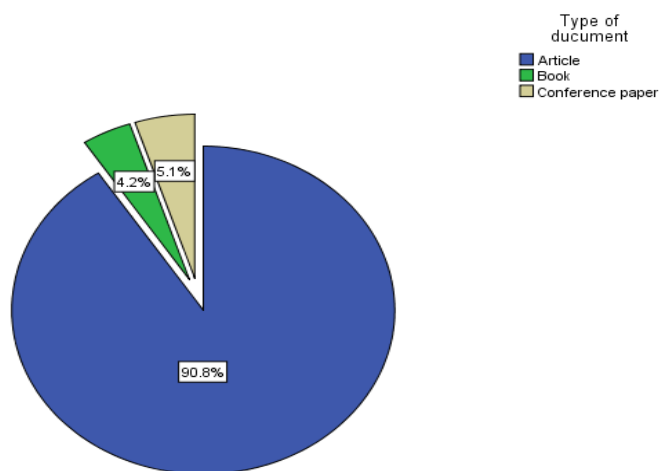
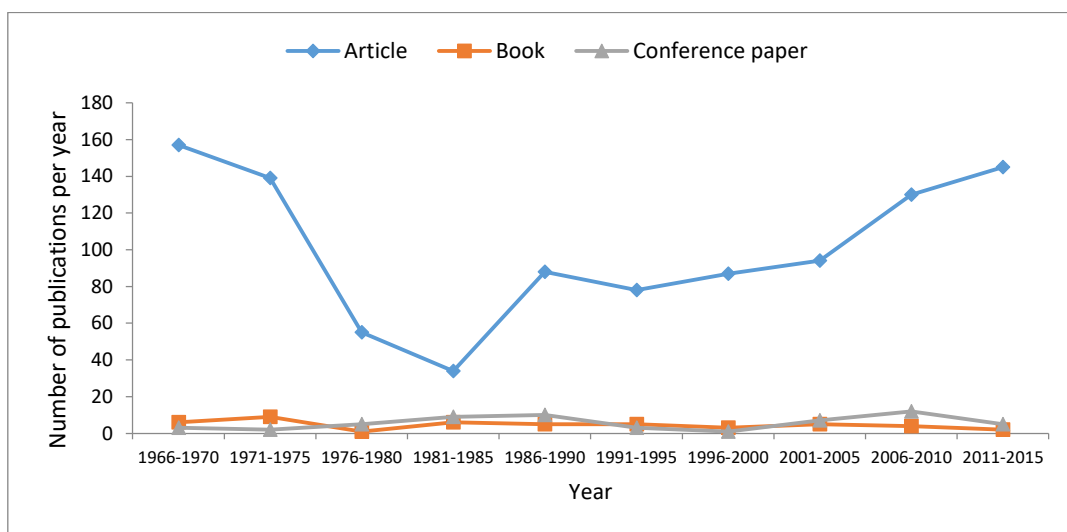


Figure 1: Type of publication



### 1.5.3 Research Productivity by Department

Table 3 shows the distribution of publications by department. The most productive department was Biological Sciences (31.4%), followed by Chemistry (27.1%), Physics (16.1%), Geography (15.0%), Mathematics (9.3%), and last (1.1%).

Table 3: Departmental wise distribution of publications

	Frequency	Percent	Cumulative Percent
Biological Sciences	360	31.4	31.4
Chemistry	311	27.1	58.4
Physics	185	16.1	74.6
Geography	172	15.0	89.5
Mathematics	107	9.3	98.9
Computer Studies	13	1.1	100.0
Total	1148	100.0	

#### 1.5.4 Authorship Patterns

Table 4 shows that most of the published works were multi-authored works (651; 56.7%) while 43.3% (497) were single-authored. Two hundred and fifty-three (22.0%) publications were two-authored works, 157 (13.7%) publications were three-authored works, 96 (8.4%) publications were four-authored works, and 61 (5.3%) publications were five-authored works. The rest (7.3%) were authored by six or more authors each. When the authorship pattern was plotted graphically and chronologically for the 50-year period, single-authored works were predominant in the period 1966-1986 while the period 1996-2015 has recorded an overwhelming predominance of multi-authored works (Figure 10.3). The period 1981-1985 was predominantly characterized by single-authored works while the reversal occurred in the followed decade, 1986-1995. A close look at the period 1986-2015 reveals a zigzag fall in single-authored works. These results indicate that the number of multi-authored works is expected to continue increasing in future.

Table 4: Number of authors per publication

	Frequency	Percent	Cumulative Percent
1	497	43.3	43.3
2	253	22.0	65.3
3	157	13.7	79.0
4	96	8.4	87.4
5	61	5.3	92.7
6	26	2.3	94.9
7	47	4.1	99.0
8	9	.8	99.8
9	2	.2	100.0
Total	1148	100.0	

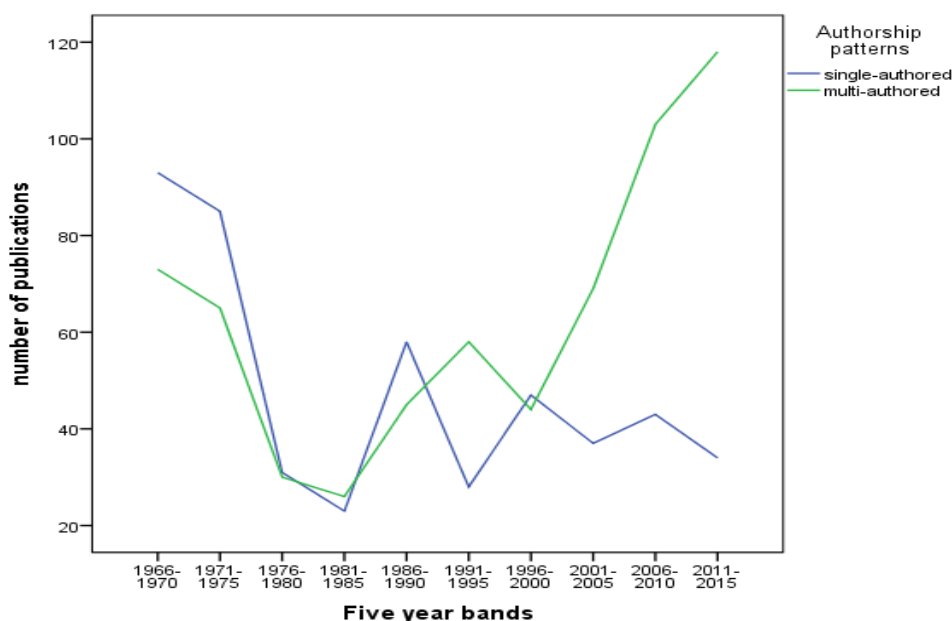


Figure 3: Authorship patterns in the five-year bands

### 1.5.5 Degree of authorship collaboration

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the HSS researchers, using the formula:

$$C = \frac{N_m}{N_s}$$

Where C=collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.57. This result reveals that there has been a moderate high degree of collaboration among faculty in NS during the period under review. Further analysis was conducted to determine whether there were any significant differences between departments regarding the degree collaboration among the HSS faculty. Kruskal-Wallis test results of  $\chi^2=101.314$ ;  $df=4$ ;  $p=0.001$  revealed that there were significant differences between NS departments regarding their degree of collaboration. However, Table 10.5 reveals that collaboration coefficient (CC) was highest in the Department of Computer Studies (0.84), followed by the Department of Chemistry (0.71), the Department of Biological Sciences (0.57), and the Department of Physics (0.51). The two remaining departments, Mathematics and Geography, recorded the lowest collaboration coefficients, 0.49 and 0.33, respectively. These results have revealed that degree of collaboration in NS varies from department to department.

Table 5: Collaboration coefficient across departments

Department	Authorship patterns		Total	CC
	single-authored	multi-authored		
Biological Sciences	156	204	360	0.57
Chemistry	77	234	311	0.71
Physics	91	94	185	0.51
Geography	116	56	172	0.33
Mathematics	55	52	107	0.49
Computer Studies	2	11	13	0.84
Total	497	651	1148	0.57

The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented in Figure 6. There was a low but steady increase in the collaboration coefficient characterised by up-and-down trend in the period 1981-2000. The collaboration coefficient over the years, 1966-2015, varied from 0.44 to 0.71, with a mean value of 0.563.

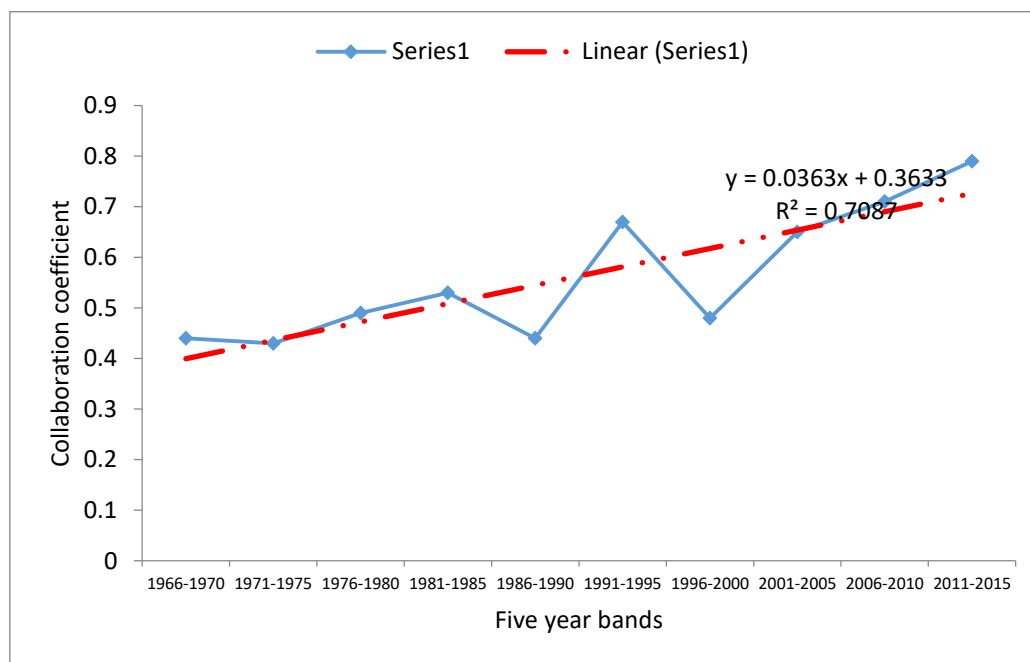


Figure 4: Collaboration coefficient patterns in the five-year bands

### 1.5.6 Core Journals

### 1.6 Conclusion

## References

## Research Output of School of Veterinary Medicine

Dickson Yumba, Christine Kanyengo and Akakandelwa

### 1.0 Abstract

The chapter provides a picture of the University of Zambia School of Veterinary Medicine academic faculty's research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by School of Veterinary Medicine academic staff published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

### 1.1 Background

The School of Veterinary Medicine was established in 1983 with an aim of addressing the critical shortage of qualified veterinary personnel in the country. The School also offers postgraduate programme, a Master's degree (MVetMed). The School has the following departments:

1. Department of Biomedical Sciences
2. Department of Paraclinical Studies
3. Department of Disease Control
4. Department of Clinical Studies

### 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Veterinary Medicine from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty

3. To investigate authorship productivity by department
4. To investigate authorship patterns and research collaboration patterns

### 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to School of Veterinary Medicine was obtained from the Registrar; and former faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

### 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the academic staff publish in local journals with the possibility of not being cited due to non-visibility.

### 1.5 Results and Discussions

#### 1.5.1 Growth of Literature

#### 1.5.2 Type of Publications

#### 1.5.3 Author Productivity

#### 1.5.4 Authorship Patterns

1.5.5 Degree of Author Collaboration

1.6 Conclusion

References



## Research Output of Faculty of the Institute of Economic and Social Research

Akakandelwa Akakandelwa, Christine W. Kanyengo, Mubiana Machwang'i and B. Mumbi

### 1.0 Abstract

The chapter provides a picture of the University of Zambia, Institute of Economic and Social Research (INESOR)'s research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the research output of the academic staff; (b) identifying the most prolific authors; (c) investigating the authorship patterns of the researchers; (d) identifying the collaborative pattern of the authors (e) the main channels of scholarly communication; and (f) the subject covered by the published works. The study confined its scope to the publications produced between 1966 and 2015 by Humanities and Social Science faculty published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

### 1.1 Background

The Institute of Economic and Social Research (INESOR) is a research wing of the University of Zambia. INESOR is located along four kilometers off Great East Road, along Munali Road. It was incorporated into the University in 1965. The Institute carries out both basic (theoretical) and applied research. In addition, the Institute carries out consultancy services in relevant research areas including facilitating the organization of workshops, seminars, and conferences. INESOR was founded in 1938, and by then was known as the Rhodes-Livingstone Institute, initially it had a strong bias towards the social sciences. Since its inception, it has undergone four phases of its name changes. Its major research programs are in Agriculture and Rural Development, Economic and Business, Governance, Health Promotion, Socio-Cultural, and Urban Development.

## 1.2 Study Objectives

The main objective of the study was to establish research productivity of the faculty in the School of Humanities and Social Sciences (HSS) from 1966 to 2015. The specific objectives were to:

1. To investigate the growth of literature
2. To investigate the types of literature mainly published the faculty
3. To investigate authorship productivity
4. To investigate authorship patterns and research collaboration patterns

## 1.3 Data Source and Methodology

The study is based on the data retrieved from Google Scholar, faculty resumes, annual reports, and local bibliographies. A list of members of staff belonging to SHSS was obtained from the Registrar; and formers faculty were also traced from the University calendars of the past years from 1966 to 2015. Publications of the faculty were retrieved from Google Scholar by searching using the faculty's names. All the data collected were compiled into one file in the MS Excel spreadsheet. The data later transferred into SPSS version 20 for analysis.

## 1.4 Limitations of the Study

The present study focuses on faculty publications that could be located from Google Scholar, local bibliographies, annual reports, and collected resumes. Publications in the context of this study, excluded unpublished works such as dissertations and theses and student project reports. As such, citations were collated based on accessible literature only. It is suspected that publications which have not been deposited in libraries may have been missed. It is possible that some publications of these authors may not have been indexed by it. Some of the faculty members publish in local journals with the possibility of not being cited due to non-visibility.

## 1.5 Results and Discussions

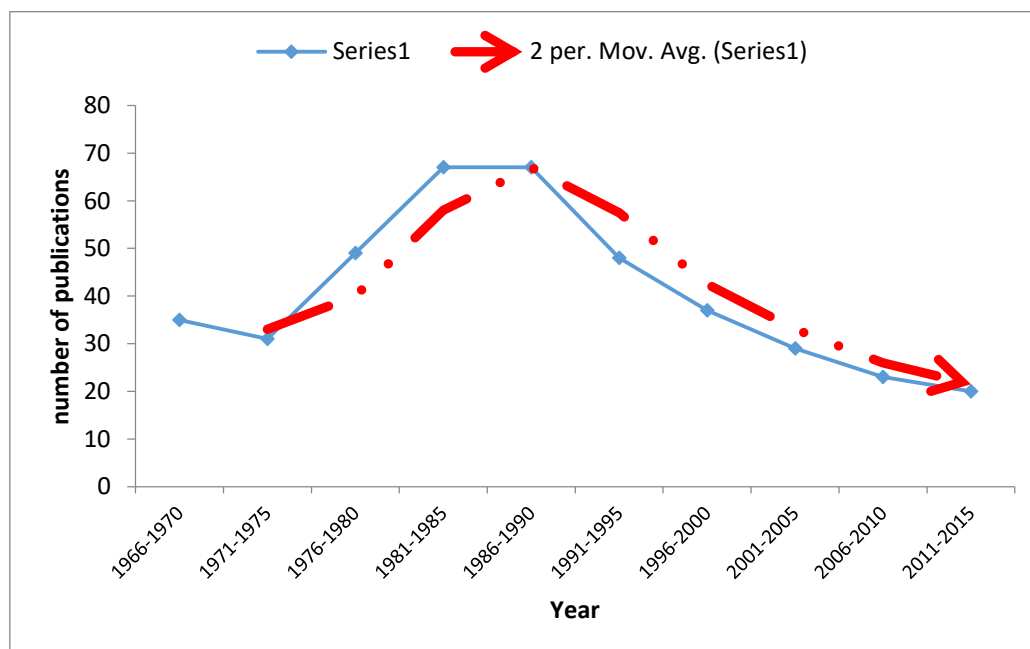
### 1.5.1 Growth of Literature

A total of 406 publications were retrieved and collated from the various sources. The publications were grouped into ten 5-year periods (Table 11.1). The publication trend started low at 35 during the embryonic period (1966-1970), where only a few authors had begun to publish their works. The number of publications declined to 31 during the 1971-75 period; then began to increase from 1976 and continued at a steady rate up to 1990. Publication contributions at INESOR began to decline

progressively from 37 in 1996-2000 period to 20 publications in 2015. The average publications produced per year was about 8. When the distribution of publications was plotted graphically with calculated trendline and moving average (Figure 12.1), the 50-year period initially but begun a downward trend of publication productivity and it is further predicted that this trend could continue in the future. The moving average depicted a stable, downward trendline ( $y = -2.4242x + 53.933$ ,  $R^2 = 0.1921$ ). Cumulatively the period between 1971 and 1980 was the most productive period for SHSS contributors (Table 11.1).

Table 11.1: Year of publication

	Frequency	Percent	Cumulative Percent
1966-1970	35	8.6	8.6
1971-1975	31	7.6	16.3
1976-1980	49	12.1	28.3
1981-1985	67	16.5	44.8
1986-1990	67	16.5	61.3
1991-1995	48	11.8	73.2
1996-2000	37	9.1	82.3
2001-2005	29	7.1	89.4
2006-2010	23	5.7	95.1
2011-2015	20	4.9	100.0
Total	406	100.0	



### 1.5.2 Type of Publications

Table 11.2 reveals that scholarly journal articles (64.6%) were the most popular channel for communication amongst HSS authors, followed by Books (15.3%), conference papers (7.8%), book

chapters (3.8%), and miscellaneous publications (8.5%), consisting of technical reports, unpublished reports, book reviews, poster presentations, contribution to an encyclopedia, abstracts, and modules. Figure 6.2 shows the research publication trends regarding the type of publication preferred by the HSS faculty. On one hand, journal articles have dominated the types of publications produced by HSS faculty during the 50 year period have revealed an increasing trend. On the hand, publication of books has seen an up-and-down trend while there is been stagnation in book chapters miscellaneous publications.

### 1.5.3 Authorship Patterns

Table 11.4 shows that most of the published works were single authored works (320; 78.8%). About 20.2% (86) of publications were multi-authored. Sixty-two (15.3%) publications were two-authored, 20 (4.9%) were three-authored and 4 (1.0%) were four-authored. When the authorship pattern was plotted graphically and chronologically for the 50-year period, the overwhelming predominance of single authored works was clearly indicated (Figure 12.3). The number of joint authored works was generally small throughout the 50 year period characterized by insignificant up and down trend this situation is expected to remain the same in future.

Table 11.4: Number of authors per publication

	Frequency	Percent	Cumulative Percent
1	320	78.8	78.8
2	62	15.3	94.1
3	20	4.9	99.0
4	4	1.0	100.0
Total	406	100.0	

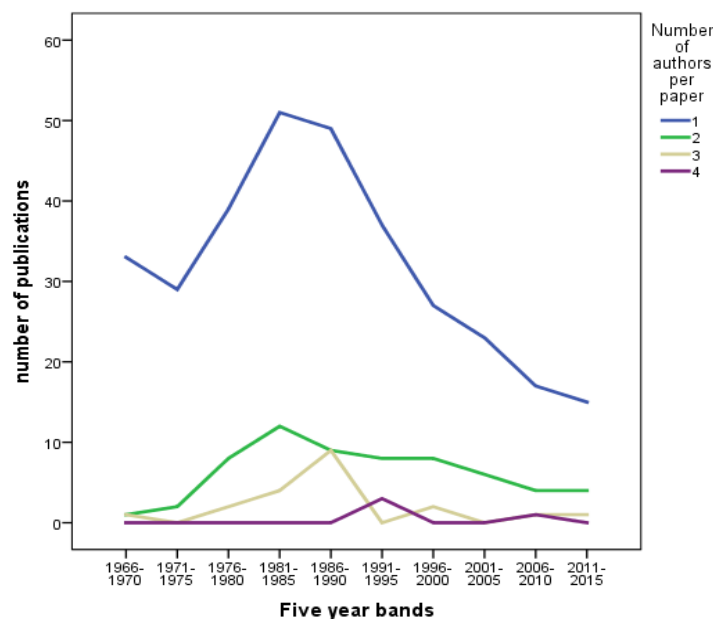


Figure 11.3: Authorship patterns in the five-year bands

#### 1.5.4 Degree of Author Collaboration

Further analysis was conducted to establish the degree of collaboration (collaboration coefficient) among the INESOR researchers, using the formula:

$$C = \frac{Nm}{Ns}$$

Where C=collaboration coefficient,  $N_m$ =number of multi-authored publications, and  $N_s$ =number of single-authored publications.

The result was 0.21. This result reveals that there is very little collaboration among faculty at INESOR. The degree of collaboration in different five-year bands was calculated using the equation above and the results are presented in Table 11.5. The collaboration coefficient over the years, 1966-2015, varied from 0.06 to 0.21, with a mean value of 0.205.

Table 11.5: Degree of collaboration over the five-year bands

Five year bands	Degree of collaboration		Total	CC
	single-authored	multi-authored		
1966-1970	33	2	35	0.06
1971-1975	29	2	31	0.06
1976-1980	39	10	49	0.2
1981-1985	51	16	67	0.24
1986-1990	49	18	67	0.27
1991-1995	37	11	48	0.23
1996-2000	27	10	37	0.27
2001-2005	23	6	29	0.21
2006-2010	17	6	23	0.26
2011-2015	15	5	20	0.25
Total	320	86	406	0.21

#### 1.5.5 Core Journals

### 1.6 Conclusion

#### References



## Mapping Postgraduate Research Output of the University of Zambia

Akakandelwa Akakandelwa, Christine W. Kanyengo, Ahmed Yusuf, and Mubanga Lumpa

### 1.0 Abstract

The chapter provides a picture of the University of Zambia, Postgraduate research output to commemorate the institution's 50<sup>th</sup> Anniversary. The study aimed at investigating (a) the growth of postgraduate research; (b) the most favoured research disciplines; and (c) preferred research methodologies in postgraduate research. The study confined its scope to the publications produced between 1966 and 2015 by Humanities and Social Science faculty published in Zambia as well as abroad. Bibliometric techniques and regression analysis were employed as the measuring instrument. The data was collected from various sources including Google Scholar, annual reports, University of Zambia Library catalogues, personal resumes, and local bibliographies.

**Keywords:** Research productivity; bibliometrics; scholarly communication; authorship pattern; collaboration coefficient; University of Zambia

### 1.1 Background

In the University's submission to the University Grants Committee for the 1973-1976 quadrennial, it was envisaged that there would be an appreciable increase in the range and volume of postgraduate study, for higher degrees, during this period. The spirit of the Committee regarding postgraduate study is captured in the following statement:

The justification for an increase in postgraduate studies lies not only in the manpower needs of the country but also in the many-faceted role which postgraduate study plays in a university. For example, postgraduate studies provide opportunities for research interests of the academic staff and for the professional work association of mature students; enable both the student and the teacher to bring new knowledge and insights into teaching; and provide a corps of junior staff useful for teaching, demonstration and other academic tasks, thereby helping to free the time of senior staff for more demanding duties.

Akakandelwa (2007) argues that the growth postgraduate studies reflect the level of maturity of a university; as postgraduate studies advance research and generate knowledge. He therefore, concludes that a university should not be contented with the teaching of undergraduate programs only.

Akakandelwa (2007) identified four advantages of providing postgraduate studies locally, namely:

- 1) Postgraduate training is of critical importance for the provision of high-calibre, technically proficient professionals in the government and informal sector.
- 2) Postgraduate training can deliver high-quality training that would meet the needs of Zambia than those offered by overseas institutions.
- 3) Postgraduate programs offered locally can strengthen the teaching and research capacity of UNZA and
- 4) Can reduce the need for the country to finance training abroad when services of comparative quality can be provided at home at reasonable cost.

The development of postgraduate studies programs at UNZA, as compared to undergraduate programs, has been slow (Akakandelwa, 2007). Kelly (1991) argues that the practice of appointing outstanding graduates to the staff development program and sending them abroad for masters' studies has had the counterproductive effect of slowing down the development of postgraduate studies at UNZA. In addition, the development of postgraduate work was hampered by the continuity of senior staff, most of whom were expatriates on relatively short contracts, and the inadequacy of resources, such as books, journals, and scientific equipment. The development of programs at this level was effectively discouraged by the absence of any policy governing financial support for postgraduate studies.

In the University of Zambia Strategic Plan 1994-1998, problems that hindered the growth of postgraduate programs were identified, among which were:

- 1) *Insufficient senior staff.* Failure to retain Zambian staff and the slow rate of development in some schools, especially science and engineering contribute to the low numbers of long-term academic staff.
- 2) *Lack of resources to meet many of the requirements of specialized research.* The lack of such facilities restricts the nature and scope of the research that can be executed meaningfully.
- 3) *Inadequate library and ICT infrastructure.* Lack of access to a wide variety of current information resources and computer hardware and software have continued to be an impediment to research.

The heart of the research degree is a written thesis which makes an original contribution to the body of knowledge in the chosen studies and demonstrates the capacity to conduct independent research. A range of research degrees are offered at UNZA, including a Masters by research (two years), PhD (three to five years). Although places great emphasis on the contribution made by its international research students, it has not been able to attract large numbers of international postgraduate students.

## 1.2 Study Objectives

The key objectives of the study are as follows:

1. To measure the growth and development of research productivity in postgraduate research
2. To identify the most favoured research areas
3. To identify the preferred research methodologies in postgraduate research

## 1.3 Data Source and Methodology

Dissertations accepted at the University of Zambia were examined. This study was limited to the dissertations housed in and placed in the University of Zambia Library Special Collection covering the years 1966-2015. Commencement programs from the University for each Academic Year were collected to find the candidates. After the candidates were selected, their names were entered on a coding Microsoft spreadsheet and the library's automated catalogue was searched to find the students' dissertations. Dissertations from this range (1966-2015) totalled 117. Title pages and reference sections were photocopied from each of the 30 dissertations. Information extracted from each included postgraduate student's name, year of graduation, title of the dissertation, degree program, title keywords, supervisor(s), and research methodology used. The data was then exported into the Statistical Package for the Social Sciences (SPSS) 20 for further data analysis.

## 1.4 Limitations of the Study

## 1.5 Results and Discussions

### 1.5.1 Distribution of Postgraduate Research Output by School

The total number of dissertations selected for this study was 1701. Table 1 shows the distribution of dissertations by school. The largest number of dissertations were produced by the School of Education (490; 28.8%), followed by the School of Humanities and Social Sciences (484; 28.5%), the School of Medicine (436; 25.6%), and the School of Agricultural

Sciences (106; 6.2%). Together these four schools produced 89.1% of the dissertations. The other schools produced 10.1%; namely: the School of Natural Sciences (70; 4.1%), the School of Law (53; 3.1%), the School of Engineering (25; 1.5%), the School of Mines (21; 1.2%), and the School of Veterinary Medicine (16; .9%).

Table 1: Field of study

	Frequency	Percent	Cumulative Percent
School of Education	490	28.8	28.8
School of Humanities & Social Sciences	484	28.5	57.3
School of Medicine	436	25.6	82.9
School of Agricultural Sciences	106	6.2	89.1
School of Natural Sciences	70	4.1	93.2
School of Law	53	3.1	96.4
School of Engineering	25	1.5	97.8
School of Mines	21	1.2	99.1
School of Veterinary Medicine	16	.9	100.0
Total	1701	100.0	

### 1.5.2 Growth of Postgraduate Research Output (Year-wise distribution)

A total of 1701 postgraduate dissertations were retrieved from the Special Collections of the University of Zambia Main Library. The dissertations were grouped into nine 5-year periods (Table 2). The production trend started low at 11 during the period (1971-1976), where only a few schools had begun to run postgraduate programs. The number of dissertations began to increase from 1976 and continued at a steady rate up to 2015. The average publications produced per year was about 38. When the distribution of publications was plotted graphically with calculated trendline and moving average (Figure 12.1), the 44-year period generally indicated a positive upward trend of publication productivity and it is further predicted that this trend could continue in the future. The moving average depicted a relatively stable, upward trendline ( $y = 66.483x - 144.75$ ;  $R^2 = 0.7202$ ). Cumulatively the period between 1996 and 2015 was the most productive period (Table 12.2).

Table 2: Yearly of distribution postgraduate research output

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
1971-1975	11	.6	.7	.7
1976-1980	32	1.9	1.9	2.5
1981-1985	76	4.5	4.5	7.0
1986-1990	95	5.6	5.6	12.7
1991-1995	87	5.1	5.2	17.8
1996-2000	139	8.2	8.2	26.1
2001-2005	191	11.2	11.3	37.4
2006-2010	377	22.2	22.3	59.7
2011-2015	681	40.0	40.3	100.0
Total	1689	99.3	100.0	
Missing				
System	12	.7		
Total	1701	100.0		

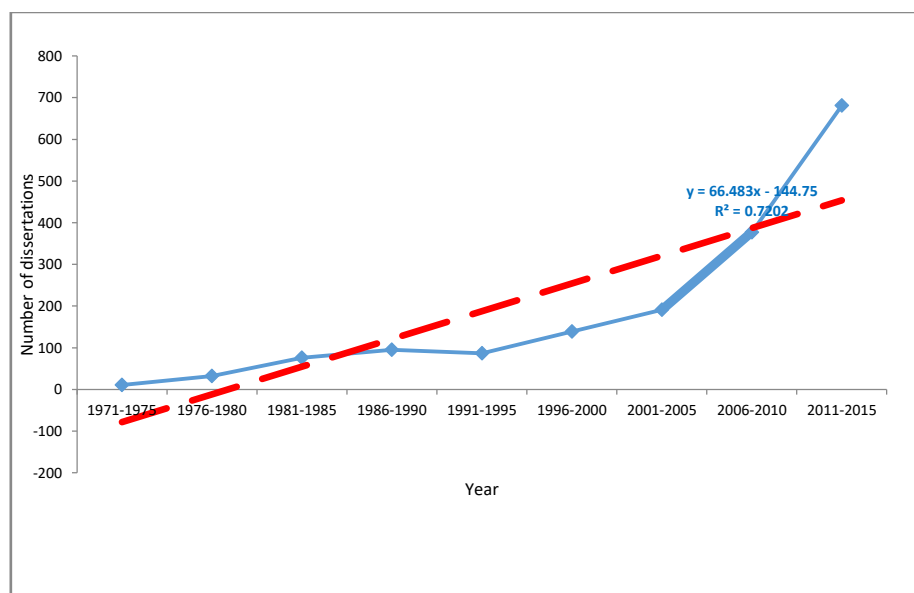


Figure 1: Five year-wise distribution of postgraduate research output

However, when examining the distribution of the postgraduate research by school across the 44-year period of study (1971-2015), the picture shows an unstable trend (Table 3). For instance, distribution of postgraduate research output in the School of Education started very low with two dissertations in 1971-1975 period, increased to 7 and 17 in 1976-1980 and 1981-1985 periods, respectively; but dropped to 9 in 1986-1990 period. The School has generally recorded an up-and-down trend in postgraduate research output in the 44-year period. The School of Humanities and Social Sciences also started postgraduate research in 1971-1975 period wherein produced two dissertations. Generally, the School has recorded a stable increase, except in 1991-2000 period when it recorded a drop. Cumulatively, the most productive period of the School has been from 2001-2015. The School of Medicine has

demonstrated a steady and stable positive trend in postgraduate research from 1981-2015, with an average of 41 dissertations per year. Postgraduate research output in the School of Agricultural Sciences was relatively small but steadily increased over the 44-year period. All the 21 postgraduate research output in the School of Mines was produced in the last two 5-year periods, 2006-2015. All the 11 postgraduate research output of the School of Veterinary Medicine was produced in the last 5-year period, 2011-2015. Three Schools have demonstrated an exponential growth in postgraduate research output: namely School of Education, School of Humanities and Social Sciences, and School of Medicine.

Table 3: Distribution of postgraduate research output by school across the 5-year bands

School	Year of publication									Total
	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015	
School of Education	2	7	17	9	16	4	29	157	249	490
School of Humanities & Social Sciences	2	8	29	41	21	29	50	103	201	484
School of Medicine	0	0	5	10	17	62	66	88	176	424
School of Agricultural Sciences	0	2	2	4	21	22	28	12	15	106
School of Natural Sciences	2	6	9	13	7	12	12	4	5	70
School of Law	4	8	13	16	2	3	0	0	7	53
School of Engineering	1	1	1	2	3	7	6	3	1	25
School of Mines	0	0	0	0	0	0	0	10	11	21
School of Veterinary Medicine	0	0	0	0	0	0	0	0	16	16
Total	11	32	76	95	87	139	191	377	681	1689

### 1.5.3 Distribution of Dissertations by Programme

Table 4 shows the distribution of the postgraduate research output by discipline. The largest number of dissertations were in education (472; 27.7%), followed by medicine (202; 11.9%), public health (201; 11.9%), mass communication (160; 9.4%), agricultural sciences (106; 6.2%), history (80; 4.7%), literature and languages (54; 3.2%), and law (53; 3.1%). Other disciplines included public administration (48; 2.8%), gender studies (39; 2.3%), economics (35; 2.1%), geography (28; 1.6%), engineering (25; 1.6%), mineral science (21; 1.2%), library and information science (17; 1.0%), philosophy and applied ethics (17; 1.0%), veterinary medicine (16; .9%), psychology (15; .9%), chemistry (14; .8%), nursing (14; .8%), mathematics (13; .8%), microbiology (13; .8%), political science (10; .6%), development studies (9; .5%), physics (8; .5%), natural resource management (7; .4%), and clinical pharmacy (6; .4%).

Table 4: Distribution of postgraduate research output by discipline

	Frequency	Percent	Cumulative Percent
Education	472	27.7	27.7
Medicine	202	11.9	39.6
Public Health	201	11.8	51.4
Mass Communication	160	9.4	60.8
Agricultural Science	106	6.2	67.1
History	80	4.7	71.8
Literature and Languages	54	3.2	75.0
Law	53	3.1	78.1
Public Administration	48	2.8	80.9
Gender Studies	39	2.3	83.2
Economics	35	2.1	85.2
Geography	28	1.6	86.9
Engineering	25	1.5	88.4
Mineral Science	21	1.2	89.6
Library and Information Science	18	1.1	90.7
Demography	17	1.0	91.7
Philosophy & Applied Ethics	17	1.0	92.7
Veterinary Medicine	16	.9	93.6
Psychology	15	.9	94.5
Chemistry	14	.8	95.3
Nursing	14	.8	96.1
Mathematics	13	.8	96.9
Microbiology	13	.8	97.6
Political Science	10	.6	98.2
Development Studies	9	.5	98.8
Physics	8	.5	99.2
Natural Resource Management	7	.4	99.6
Clinical Pharmacy	6	.4	100.0
Total	1701	100.0	

#### 1.5.4 Title Keyword Subject coverage of the Master's Research

This section analyses the subject coverage of the various dissertations as depicted from their keywords from the titles. The analyses are conducted under broad subject areas by school.

##### 1.5.4.1 Medicine Subject coverage

One thousand, two hundred and seventy-three keywords (terms) were extracted from the 320 medical masters' dissertations, using the VOSviewer software. The terms were subject to further filtration process to select only terms that met a minimum occurrence of 5 times. Sixty-five terms met this threshold. A final number that was selected was 40. These 40 terms were grouped into 8 clusters (Figure 2). Table 5 shows the detailed list of the items in each cluster. These are: cluster 1 consisting of studies relating to adults (8), age (10), diarrhoea (11), HAART (8), HIV/AIDS (11), impact studies (5), incidence of diseases (11), stroke (7), UTH (15), and year-wise related studies (17). Cluster 2 consisted of case related studies (7), determinant (12), health worker (6), studies on Lusaka Urban District (5), malaria related studies (8), studies related to pregnancy (9) and pregnant women (8), and studies relating to utilization of health facilities and services (12). Cluster 3 consisted of 6 items: evaluation (12), Lusaka District (16), person (8), and quality related studies (7). Cluster 4 consisted of 4 items: case studies (8), HIV infection, Lusaka Urban (5), and risk factors (7). Cluster 5 consisted of 3 items: child transmission (5), mother (18), and prevention (10). Cluster 6 consisted of 3 items: Infant (7), Lusaka-Zambia (12), and short term outcome (5). Cluster 7 consists of 3 items: causal related studies (5), studies related to knowledge levels (29), and perceptions (9). Cluster 8 consisted of 2 items: studies relating to adult patients (6), and studies relating to practice (26).

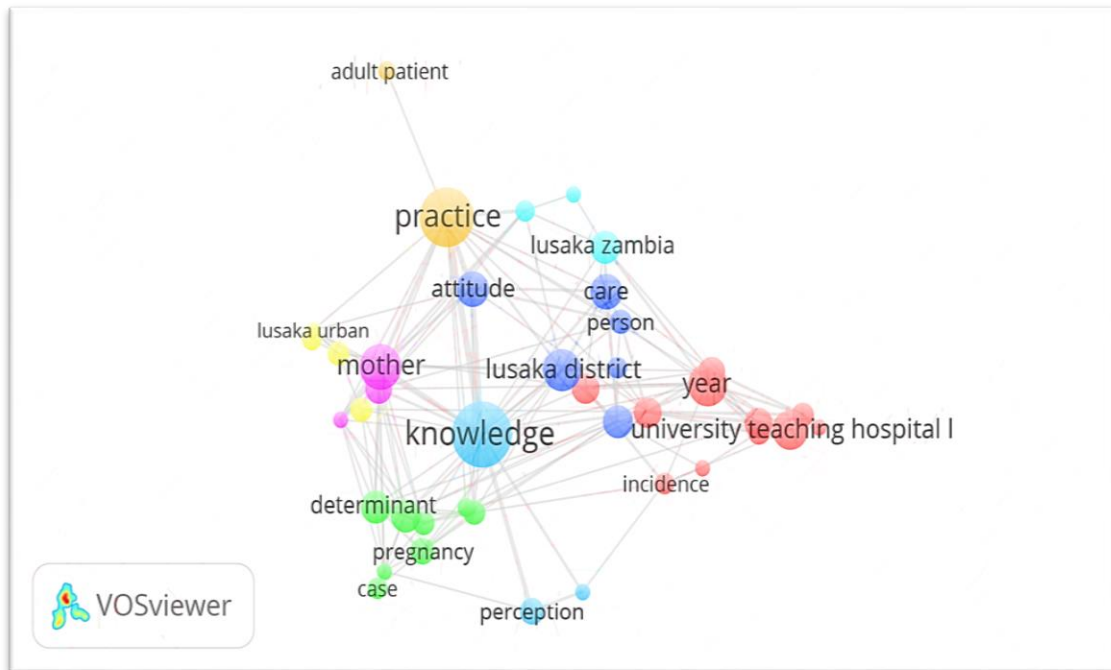


Figure 2: An interdisciplinary network of the 17 most productive medical subject areas in the postgraduate research

Table 5: eight cluster of most occurring subject areas

Cluster	Terms	Frequency
Cluster 1 (11 items)	Adult	8
	Age	10
	Diarrhoea	11
	HAART	8
	HIV/AIDS	11
	Impact	5
	Incidence	11
	Stroke	7
	UTH	15
	Year	17
Cluster 2 (8 items)	Case	7
	Determinant	12
	Health worker	6
	Lusaka Urban District	5
	Malaria	8
	Pregnancy	9
	Pregnant woman	8
	Utilization	12
Cluster 3 (6 items)	Attitude	13
	Care	13
	Evaluation	12
	Lusaka District	16
	Person	8
	Quality	7
Cluster 4 (4 items)	Case study	8
	HIV infection	8
	Lusaka Urban	5
	Risk factor	7
Cluster 5 (3 items)	Child transmission	5
	Mother	18
	Prevention	10
Cluster 6 (3 items)	Infant	7
	Lusaka Zambia	12
	Short term outcome	5
Cluster 7 (3 items)	Cause	5
	Knowledge	29
	Perception	9
Cluster 8 (2 items)	Adult patient	6
	Practice	26

#### 1.5.4.2 Education Subject coverage

One thousand, four hundred and sixty-five keywords (terms) were extracted from the 320 education masters' dissertations, using the VOSviewer software. The terms were subjected to further filtration process to select relevant terms that met a minimum occurrence of 5 times. Eighty-nine terms met this threshold. A final number that was selected was 53. These 53 terms were grouped into 8 clusters (Figure 3). Table 5 shows the detailed list of the items in each

cluster. These are: cluster 1 consisting of studies relating to environmental education (11), HIV (9), impairment (10), Kafue District (5), knowledge (9), learners (19), management (14), practice (13), role (28), and status (7). Cluster 2 consisted of studies relating to Central Province (12), evaluation (11), history (6), implementation of programmes (14), information (7), studies relating to Kabwe (5), and studies participation (17). Cluster 3 consists of studies relating to: basic education (7), Chongwe District (14), Copperbelt (8), mathematic (7) and mathematics (6), relationships (21), and selected schools (10). Cluster 4 consists of studies relating to: children (15), English language (6), Livingstone (6), parents (8), Southern Province (6), Southern Zambia (6), and use (17). Cluster 5 consists of studies relating to: cause (5), difficulty (7), Kitwe District (7), Nature (15), Northern Province (6), and prevalence (6). Cluster 6 consists of studies relating to: challenge (18), initial literacy (6), Luapula Province (5), Mansa District (5), selected primary schools (11), and Solwezi (6). Cluster 7 consists of studies relating to: guidance (10), Kabwe District (7), secondary schools (29), survey (5), and Western Province (6). Cluster 8 consists of studies relating to: constraints (5), North Western Province (9), professional development (12), quality (8), and university (27).

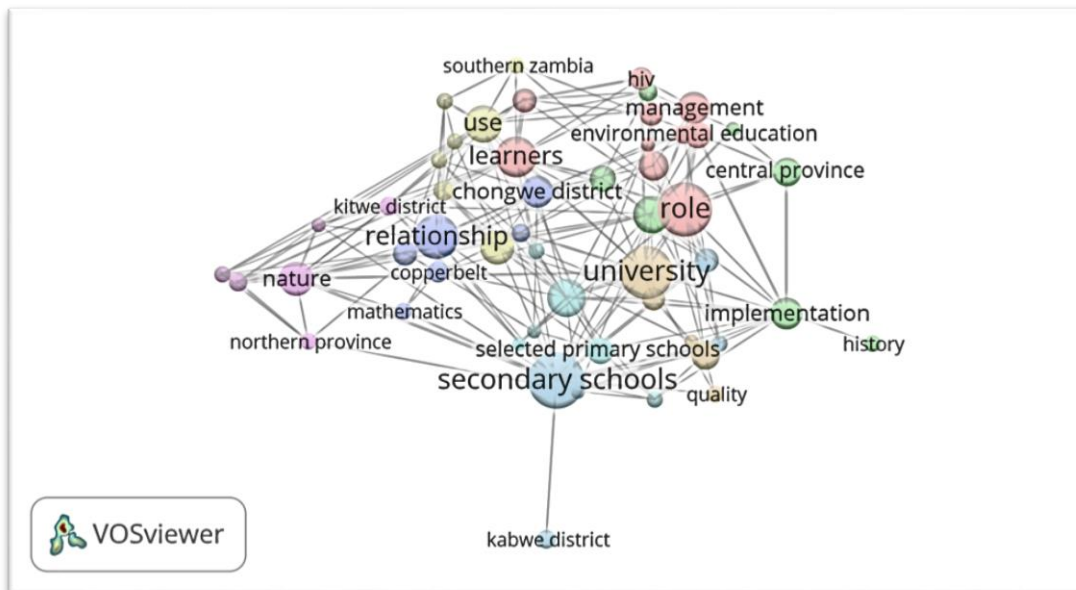


Figure 3: An interdisciplinary network of the 17 most productive subject areas in the School of Education postgraduate research

Table 6: Clusters of most occurring keywords in education master's research

Cluster	Items	Frequency
Cluster 1 (10 items)	Environmental education	11
	HIV	9
	Impairment	10
	Kafue District	5
	Knowledge	9
	Learners	19
	Management	14
	Practice	3
	Role	28
	Status	7
Cluster 2 (7 items)	Central Province	12
	Evaluation	11
	History	6
	Implementation	14
	Information	7
	Kabwe	5
	Participation	17
Cluster 3 (7 items)	Basic	7
	Chongwe District	14
	Copperbelt	8
	Mathematic	7
	Mathematics	6
	Relationship	21
	Selected schools	10
Cluster 4 (7 items)	Child	15
	English	6
	Livingstone	6
	Parent	8
	Southern	6
	Southern Zambia	6
	Use	17
Cluster 5 (6 items)	Cause	5
	Difficulty	7
	Kitwe	7
	Nature	15
	Northern Province	6
	Prevalence	6
Cluster 6 (6 items)	Challenge	18
	Initial literacy	6
	Luapula Province	5
	Mansa District	5
	Selected primary schools	11
	Solwezi	6
Cluster 7 (5 items)	Guidance	10
	Kabwe	7
	Secondary	29
	Survey	5
	Western Province	6
Cluster 8 (5 items)	Constraint	5
	North Western Province	9
	Professional development	12
	Quality	8
	University	27

### 1.5.5 School of Humanities and Social Sciences

One thousand, six hundred and twenty-five keywords (terms) were extracted from the 320 education masters' dissertations, using the VOSviewer software. The terms were subjected to further filtration process to select relevant terms that met a minimum occurrence of 5 times. Eighty-nine terms met this threshold. A final number that was selected was 35. These 35 terms were grouped into 8 clusters (Figure 4). Table 7 shows the detailed list of the items in each cluster. These are: cluster 1 consisting of studies relating to agriculture (8), Central Province (5), constraint (6), Eastern Province (7), history (15), Northern Rhodesia (9), practice (7), Southern Province (6), and Tonga (11). Cluster 2 consisted of studies relating to AIDS (5), assessment (11), attitude (5), HIV (11), HIV/AIDS (6), and studies youth (6). Cluster 3 consists of studies relating to economic growth (6), English (6), ethical assessment (7), investigation (10), relationships (7), and university (5). Cluster 4 consists of studies relating to access (7), comparative study (7), department (7), ministry (9), and performance (9). Cluster 5 consists of studies relating to determinant (8), effect (11), Lusaka District (8), and study (139). Cluster 6 consists of studies relating to factor (7), Lusaka Urban (8), school (10), and selected schools (6).

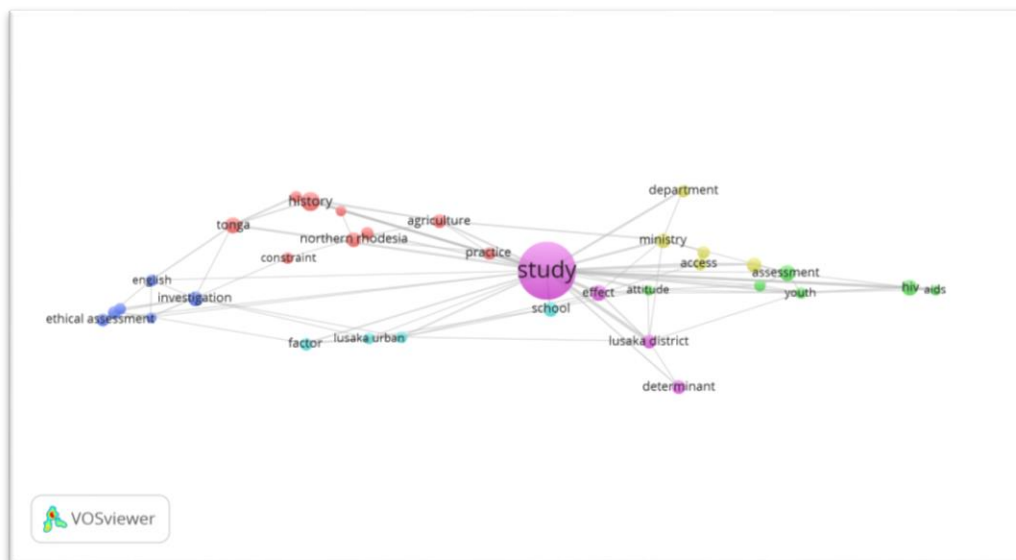


Figure 4: An interdisciplinary network of the 17 most productive subject areas in the School of Humanities and Social Sciences postgraduate research

Table 7: Clusters of most occurring keywords in education master’s research

Cluster	Items	Frequency
Cluster 1 (9 items)	Agriculture	8
	Central Province	5
	Constraint	6
	Eastern Province	7
	History	15
	Northern Rhodesia	9
	Practice	7
	Southern Province	6
	Tonga	11
Cluster 2 (6 items)	AIDS	5
	Assessment	11
	Attitude	5
	HIV	11
	HIV/AIDS	6
	Youth	6
Cluster 3 (6 items)	Economic growth	6
	English	6
	Ethical assessment	7
	Investigation	10
	Relationship	7
	University	5
Cluster 4 (5 items)	Access	7
	Comparative study	7
	Department	7
	Ministry	9
	Performance	9
Cluster 5 (4 items)	Determinant	8
	Effect	11
	Lusaka District	8
	Study	139
Cluster 6 (4 items)	Factor	7
	Lusaka Urban	6
	School	10
	Selected school	6

### 1.5.5 PhD Research Output

This section presents the University of Zambia doctoral research output. Table 5 reveals that a total of 63 PhD theses in 20 disciplines were produced since the institution’s establishment. Leading is PhD in Education (25; 39.7%), followed by Literature and Languages (4; 6.3%), Biology (3; 4.8%), Law (3; 4.8%), Medicine (3; 4.8%), and Veterinary Medicine (3; 4.8%). The following disciplines have produced two PhDs each: Psychology, Public Health, Ecology, Engineering, Mines, and Public Administration. The rest of the disciplines have produced one PhD each: Agricultural Sciences, Geography, Mathematics, Social Work, and Development Studies. Figure 2 shows the year-wise distribution of the PhD research output. As may be observed, the research output at PhD level has been very unstable over the 35-year period (1980-2015) characterized by an up-and-down trend. These results tend to suggest a lack of

policy and agenda at PhD level. The most productive period, cumulatively, is the last three years, 2013-2015.

Table 5: PhD Research output

	Frequency	Percent	Cumulative Percent
Education	25	39.7	39.7
Literature & Languages	4	6.3	46.0
Biology	3	4.8	50.8
Law	3	4.8	55.6
Medicine	3	4.8	60.3
Psychology	3	4.8	65.1
Public Health	3	4.8	69.8
Veterinary Medicine	3	4.8	74.6
Ecology	2	3.2	77.8
Engineering	2	3.2	81.0
Mines	2	3.2	84.1
Public Administration	2	3.2	87.3
Agricultural Sciences	1	1.6	88.9
Geography	1	1.6	90.5
Mathematics	1	1.6	92.1
Social Work	1	1.6	93.7
Demography	1	1.6	95.2
Development Studies	1	1.6	96.8
History	1	1.6	98.4
Physics	1	1.6	100.0
Total	63	100.0	

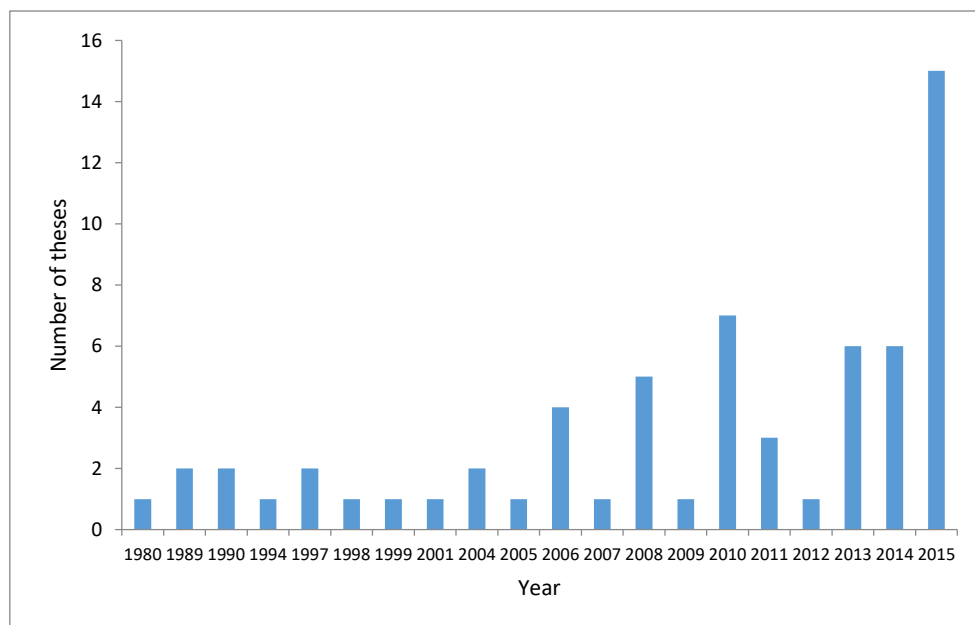


Figure 2: Five year-wise distribution of postgraduate research output

## 1.6 Conclusion

This Chapter has reviewed postgraduate research output from 1971 to 2015. Postgraduate research output at the University of Zambia started late in 1971. The research output has increased over the years from 1 dissertation in 1997 to 101 in 2015. There was also an increase in the number of postgraduate programs being offered from 1 to 58 programs. Research output at PhD level has been very slow with the largest number produced in 2015.

## References



## A Bibliometric Analysis of UNZA in-house Journal Output

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### 1.0 Abstract

The present study is a bibliometric assessment of scientific research output of University of Zambia journals. The study attempts to analyze the growth and development of research activity of the university as reflected in publications output covered by institutional journals. The study attempt to examine the content of papers published, including the annual average growth rate percent, authorship pattern, degree of collaboration, organizational affiliation of papers. The following quantitative measures are used to study the articles published in the University of Zambia sponsored journals: (1) the research productivity of each journal from its inception; (2) the types publications produced; (3) the authorship and collaboration patterns; and (4) the major subject areas of research.

**Keywords:** Single journal study; journal productivity; authorship patterns; bibliometrics

### 1.1 Introduction

#### 1.1.1 Background

Universities world over recognize the importance of publishing their academic research output. For this reason most universities have established journals. The University of Zambia has over the years encouraged the establishment of academic journals for purposes of disseminating its scholarly works. Six scholarly journals have been supported by the University and have been published by the UNZA Press. The six journals include: *African Social Research*, *Zango*, *Journal of Humanities*, *Journal of Science and Technology* and *Zambia Law Journal*. Other academic works introduced by the University include monographs and Professorial Inaugural Lecture series, for instance the *Zambian Papers*. Each publication is produced by a competent editorial board of University academics with appropriate qualifications. UNZA Press handles the administration and production of the publications. The publications cover a wide range of topics of relevance to the University academic community and for teaching purposes. These journals are distributed widely mainly to higher institutions of learning within and outside the country.

Periodicals in general and journals in particular are the indicators of literature growth in any field of knowledge. They emerge as the main channel for transmitting knowledge. Due to the escalating cost of the journals and lack of adequate library budgets, the selection of any particular journal for a library should be done carefully. Therefore, the library authorities are forced to reduce the number of journal subscriptions. Bibliometrics has many applications in library and information science in identifying research trends, core journals, etc., and thereby framing subscription policies for tomorrow. These studies will be helpful for librarians in collection development.

These single journal studies help characterize UNZA journals in various lights. When a single journal is studied bibliometrically, it created a portrait of the journal, provided an insight that is beyond the superficial (Zainab, Anyi and Nuar, 2009). It helps indicate the quality, maturity and productivity of the journal. It informs about the research orientation that the journal supports to disseminate and its influence on author's choice as a channel to communicate or retrieve information for their research needs. It helps indicate the importance or significance of the journal in a field and somehow reflect the activity of research in the field. Studying the single journal allows one to determine its quality in terms of indexation and impact as well as how it supports joint or collaborative works either within faculty members or cross faculties within the same or different universities at country or international levels. Nebelong-Bonnevie and Frandsen (2006) indicated that single journal studies provided a detailed multi-faceted picture of the characteristics of a single journal. This is what we have attempted to do with each one of the selected UNZA journals.

### 1.1.2 Study Objectives

The main objective of the study was to establish publishing trends of Zambian local journals by examining such parameters like, volume of papers published, authorship patterns, types of articles, keyword analysis, and referencing patterns. The specific objectives of the study were to:

1. Assess the quantitative growth of article by volume
2. Examine the authorship patterns
3. Examine the contributors by geographical location and institutional affiliation
4. Establish ratio of Zambian versus foreign contributors
5. Determine subject-wise contribution of the articles (keyword analysis)

### 1.1.3 Literature Review

Bibliometrics studies of scholarly Library and Information Science (LIS) journals are well documented and diversified. Some of the pertinent studies on bibliometrics and citation analysis conducted by the scholars of LIS all over the world are worthy of examination. Biswas, Roy and Sen (2007) conducted a study with 358 original contributions published in the journal *Economic Botany* during 1994-2003. In their findings, they stated that among the citations, books accounted for 59%, journals 41% and e-citations started appearing from 1998 are still negligible in number. Furthermore, they found that the highest numbers of contributions i.e.60.61% were emanated from academic institutions such as universities (Biswas, Roy, and Sen, 2007).

Liu (2007) studied the scholarly communication of educational psychology by exploring its intellectual structure and general journal citation patterns and six clusters of journals were identified, including general educational psychology/learning/literacy, school psychology, measurement and counselling, Germany-based educational psychology, creativity, and the other. Furthermore, the study revealed that a small number of journals accounted for a relatively high percentage of the intra-disciplinary citations; the majority of the selected journals cited more than being cited in the field (Liu, 2007).

Zainab, Anyi and Anuar conducted a bibliometric study on *Malayasian Journal of Computer Science* and evaluated the article productivity of the journal from 1985 to 2007 using Lotka's Law. The study further revealed authorship, co-authorship pattern by authors' country of origin and institutional affiliations (Zainab, Anyi, andAnuar, 2009). Narang and Kumar carried out a bibliometric study on 400 articles in five volumes – 34 (2003) to 38 (2007) of the *Indian Journal of Pure and Applied Mathematics*. They founded that the most cited documents are articles from research journals and the foreign authors have contributed more than Indian authors (Narang and Kumar, 2010). Similarly, Narang undertook a bibliometric study of 8396 citations appended to 737 articles in the five volumes 29 to 33 published in the *Indian Journal of Pure and Applied Mathematics* during the years 1998-2002 and founded that the number of contributions is increasing in successive volumes and highest number of papers have been written by joint authors (Narang, 2004).

Swain in his scientometric analysis of *Library Philosophy and Practice* from 2004 to 2009 found that the highest percentage of contributions was from single authors, with respect to other types of authorship. It is observed that the degree of collaboration ranged from 0.222 to 0.52

in *Library Philosophy and Practice* from 2004 to 2009 (Swain, 2011). On the other hand, Swain and Panda conducted a bibliometric study on *Journal of Intellectual Property Rights*, 2002 to 2010 and found that solo contributing authors are dominant in JIPR (Swain and Panda, 2012).

Jena, Swain and Sahu in their bibliometric study of *The Electronic Library* from 2003 to 2009 revealed that the majority of citations are from journals, followed by web resources and books and the average length of articles is 13.017 pages (Jena, Swain, and Sahu, 2012). Jan carried out the citation analysis of all the journal articles published in the *Library Trends* from 1994-2007. 593 articles are published in the journal during 14 years. Highest number i.e. 52 of articles is published in 2004. The Journal contained 15662 references for the study period of which 13783 are print-citations and 1879 are electronic-citations. Every issue published approximately 11 articles and each article has an average of 23.2 print-references and 3.1 electronic-citations. It was found that 44.51 % print books are consulted by the authors and 0% e-books are accessed. Authors have consulted 44.04% print-journals as against 11.82% e-journals. The study shows that 88.14% other web references are used in the articles reference. Female contribution (52.34%) accounts more than male contribution (47.66%) (Jan, 2009).

Thanuskodi (2011) presented a bibliometric analysis of the journal titled *Library Herald* for the period between 2006 and 2010. The analysis cover mainly the number of articles, authorship pattern, subject wise distribution of articles, average number of references per articles, forms of documents cited, year wise distribution of cited journals etc. The result showed that out of 138 articles single author contributed 72 (52.17%) articles while the rest 66 (47.83%) articles were contributed by joint authors. Study reveals that most of the contributions are from India with 89.85 % and the rest 10.15 % only from foreign sources. Thanuskodi stated that the journal published 249 articles during the period of study. The maximum numbers of contributors are single authors with 31.32%. The Study revealed that majority of articles (96.85%) contains references which include journals, books, conference proceedings, dissertations, etc. (Thanuskodi, 2011).

Chaurasia carried out a bibliometric analysis of the journal “*Annals of Library and Information Studies (2002-2006)*” and observed a trend of growth in contributions and average number of contributions is 21.4 per volume. Majority of the library and information scientists prefer to do collaborative research and contribute their papers jointly. Majority of the library and information scientists have cited journals in large number (50.15%) while books comes on second with 273(19.96%) citations (Chaurasia, 2008).

Akakandelwa and Chifwepa (2006) conducted an informetric analysis of *Zango: the Zambian Journal of Contemporary Issues* from 1997-2005. Twenty-nine research articles published in this journal at the University of Zambia was carried out to study the authorship productivity and patterns, citation patterns, and other related issues. It was found that books (39.4%), journals (21.3%), newspapers (11.8%), and government publications (9.84%) were the most cited source of information among the scientists. The study also revealed a dominance of single authorship among the humanities and social science of literature. The Zango scientists are also quite up-to-date in their search for knowledge, as references cited were fairly recent with 55.97% covering the period of 1978-1997. The study also found that the *Lancet* and the *Review of African Political Economy* topped the list as the most cited journals.

This brief literature review shows that there are substantial bibliometric studies on individual journals published in all parts of the world, especially in the United States, Europe and India. It is quite obvious that in Zambia there is little evidence of bibliometric study on individual journals. Consequently, in view of the little evidence of a comprehensive study dealing with Zambian journals, single journal bibliometric study involving the journals of this country becomes worthwhile. Therefore, this study aims to provide some value addition to the corpus of literature on bibliometric studies.

#### 1.1.4 Data Source and Methodology

The sample for this study comprised research articles published in the selected local journals. Each article published during the study was examined. Title pages and references were photocopied from each articles published by each local journal covered in the study. Data concerning total number of articles, and total number of different sources cited, and dates of publications of such references with authorship pattern for each article was entered in Microsoft Excel spreadsheets. The details with regard to each published article such as number of articles in each issue of the journal, number of authors, name of authors, place of authors, were recorded and analysed for making observations. The data were collected; organised and analysed using MS-Excel spreadsheets. The tables and graphs were generated in accordance with the objectives of the study. For the sake of convenience, only three major forms of citations comprising of journals, books and web resources were taken into the purview of the study while proceedings (conference/seminars/workshops), reports, theses, notes, lectures, speeches, press releases, white papers, employment gazettes, interviews, commentary, news items and such other materials which were found relatively less by their individual numbers were clubbed up

into others category. Finally, these data were further exported into SPSS version 20, coded and analyzed. The gathered data after due scrutiny, were tabulated and processed for analysis and subsequent interpretation.

The title of an article always includes the information that the author would most like to express to the readers. It can be used to identify the subjective focus and emphasis specified by authors. The analysis of paper titles was first applied in mapping research trends in each journal. All single words in the titles of the articles were statistically analysed in this study. Some prepositions, articles and common words such as “using”, “under”, “the”, and “during” were discarded, as they were meaningless for further analysis. The most frequently used words in titles were ranked according to their frequency to establish the most researched areas in each journal.

#### 1.1.5 Limitations of the Study

This study is based on data collected from volume numbers the UNZA journals, therefore its results may vary on different times for the different journals. The validity of the result depends upon the sample size and as this study is based on only seven journals and the issues that were available in the Special Collections of the University of Zambia Main Library. Furthermore, the journals surveyed started at different periods and their frequency of publication varied from biannual to annual. Therefore the results vary from journal to journal and may not necessarily be representative of all the journals. Some journals did not include information on authors' affiliation and country of origin. Some journals also did not include keywords.

#### 1.2 African Social Research

The African Social Research (ASR) (ISSN: 0002-0168) was formally known as *Rhodes Livingstone Journal of Human Problems in Central Africa*. The frequency of publication is semi-annual (twice per year), in June and December, with the publication of an index issued every five years. The first index was issued in Africa Social Research Number 10 December 1970, and the second ten (10) year issue appeared in the Number twenty (20) issue of (December 1975). The focus of the Journal is in the general field of Social Research in Africa especially in sociology, social anthropology, psychology, economics, human geography and demography, history and political science. Special consideration is given to material on Zambia. However, articles done elsewhere are considered if the findings are applicable to the Zambian circumstances or provide important points of contrast. It is used as a communication

tool to disseminate research finding of interest to academicians across the world. The journal is published for the Institute for African Studies by the University of Zambia Press.

### 1.2.1 Publication frequency

Table 1 shows the publication frequency and pattern of *ASR* during the period 1966-2013. The results reveal that *ASR* was published irregularly. For instance, the following issues are 7, 10, 12, 15, 31, and 33 while several issues had to be combined. There were an irregular number of articles per issue, ranging from 1 (Issue no. 50) to 49 (Issue nos. 53/54), with an average of 12. Therefore, there was no consistency in the number of publications per issue. These issues affect the quality and the reputation of the journal.

Table 1 Publication pattern of *ASR*

Issue number	Number of articles	Percent
1	8	1.7
2	8	1.7
3	7	1.5
4	7	1.5
5	5	1.0
6	7	1.5
8	13	2.7
9	17	3.6
11	15	3.1
13	11	2.3
14	11	2.3
16	11	2.3
17	12	2.5
18	10	2.1
19	14	2.9
20	12	2.5
21	23	4.8
22	20	4.2
23	16	3.3
24	15	3.1
25	11	2.3
26	13	2.7
27	8	1.7
28	18	3.8
29	11	2.3
30	15	3.1
32	11	2.3
34	8	1.7
35	9	1.9
36	9	1.9
37/38	12	2.5
39/40	6	1.3
41/42	12	2.5
43/44	7	1.5
45/46	6	1.3
47/48	7	1.5
50	1	.2
51	9	1.9
52	5	1.0
53/54	49	10.3

55/56	9	1.9
Total	478	100.0

### 1.2.1 Growth of Literature (Yearly distribution of papers)

Table 2 shows the five-yearly distribution of research output from 1966 to 2013. A total of 478 scholarly papers were published within the period of review. The number of publications remarkably increased steadily from 1966 to 1980. This period was, cumulatively the most productive period for the Africa Social Research Journal. Surprisingly, the number of publications dropped to 37 in the period 1981-1985 and to further 18 in the period 1996-2000; thereafter began to increase slowly 42 and 63 publications in 2001-2005 and 2006-2013, respectively. A review of the yearly distribution of the *African Social Research* reveals that there were huge gaps in its frequency of publication. For instance the Journal was not published in the following time periods: 1984-1995, 1999-2000, 2007-2009, and 2011-2012.

Figure 1 reveals an initial increase in research productivity during the early years 1966-1980, followed by a sharp declining 1981-2000, and thereafter a slow increase to 2013. For this reason we did not calculate an annual growth rate but instead calculated five-year moving averages, shown in Figure 1. Figure 1 clearly shows a steady growth in the earlier years, followed by a decline ending around 1998. From then on the Journal published about 8 publications a year till the year 2010. From 2010 onward we see again a sudden increase to 49 publications in 2013.

**Table 2: Five-Yearly distribution of publications**

	Frequency	Percent	Cumulative Percent
1966-1970	72	15.1	15.1
1971-1975	96	20.1	35.1
1976-1980	150	31.4	66.5
1981-1985	37	7.7	74.3
1996-2000	18	3.8	78.0
2001-2005	42	8.8	86.8
2006-2013	63	13.2	100.0
Total	478	100.0	

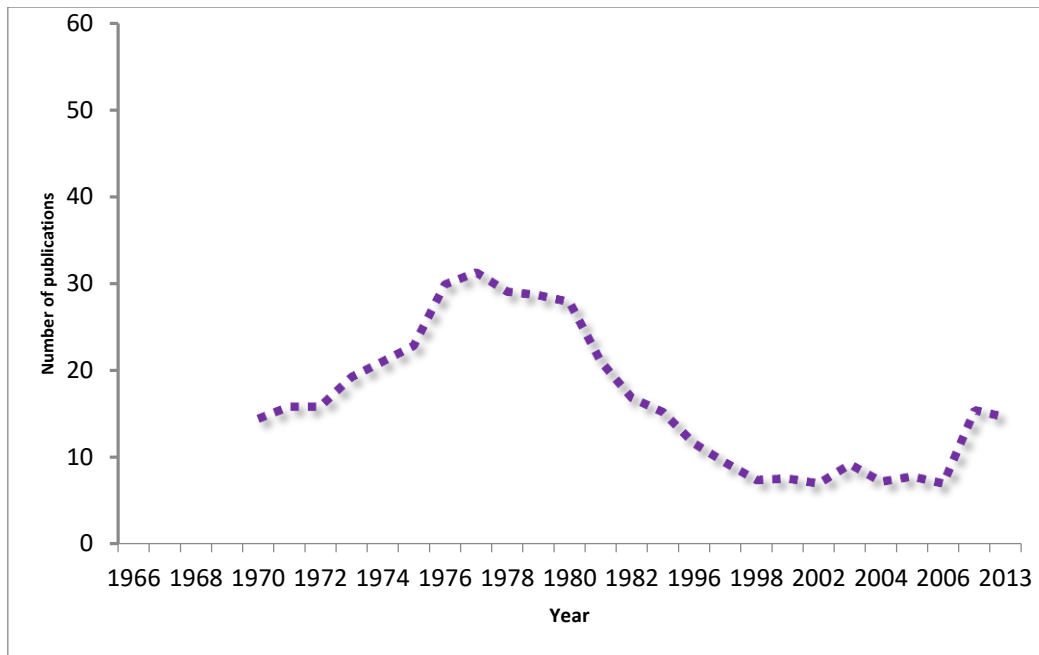


Figure 1: Research output 1966-2013: 5-year moving averages

### 1.2.2 Type of Publications

Out of 478 papers published in *ASR* from 1976 to 2013 (Table 2), 51.5% (246) were book reviews, 43.5% (208), were articles, 3.3% (16) were review articles, 1.5% (7), were editorial comments, and one was a prologue. These results therefore indicate that major document types preferred by researchers publishing in the *ASR* are book reviews and articles.

Table 2 Document types

	Frequency	Percent	Cumulative Percent
Book review	246	51.5	51.5
Article	208	43.5	95.0
Review article	16	3.3	98.3
Editorial comment	7	1.5	99.8
Prologue	1	.2	100.0
Total	478	100.0	

Table 3 shows the trends in the document types being published in the *ASR* over the period under review. The results reveal that book reviews were predominant in the period 1966-1980. Similarly, review articles were predominant during the period 1966-1985; thereafter there have been no article reviews. All the seven editorial comments were published in the 1966-1970 period. Articles have been steadily increasing from 1966 to 2013. Articles are the predominant document type from 1996 to 2013.

Table 3: Trends in document type across the Five-year publication bands

Five-year publication bands	Document type	Total
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	book review	article	review article	prologue	editorial comment	
1966-1970	40	20	5	0	7	72
1971-1975	64	24	8	0	0	96
1976-1980	110	37	2	1	0	150
1981-1985	21	15	1	0	0	37
1996-2000	4	14	0	0	0	18
2001-2005	6	36	0	0	0	42
2006-2013	1	62	0	0	0	63
Total	246	208	16	1	7	478

### 1.2.3 Author Productivity/collaboration patterns

Table 4 reveals that out of the 478 articles published in ASR, 94.6% were single-authored and 5.0% were two-authored. The remaining two articles were authored by three and four authors, respectively. This gives a collaboration coefficient of 0.054. These results indicate that ASR researchers are mainly single authors and there is very little collaboration among them.

Table 4 Authorship pattern

	Frequency	Percent
1	452	94.6
2	24	5.0
3	1	.2
4	1	.2
Total	478	100.0

Table 5 shows the distribution of the authors by their geographical affiliation. Three authors did not provide information regarding their geographical affiliation. The results reveal that the journal is dominated by Zambian authors (81.9%), followed by authors residing in the USA (4.4%), Britain (3.2%), Nigeria (1.7%), and Zimbabwe (1.5%). These results indicate that ASR research output publishes mostly research of local interest and less international in scope. The results may also suggest that the journal has less international visibility and therefore does not attract many international researchers.

Table 5: Geographical affiliation of contributors

	Frequency	Percent	Cumulative Percent
Zambia	389	81.9	81.9
USA	21	4.4	86.3
Britain	15	3.2	89.5
Nigeria	8	1.7	91.2
Zimbabwe	7	1.5	92.6
Botswana	4	.8	93.5
Germany	4	.8	94.3
Tanzania	4	.8	95.2
Australia	3	.6	95.8
Norway	3	.6	96.4
Canada	2	.4	96.8
Kenya	2	.4	97.3
Lesotho	2	.4	97.7
British Columbia	1	.2	97.9
Cameroon	1	.2	98.1
France	1	.2	98.3
Namibia	1	.2	98.5
New Zealand	1	.2	98.7
Scotland	1	.2	98.9
Serra Leon	1	.2	99.2
South Africa	1	.2	99.4
Swaziland	1	.2	99.6
Uganda	1	.2	99.8
Zaire	1	.2	100.0
Total	475	100.0	

Since the majority (81.9%) of the contributions was from Zambian authors, further analysis was conducted to establish the institutional affiliation of the Zambian authors. Majority (76.4%) of the Zambian contributors were from the University of Zambia. The remainder 4.4% were contributions from the following institutions: the Jesuit Centre for Theological Reflection (3; .6%), Central Statistics Office (3; .6%), Zambian High Court (3; .6%), the Zambia Institute of Mass Communication (ZAMCOM) (3; .6%), and Nchanga Consolidated Copper Mines (NCCM) (2; .4%). Others were Kabulonga Boys Secondary School (1; .2%), Nkrumah Teachers' College (1), Kenneth Kaunda Foundation (1; .2%), Law Development Commission (1; .2%), Livingstone Museum (1; .2%), Ministry of Development and Finance (1; .2%), World Council of Churches (1; .2%), Zambia National Monuments Commission (1; .2%), and the Geological Survey (1; .2%). It was further observed that ASR draws most of its authorship from academe, mainly universities with a few from research institutes.

#### 1.2.4 Distribution of Title Keywords

Research trends can be obtained by analyzing the title keywords. There were 1,805 keywords in 478 publications in ASR. The top three most frequently used keywords were “Zambia” (TP=99; 5.5%), “Africa” (TP = 78; 4.3%), “African” (TP=40; 2.2%), “University of Zambia” (33; 1.8%), “History” (29; 1.6%), “AIDS” (27; 1.5%), “Politics” (TP=25; 1.4%), “HIV” (24; 1.3%), “development” (TP=21; 1.2%), “Education” (TP=19; 1.1%), “political” (19; 1.1%), and “social” (TP=19; 1.1%), which were associated with hot topics in ASR. Fifty-seven keywords appear 5-17 times in publications; 164 keywords occur 2-4 times in publications; while 438 keywords occur only once in the publications. The occurrence of such a huge number of keywords suggests that ASR has a very wide coverage of disciplines.

#### 1.2.6 Conclusion

The ASR is the oldest UNZA journal with pre-colonial origin. The journal has been in existence for over 50 years. This study examined the research output of the journal over a period of 47 years (1966-2013). In this relatively long period the journal has tried to keep up its main aim of acting as a medium for communication of all research the academics, and scientists. The present study has revealed that the highest number of articles were mainly on Zambian issues. The journal published 478 articles during the period of study. The majority of the contributors are single Zambians authors based at the University of Zambia. Therefore the journal has very little international scope. Furthermore, the study revealed that journal’s research output drastically decline over a long period with over seventeen years of lack of publication. These irregularities in publication are mainly attributed to poor funding and inadequate submissions.

#### 1.3 Journal of Humanities

The Journal of Humanities (ISSN: 1027-7455) was intended to be a biannual publication for research work in the School of Humanities and Social Sciences. Its first and inaugural issue owes a great deal to the inspiration of the then University of Zambia Chairman of the Senate Publications Committee, Professor Jorry Mwenechanya, who encouraged publication in journals.

The Journal aimed principally at the teaching and research community of the University of Zambia. However, articles and book reviews by authors from outside were accepted as long as they fell within the parameters of the philosophy of the journal. The inaugural, volume 1 issue number 1, June, 1997 issue illustrated a wide range of research work especially in an

environment where publishing had been dead for a long time and was tortuous and frustrating. The initial response to call for articles was less than encouraging. However, after persistent requests and personal contacts with some potential authors, articles trickled in. Soon after articles were received, reviewers were immediately identified and quickly they reviewed, and gave their advice to the Editorial Board on how to go about in publishing the journal. Finally the first issue was published with assistance from the Assistant Editor Mr Samuel Kasankha of the University of Zambia Press (UNZA Press).

### 1.3.1 Growth of Literature (Yearly distribution of papers)

Table 1.3.1 shows the annual distribution of research output from 1997 to 2011, a period of 14 years. The journal has a very short history. A total of 85 scholarly papers, in eleven volumes, were published within the period under review. The number of publications started with only three publications in 1997; the number increased to ten in 1998-1999 issue, but dropped to 8 and 6 in 2000-2001 issue. The number of publications has been irregular, ranging from 3 to 12. The 1998 and 1999 publications were combined in one volume. Similarly, the 2000 and 2001 publications were combined in one volume. This is an indication of failure to publish on regular schedule. From these results one can conclude that the Zambia able its mandate to publish biannually and has barely managed to publish once per year while in some cases once after two years.

Table 1.3.1: Annual distribution of publications

Volume	Year	Frequency	Percent	Cumulative Percent
1	1997	3	3.5	3.5
2	1998-1999	10	11.8	15.3
3	2000-2001	8	9.4	24.7
4	2004	6	7.1	31.8
5	2005	12	14.1	45.9
6	2006	4	4.7	50.6
7	2007	13	15.3	65.9
8	2008	10	11.8	77.6
9	2009	10	11.8	89.4
10	2010	4	4.7	94.1
11	2011	5	5.9	100.0
	Total	85	100.0	

### 1.3.2 Document Types

During its short existence, the journal has published mainly articles, which comprise 95.5% of research output, while the remainder (8.5%) are book reviews.

### 1.4.3 Author Productivity/collaboration patterns

Table 2 below shows that 95.3% of the articles Journal of Humanities were single-authored while 4.7% were multi-authored. This gives a collaborative coefficient of 0.05, which is very low. Therefore, the Journal of Humanities is predominantly single-authorship (solo authorship) with very little collaboration among the contributors. In the four multi-authored papers one a result of collaboration between two UNZA researchers, the rest were a result of collaboration between UNZA researchers and foreign based researchers. Further analysis revealed that there was very little international collaboration; only five papers were authored with foreign based researchers: one two from Germany, two from Nigeria, and one from Botswana. These results reveal that the Journal of Humanities has not yet managed to attain international scope.

Table 2: Number of authors per paper

	Frequency	Percent
1	81	95.3
2	3	3.5
3	1	1.2
Total	85	100.0

### 13.3.4 Contributing UNZA Departments

Since the majority (72.94%) of the contributions was from the University of Zambia authors, further analysis was conducted to establish the institutional affiliation of the Zambian authors. Table 3 reveals that 13 UNZA departments contributed 62 papers to the Journal of Humanities during the period under review. Topping the list is the Department of History (17; 27.4%), followed by the Institute of Social and Economic Research (9; 14.5%), the Department of Religious Studies (7; 11.3%), the Department of Language and Social Sciences (6; 9.7%), the Department of Literature and Languages (6; 9.7%), and the Department of Philosophy (6; 9.7%). Others were Political and Administrative Studies (3; 4.8%), Demography and Political Studies (2; 3.2%), Educational Policy, Sociology and Special Education (2; 3.2%), Adult Education and Extension Studies (1; 1.6%), Language and Social Science (1; 1.6%), Literature and Languages (1; 1.6%), and Mass Communication (1; 1.6%).

Table 3: Contributing UNZA departments

	Frequency	Percent	Cumulative Percent
History	17	27.4	27.4
Institute for Economic & Social Research	9	14.5	41.9
Religious Studies	7	11.3	53.2
Language & Social Sciences	6	9.7	62.9
Literature & Languages	6	9.7	72.6
Philosophy	6	9.7	82.3
Political & Administrative Studies	3	4.8	87.1
Demography & Population Studies	2	3.2	90.3
Educational Psychology, Sociology & Special Education	2	3.2	93.5
Adult Education & Extension Studies	1	1.6	95.2
Language & Social Science	1	1.6	96.8
Literature & Languages	1	1.6	98.4
Mass Communication	1	1.6	100.0
Total	62	100.0	

#### 1.3.4 Distribution of Title Keywords

Research trends can be obtained by analyzing the title keywords. There were 365 keywords in 85 publications in Journal of Humanities. The top four most frequently used keywords were “Zambia” (TP=31; 8.5%), “Education” (TP=8; 2.2%), “Language” (TP=6; 1.6%), “Culture” (5; 1.4%), which were associated with hot topics in the Journal of Humanities. Nineteen keywords appear 2-4 times in the publications; 253 keywords occur only once in publications. The occurrence of such a huge number of keywords suggests that the Journal of Humanities has a very wide coverage of disciplines.

#### 1.3.5 Conclusion

The journal has a short history of 14 years (1997-2011). In this short period the journal has tried to keep up its main aim of acting as a medium for communication of all sorts of students, humanities and social scientists, and academicians. The present study reveals that the majority of articles published in the journal are concentrated on local issues such as education, language, and culture. The journal published 85 articles during the period of study. Majority of the contributors are single authors (95.3%). The major contributors are mostly from the University of Zambia.

### 1.4 Zambia Journal of History

The Zambia Journal of History (ISSN: 1815-025X) is a publication of the Department of History of the University of Zambia. The journal is a result of the encouragement from the former Dean of the School of Education to have departments launch departmental journals.

Funds for publication were even allocated. This prompted the Department to review its existing publishing commitments and decided, among other publishing commitments, to launch this journal. Its first publication was done in 1981 under the chairmanship of M. S. Muntamba for the editorial Board. Editors included H. W. Macmillan, B. Nyeko and J. K. Rennie. Initially, the journal was intended to be the major publication of the department to be produced annually.

The journal in principle accept articles, letters and book reviews for publication on Africa, and world history topics, except that the first issue would be devoted to works on Zambian history. Contributors do not only come from members of staff and postgraduates in the Department of History but all other scholars outside the department who have written on issues relating to the history of Zambia and Africa.

The journal is aimed at a wider academic readership while its objective is to showcase the on-going research activities in several dimensions of the Zambian history- ecology, economics politics and ideology. It was further intended that, with the expansion of the department to providing post-graduate programs, it would produce more historical research both locally and abroad. The future issues would therefore contain a more representative selection of people's works and a better coverage of pre-colonial history. It was however openly agreed to give priority to publishing deserving results of research done in the University of Zambia

After the first issue was published in 1981, it took eight years before the second issue could be released in 1989. The eight year gap in publication has been attributed to staff turnover, financial difficulties, theft and incidental delays in typing and production of the issue. At the second publication, the editorial team promised to have regular publications at the end of each calendar year. This was because the department then had acquired facilities required to run regular journal publications.

Like true to their plan, the Zambia Journal of History (ZJH) for some time maintained the publication momentum until after the 1995 publication. The period from 1996 to 2003 went without a single publication. Reasons advanced for this 'dry spell' was that the journal's major funder for the publication in the name of African Commercial Bank got liquidated and could not therefore continue funding the journal's publications. Other financiers were Centre de Recherche d' Echanges et de Documentation Universitaire that financed the publication of issue No. 4, 1991 and Beit trust that financed the publication of a combined issue for Nos. 6/7, 1993/94.

As the department kept looking for the way out of this dilemma, in 2004 the Central administration of the University of Zambia released the funds that belonged to the department. These funds helped in the publication of the 2004 issue, now called Volume 1, No. 9. At this point, the journal also changed its size from the previous A4 to A5. Since then, no other issue has been released and currently, a “call for papers” for publication in the journal has been running on the University of Zambia website.

The department was blessed with well-meaning Professional Historians (Doctors, professors and PhD student- lecturers) that had the passion for the department and to have the department’s research results published.

The journal has experienced a lot of inconsistencies in its publications such as the frequency of publications as well as long gaps between publications. For example, eight years passed between the first and the second publication, another eight years passed between the eighth and ninth publications and eleven years has passed since the last publication (Vol.1. No. 9, 2004) and we are still waiting for another publication. These hiccups in publication are what probably caused issues 6 & 7 to be combined (Nos. 6/7, 1993/94). Explaining the current problem behind non-publication, one of the editors cited lack of commitment from the members, not much to do with funding.

Too many book reviews in the issues such that it kind of became a norm to have a number of book reviews in every publication. In some instances, there were more reviews than research articles e.g. issue no. 2, 1989 has 3 articles against 4 book reviews while issue No. 5, 1992 has 3 research articles against 7 book reviews and issue No. 6/7, 1993/94 has 4 research articles against 5 book reviews and 2 obituaries. Worse still some reviews are very short, even as short as half a page. This scenario could be analysed from two view points, on one hand, that the book reviews are given precedence over original research while on another hand; one would attribute this to lack of enough people submitting research articles.

Some issues have no information on the authors such as institution one belonged to when they submitted their work. This makes it difficult to trace the contributors in cases where the reader would want to.

#### 1.4.1 Growth of Literature (Yearly distribution of papers)

Table 1 shows the annual distribution of research output from 1981 to 2004, a period of 23 years. The journal has a relatively short history. A total of 61 scholarly papers, in eight issues,

were published within the period under review. The number of publications started with only six publications in 1981, and slowly increased to ten in the fifth and 6/7<sup>th</sup> issues; but dropped to 5 and 7 publications, respectively, in the last two issues. The number of publications has been irregular, ranging from 5 to 10. After the first issue was published in 1981, it took eight years before the second issue could be released in 1989. The eight year gap in publication has been attributed to staff turnover, financial difficulties, theft and incidental delays in typing and production of the issue. At the second publication, the editorial team promised to have regular publications at the end of each calendar year. This was because the department then had acquired facilities required to run regular journal publications. From 1989 to 1992, the ZJH maintained its publication schedule of publishing one annually; but failed in 1993, and therefore combined the 1993 and 1994 publications into one volume. The period from 1996 to 2003 passed without a single publication. Reasons advanced for this ‘dry spell’ was that the journal’s major funder, the African Commercial Bank, got liquidated and could not therefore continue funding the journal. Other financiers were Centre de Recherche d’ Echanges et de Documentation Universitaire that financed the publication of issue No. 4, 1991 and Beit trust that financed the publication of a combined issue for Nos. 6/7, 1993/94. Therefore, the journal’s publication history is characterised by long dry spell periods. Consequently, research output has been very low.

Table 1: Annual distribution of publications

Issue		Frequency	Percent	Cumulative Percent
1	1981	6	9.8	9.8
2	1989	7	11.5	21.3
3	1990	7	11.5	32.8
4	1991	9	14.8	47.5
5	1992	10	16.4	63.9
6 & 7	1993/94	10	16.4	80.3
8	1995	5	8.2	88.5
9	2004	7	11.5	100.0
	Total	61	100.0	

#### 13.4.2 Type of Publications

Figure 1 shows that the major types of documents published in the *Zambian History Journal* were articles (54%; 33), book reviews (41%; 25), obituary (3%; 2), and article reviews (2%; 1).

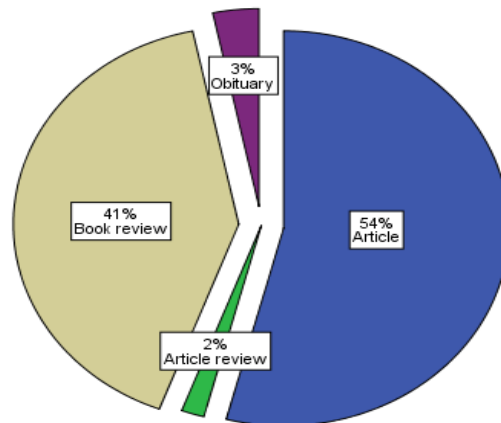


Figure 1: Types of document published in ZJH

#### 1.4.3 Author Productivity/collaboration patterns

As observed earlier, 61 articles were produced by the ZJH from 1981 to 2004. All the sixty-one articles were single-authored. There was absolutely no collaboration. Thirty-one authors contributed one article each to the Journal; five authors contributed two articles each; two authors contributed four articles each; one author contributed five articles; and one author contributed seven articles. Furthermore, 47 (77.1%) articles were written by the members of staff in the University of Zambia; two were written by one author from the University of Toronto (Canada), one by a contributor from the University of Edinburgh (UK), one from the University of London (UK), one from the University of California (USA), one from the University of Tromso (Norway), and one from the National University of Lesotho (Lesotho). There were only two contributors from local institutions, outside UNZA, one from Monze Secondary School and the other from Lusaka Historical Museum. The journal is therefore dominated by Zambian authors. This is probably because the journal focuses on local research topics.

#### 1.4.5 Subject Areas and trends

#### 1.4.6 Conclusion

The journal has published 61 articles during the period of study. The journal has been characterized by low research output ranging from 5 to 10 articles per volume, with a dry spell at the beginning. This study reveals that the categories of article distributions are almost equally distributed between research articles and book reviews. All the sixty one articles were contributed by single authors; and most authors were faculty members or researchers affiliated with academic or research institutions. Similarly most of the contributions are from the University of Zambia, while contribution from foreign based authors was very minimal.

#### 1.5 Zango: the Zambian Journal of Contemporary Issues

ZANGO, the Zambian Journal of Contemporary Issues (ISSN: 1028-3536), is a popular journal sponsored by the University of Zambia and edited by a committee of faculty members of the University. ZANGO means '*forum*', 'debate' or 'arena' for exchanging views. It was started in 1976 as a bi-annual journal until 1907 when it began to publish a continuous annual volume. The journal carries articles on African thought, development, politics, international issues, language and music. ZANGO contains inter alia information on bibliography of Zambia, university announcements and readers' comments. ZANGO is published by UNZA Press. With a gap of 13 years, between 1983 and 1996, the journal resumed publication in 1997. Between 1998 and 2011, journal issues were combined e.g. 1998/1999; 2006/2007, etc. From 2012 onwards the journal reverted to its original vision of bi-annual publications.

##### 1.5.1 Growth of Literature (Yearly distribution of papers)

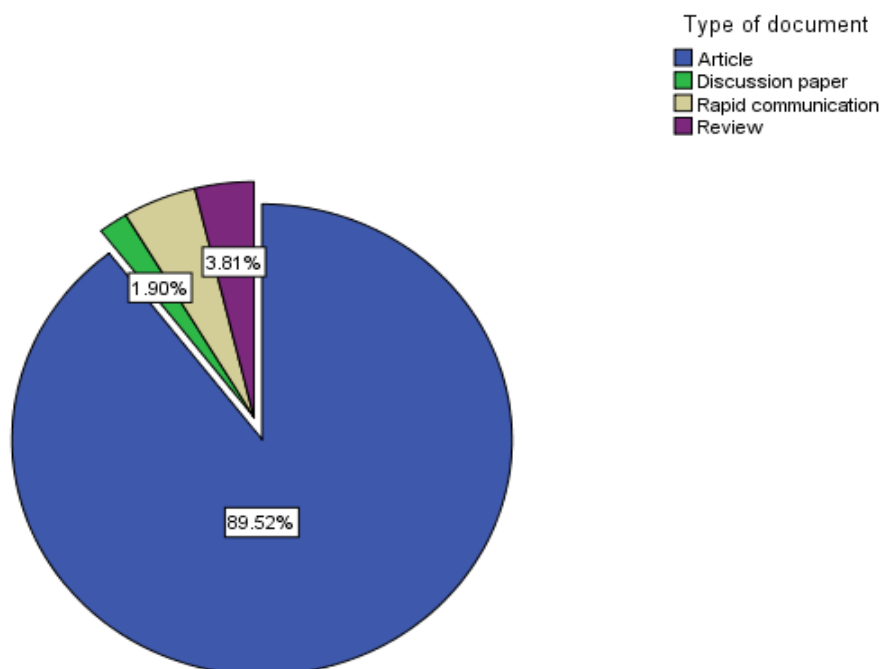
Table 1 shows the annual distribution of research output of Zango from 1976 to 2013, a period spanning 37 years. This makes the second oldest UNZA sponsored journal after the African Social Research. A total of 107 scholarly papers were published within the period of review. The journal has published 16 volumes from 1976 to 2013. The research output of the journal is very small, ranging from 4 to 12 per volume. This gives an average of 6 publications per volume. The journal resorted to publishing once every two years from 1998 to 2011. There were no publications in the 2008-2009 period. The journal resumed publishing annually in 2012 and 2013. These inconsistencies in frequency of publishing are an indication that the journal has serious challenges.

Table 1 Year of publication

	Frequency	Percent	Cumulative Percent
1976	4	3.7	3.7
1977	9	8.4	12.1
1978	9	8.4	20.6
1979	6	5.6	26.2
1980	12	11.2	37.4
1981	4	3.7	41.1
1982	6	5.6	46.7
1997	5	4.7	51.4
1998/1999	4	3.7	55.1
2000/2001	6	5.6	60.7
2002/2003	9	8.4	69.2
2004/2005	5	4.7	73.8
2006/2007	7	6.5	80.4
2010/2011	9	8.4	88.8
2012	6	5.6	94.4
2013	6	5.6	100.0
Total	107	100.0	

### 1.5.2 Type of Publications

The majority (89.52%; 94) of publications produced in Zango were articles (Figure 1). The remainder consisted of rapid communication (5; 4.7%), review articles (4; 3.7%), and discussion papers (2; 1.9%).



### 1.5.3 Author Productivity/collaboration patterns

About 95.3% (102) of the publications were single-authored; only five (4.7%) were multi-authored. This gives a collaborative coefficient of 0.05, which is very low. Therefore, Zango is predominantly single-authorship with very little collaboration. Furthermore, it was observed that apart from one author based in the United States of America (Florida State University), all the other authors were University of Zambia staff. The Journal therefore has not yet achieved an international scope. This may be attributed mainly the journal's concentration on local research topics and lack of visibility at international level. The Journal is not indexed in any of the international databases like African Journal Online (AJOL) and the Web of Science.

A total of 202 authors were contributed articles to Zango from 1976 to 2013. Seventy-two authors contributed one article each to the Journal; 10 authors contributed two articles each; two authors contributed three articles each; two authors contributed four articles each; and one author contributed six articles.

### 1.5.4 Subject Areas and trends

### 1.5.5 Conclusion

The journal has published 107 articles during the period under review. Research output is generally small and varies from 4 to 12 per volume. There inconsistencies regarding the frequency of publishing. The majority of the articles were contributed by single authors and most authors were faculty members or researchers affiliated with academic or research institutions. Similarly nearly all the contributions were from the University of Zambia, while only one contribution was foreign based author.

## 1.6 The Zambian Papers

The *Zambian Papers* (ISSN: 1028-2351), formally called the *Rhodes-Livingstone Journal of Human Problems in Central Africa*, was initially published twice in a year (June and December). The *Zambian Papers*, was an offshoot of the *African Social Research* journal. It started publishing in 1967. It is published twice yearly in June and December by the University of Zambia Press. However, as time went on the journal whose latest edition is number 23, was sometimes published as a monographic series. The contributions of this journal come from all those working in the general field of social research in Africa, especially in sociology and social

anthropology, economics, psychology, human geography and demography, history and political science. Articles are also welcome from those engaged on similar work elsewhere when the findings are applicable to Africa or provide important points of contrasts. As general rule articles are not exceed 10,000 words in length but consideration is given to longer articles of special interest.

A summary of about 100 words suitable for abstract purposes are provided by the author. The summary is printed at the head of the article. At least two copies of the article are to be submitted by the author and after the journal is published the author is entitled to two copies and 25 off-prints of their article for free.

### 1.6.1 Growth of Literature (Yearly distribution of papers)

Table 1 shows the annual distribution of research output of the *Zambian Papers* from 1967 to 2011. A total of 49 scholarly papers were published within the period under review (44 years). The number of publications per year was very small ranging from one to 26 papers; the mode is one publication per year. Surprisingly, the largest number of papers (26) was published in 1984. This was a special issue. Table 1 reveals that the journal was published irregularly; in sometimes as bi-annual (1967, 1971, 1978, and 1984), sometimes as an annual (for example in 1968 and 1969), and at other times as a monographic series (1997, 2001, 2004, 2010, and 2011). There were several years when the journal was not published. For instance the Journal was not published in the following years: 1975, 1977, 1979, 1981, 1983, 1986-1996, 1998-2000, 2002-2003, and 2005-2009. At the time of writing this monograph issue number 24 was not yet published; and it was not known when the issue was going to be published. These inconsistencies in the frequency of publishing and in the numbering of issues, number of articles per issue, have a negative effect on the quality of the journal.

Table 1: Annual distribution of research output of the *Zambian Papers*

Year	Issue number	Frequency	Percent
1967	1 & 2	4	8.2
1968	3	1	2.0
1969	4	1	2.0
1971	5 & 6	2	4.1
1972	7	1	2.0
1973	8	1	2.0
1974	9	1	2.0
1976	16	1	2.0
1978	10/11 & 12	2	4.1
1980	13	1	2.0
1982	17	1	2.0
1984	14 & 15	26	53.1
1985	18	1	2.0
1997	19	1	2.0

2001	20	1	2.0
2004	21	1	2.0
2010	22	1	2.0
2011	23	2	4.1
Total		49	100.0

### 1.6.2 Type of Publications

Table 2 reveals that the major document types published in the *Zambian Papers* are mainly research articles (32; 65.3%), followed by speeches (13; 26.5%). There were three short communication articles, and one discussion paper was published.

Table 2: Document types

	Frequency	Percent	Cumulative Percent
Article	32	65.3	63.3
Speech	13	26.5	91.8
Short communication article	3	6.1	97.9
Discussion paper	1	2.0	100.0
Total	49	100.0	

### 1.6.3 Author Productivity/collaboration patterns

Nearly all the papers published in the *Zambian Papers* are single-authored; only two papers were two-authored; one by Professor Geoffrey Lungwangwa and Professor Mubiana Macwan'gi and the other by Wanga W. Chakanika and Sylvia K. Phiri. Forty-nine authors participated in the production of the 49 publications. L.H.K. Goma contributed 18 papers, Patrick Ohadike contributed 8 papers, and Wanga W. Chakanika contributed two papers.

### 1.6.4 Conclusion

This study has reviewed the research output of the *Zambian Papers* from 1967 to 2011. Only 47 papers were published during the period under review. Publishing was intermittent and irregular and low, mostly of one paper per year. Most of the papers published were research articles and speeches. All the papers were contributed by researchers at the University of Zambia. Inconsistencies in the frequency of publishing and in the numbering of issues, number of articles per issue, have a negative effect on the quality of the journal.

## 1.7 The Journal of Science and Technology

The *University of Zambia Journal of Science and Technology* (ISSN 1028-4928), was established in 1996 and the first issue was published in 1997. It is published twice yearly in June and December by the University of Zambia Press. The *Journal of Science Technology*

(JST) is one of the sponsored University journals, with a mandate to serve the publication needs of academics in the five science-based Schools of Agricultural Sciences; Natural Sciences; Mineral Sciences; Engineering and Veterinary Medicine. The journal provides an outlet for research findings and reviews in areas of science and technology found to be relevant for national and international development. The biannual journal is intended, in its publications, to stimulate new research and foster practical application from the research findings. The journal aims at publishing original research of such high quality in order to attract contributions from the relevant local, regional and international communities. It also aims at providing a unique channel for enhancing innovative ideas and developments in inter and multi-disciplinary areas covered by the journal. Therefore a bibliometric study of this journal is of immense significance.

With a gap of 4 years, between 1999 and 2003, the journal resumed publication with a special edition in 2004. According to the Christopher Bwalya, Assistant Editor at UNZA Press, the two critical challenges threatening the existence of the journal are: lack of articles from researchers, and lack of funds to enable consistency in the publication of the journal. In terms of financial support, the Journal has been receiving funding from the National Science and Technology Council (NSTC).

#### 1.7.1 Growth of Literature (Yearly distribution of papers)

Table 1 shows the annual distribution of research output of the JST from 1997 to 2014. A total of 90 scholarly papers were published within the period under review (17 years). The number of publications per year was very small ranging from 5 to 13 papers; with an average of 8 publications per year. The largest number of papers (13) was published in 2004. Table 13.7.1 reveals that the journal was published irregularly; in sometimes as bi-annual (1967, 1971, 1978, and 1984), sometimes as an annual (for example in 1968 and 1969), and at other times as a monographic series (1997, 2001, 2004, 2010, and 2011). There were several years when the journal was not published. For instance the Journal was not published in the following years: 1999-2003, 2006, and 2007. At the time of writing this monograph the 2015 issue was not yet published. These inconsistencies in the frequency of publishing and in the number of articles per volume, may have a negative effect on the quality of the journal.

Table 1: Annual distribution of research output of the JST

Year	Frequency	Percent	Cumulative Percent
1997	11	12.2	12.2
1998	9	10.0	22.2
2004	13	14.4	36.7

2005	6	6.7	43.3
2008	6	6.7	50.0
2009	6	6.7	56.7
2010	5	5.6	62.2
2011	10	11.1	73.3
2012	11	12.2	85.6
2013	6	6.7	92.2
2014	7	7.8	100.0
Total	90	100.0	

### 1.7.2 Type of Publications and Subject Areas and trends

All the 90 documents published during the period under review were research articles.

### 1.7.3 Author Productivity/collaboration patterns

About 77.8% (70) of the publications were multi-authored; only 22.2% (20) were single-authored. This gives a collaborative coefficient of 0.78, which is very high. Therefore, the Journal of Science and Technology is predominantly multi-authorship. Table 2 below reveals that 28 (31.1%) articles were two-authored, 11 (12.2%) were three-authored, 15 (16.7%) were four-authored, 5 (5.6%) were five-authored, 4 (4.4%), were six-authored, 4 (4.4%) were seven-authored, 2 (2.2%) were eight-authored, and 1 (1.1% article was nine-authored.

Table 2: Authorship patterns

	Frequency	Percent	Cumulative Percent
1	20	22.2	22.2
2	28	31.1	53.3
3	11	12.2	65.6
4	15	16.7	82.2
5	5	5.6	87.8
6	4	4.4	92.2
7	4	4.4	96.7
8	2	2.2	98.9
9	1	1.1	100.0
Total	90	100.0	

A total of 202 authors were contributed articles to the Journal of Science and Technology from 1997 to 2014. Seventy-two authors contributed one article each to the Journal; 10 authors contributed two articles each; two authors contributed three articles each; two authors contributed four articles each; and one author contributed six articles.

### 1.7.3 Geographical and Institutional Affiliation of the Authors

Table shows that 81.3% of the authorship was from Zambia. Majority of these authors were from the University of Zambia. About 18.7% of the authorship was drawn from other countries,

namely Nigeria (7), China (2), and South Africa (2). Others were Belgium (1), Japan (1), Malawi (1), Norway (1), Scotland (1), UK (1), and Zimbabwe. Contributions from the international research community are still at very low level. This may be due to the fact that the journal is not yet indexed in international indexing databases and is therefore not widely known.

	Frequency	Percent	Cumulative Percent
Zambia	78	81.3	81.3
Nigeria	7	7.3	88.5
China	2	2.1	90.6
South Africa	2	2.1	92.7
Belgium	1	1.0	93.8
Japan	1	1.0	94.8
Malawi	1	1.0	95.8
Norway	1	1.0	96.9
Scotland	1	1.0	97.9
UK	1	1.0	99.0
Zimbabwe	1	1.0	100.0
Total	96	100.0	

### 1.7.6 Conclusion

The Journal of Science and Technology has published 90 articles during the period under review. The year 2004 shows the maximum number of contributions (13 articles; 14.4%) to JST. This study reveals that the categories of article distributions are remarkable in this research journal. The majority of the articles were contributed by multiple authors (70 articles; 77.8%); and most authors were University of Zambia lecturers and researchers.

## 1.8 Zambia Law Journal

### 1.8.1 Publication frequency

Table 1 shows the publication frequency and pattern of Zambia Law Journal (ZLJ) during the period 1969-2013. The journal published 33 volumes. The results reveal that ZLJ was published irregularly. For instance, the following volumes 3 and 4, 7-9, 21-24, and 25-28, were combined. Furthermore, although the journal was intended to be a bi-annual, it was mostly published as an annual serial (Table 2). It was only published twice in one single year, i.e. in 1969. In some years issues 1 and 2 were combined. There were an irregular number of articles per issue, ranging from 1 to 16, with an average of 4. Therefore, there was no consistency in the number of publications per issue. This affects the quality and the reputation of the journal.

Table 1 Publication pattern of *ZLJ*

	Number of publications	Percent
1	16	7.1
2	1	.4
3/4	15	6.6
5	15	6.6
6	10	4.4
7/9	7	3.1
10	8	3.5
11	6	2.7
12	6	2.7
13	7	3.1
14	10	4.4
15	11	4.9
16	6	2.7
17	7	3.1
19	5	2.2
20	6	2.7
21	5	2.2
21/24	5	2.2
25/28	5	2.2
29	3	1.3
31	6	2.7
32	6	2.7
33	6	2.7
35	7	3.1
36	4	1.8
37	4	1.8
38	5	2.2
40	5	2.2
41	4	1.8
42	6	2.7
43	4	1.8
44	5	2.2
Special	10	4.4
Total	226	100.0

Table 2: Distribution of publications by year number of issues

	Number of issues			Total
	1	1/2	2	
1969	11	0	5	16
1970	0	1	0	1
1971-1972	0	3	0	3
1972 -1972	0	1	0	1
1973	15	0	0	15
1973 -1972	0	1	0	1
1974	10	0	0	10
1974 -1972	0	1	0	1
1975 -1972	0	1	0	1
1975-1977	7	0	0	7
1976 -1972	0	1	0	1
1977 -1972	0	1	0	1
1978	8	0	0	8
1978 -1972	0	1	0	1
1979	6	0	0	6
1979 -1972	0	1	0	1
1980	6	0	0	6

1980 -1972	0	1	0	1
1981	7	0	0	7
1981 -1972	0	1	0	1
1982	10	0	0	10
1982 -1972	0	1	0	1
1983	11	0	0	11
1983 -1972	0	1	0	1
1984	6	0	0	6
1985	7	0	0	7
1987	5	0	0	5
1988	7	0	0	7
1989	5	0	0	5
1989-92	5	0	0	5
1993-96	5	0	0	5
1997	3	0	0	3
1998	4	0	0	4
1999	6	0	0	6
2000	6	0	0	6
2001	6	0	0	6
2003	7	0	0	7
2004	4	0	0	4
2005	4	0	0	4
2006	5	0	0	5
2008	5	0	0	5
2009	5	0	0	5
2010	4	0	0	4
2011	6	0	0	6
2012	4	0	0	4
2013	5	0	0	5
	205	16	5	226

### 1.8.2 Growth of Literature (Yearly distribution of papers)

Figure 1 shows the yearly distribution of research output from 1969 to 2013. A total of 226 scholarly papers were published within the period of review. The number of publications remarkably was irregular and characterized by up-and-down patterns throughout the 45 year period. The highest number of publications was produced in 1969 (16), followed by 1973 (15). The number of publications would sometimes drop to one publication per issue, for instance in 1970, and 1974.

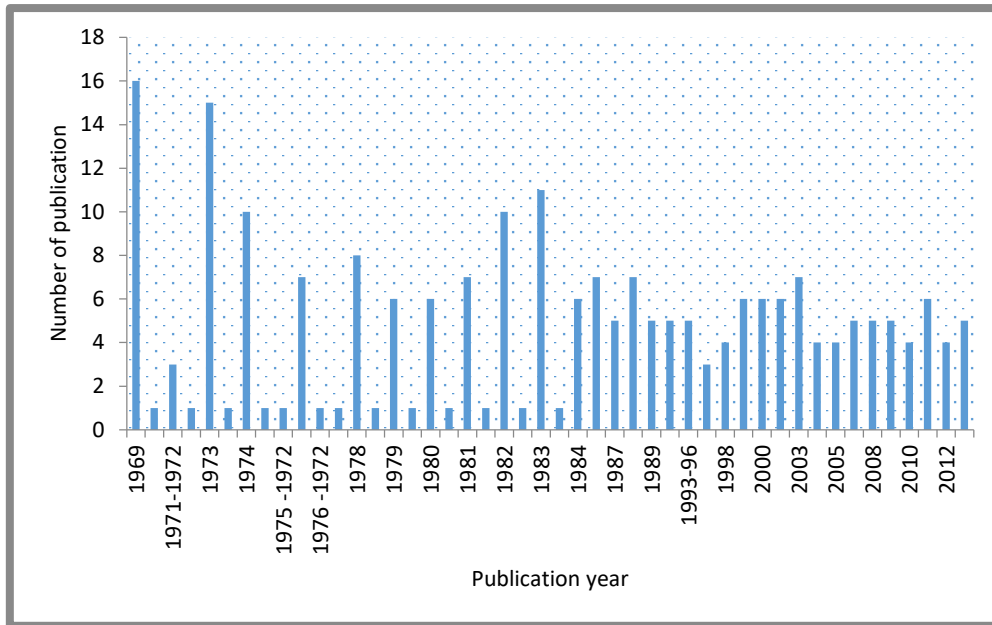


Figure 1: Research output of ZLJ 1969-2013

### 1.8.3 Type of Publications

Out of 226 documents published in ZLJ from 1969 to 2013 (Table 13.8.3), 73.9% (167) were articles, 12.8% (29) were commentary, 5.3% (12) were book reviews, 2.7% (6) were cases, 2.2% (5) were article reviews, 1.8% (4) were obligatory essays, .9% (2) were pieces of legislation, and one was a news item (Table 3). These results therefore indicate that major document types preferred by researchers publishing in the ZLJ are articles and commentaries.

Table 3 Document types

	Frequency	Percent	Cumulative Percent
Article	167	73.9	73.9
Commentary	29	12.8	86.7
Book review	12	5.3	92.0
Case	6	2.7	94.7
Review	5	2.2	96.9
Obligatory essay	4	1.8	98.7
Legislation	2	.9	99.6
News	1	.4	100.0
Total	226	100.0	

### 1.8.4 Author Productivity/collaboration patterns

Table 4 reveals that out of the 226 articles published in ZLJ, 96.9% were single-authored, 2.2% were two-authored, and 0.9% was three-authored. The remaining two articles were authored by three and four authors, respectively. This gives a collaboration coefficient of 0.031. These

results indicate that ZLJ researchers are mainly single authors and there is very little collaboration among them.

Table 13.2.4 Authorship pattern

	Frequency	Percent
1	219	96.9
2	5	2.2
3	2	.9
Total	226	100.0

Table 5 shows the distribution of the authors by their geographical affiliation. The 226 publications were contributed by 228 authors drawn from different institutions. The results reveal that the journal is dominated by Zambian authors (73.7%), followed by authors residing in the Nigeria (8.8%), USA (5.7%), and Kenya (4.4%). These results indicate that ZLJ research output publishes mostly research of local interest and less international in scope. The results may also suggest that the journal has less international visibility and therefore does not attract many international researchers.

Table 5: Geographical affiliation of contributors

	Frequency	Percent
Zambia	168	73.7
Nigeria	20	8.8
USA	13	5.7
Kenya	10	4.4
Benin	2	.9
Lesotho	2	.9
Malawi	2	.9
Papua New Guinea	2	.9
South Africa	2	.9
Tanzania	2	.9
UK	2	.9
Botswana	1	.4
Ghana	1	.4
Sweden	1	.4
Total	228	100.0

Since the majority (73.7%) of the contributions was from Zambian authors, further analysis was conducted to establish the institutional affiliation of the Zambian authors. Majority (84.9%) of the Zambian contributors were from the University of Zambia. The remainder

15.1% was contributions from various institutions. Seventeen (7.5%) publications were from government institutions like the Judiciary (the High Court and the Supreme Court), Legal Development Commission, the National Institute of Public Administration, and Office of the President, Ministry of Legal Affairs, and Bank of Zambia. Nine (4.0%) publications were from the private sector including one from private university. Therefore ZLJ draws most of its authorship from academe, mainly universities with a few from research institutes.

#### 1.8.6 Distribution of Title Keywords

Research trends can be obtained by analyzing the title keywords. There were 569 keywords in 226 publications in ZLJ. The top three most frequently used keywords were “Zambia” (TP=53; 9.3%), “Law” (TP = 10; 1.8%), “African” (TP=8; 1.4%), “Constitution” (7; 1.2%), “Act” (5; 0.9%), “Appeal cases” (5; 0.9%), “Human rights” (TP=5; 0.9%), “Legal” (5; 0.9%), and “development” (TP=4; 0.7%), which were associated with hot topics in ZLJ. Six keywords appear 3 times in publications; 44 keywords occur twice in publications; while 361 keywords occur only once in the publications. The occurrence of such a huge number of keywords suggests that ZLJ has a very wide coverage of topics.

#### 1.8.7 Conclusion

The ZLJ is one of the oldest UNZA journals run by the University of Zambia. The journal has been in existence for 47 years. This study examined the research output of the journal over a period of 45 years (1969-2013). In this relatively long period the journal has tried to keep up its main aim of acting as a medium for communication of all research the academics, and legal practitioners. The present study has revealed that the highest number of articles were mainly on Zambian issues. The journal published 226 articles during the period of study. The majority of the contributors are single Zambians authors based at the University of Zambia. Therefore the journal has very little international scope. Furthermore, the study revealed that the journal’s publishing trend was extremely irregular and the research output was therefore low and varied. These irregularities in publication are mainly attributed to poor funding and inadequate submissions.

### 1.9: General Conclusion and Recommendations

2016 sees the University of Zambia celebrating its 50<sup>th</sup> anniversary, and this paper has discussed the research output of six of the University’s sponsored journals. Bibliometric study of a single journal provides a portrait of the concerned journal by indicating the quality,

maturity and productivity of the journal. It informs about the research orientation that the journal supports to disseminate and its influence on author's choice as a channel to communicate or retrieve information for their research needs.

UNZA journals are characterized by a short history of ranging from 7 to 66 years. In this short period the journals have tried to keep up their main aim of acting as a medium for communication of all sorts of information to librarians, scientists, and academicians. The journals also differed in their frequency of publication; some journals published biannually while others published annually. Consequently, the research output varied from journal to journal. Most journals were unable to keep to their schedule and were therefore irregular in their publication. Although there were no dates indicating the time of submission, date of acceptance and date of publication, it was observed that there were considerable lengths of time between these time periods. Time lag is the time taken between the date of acceptance of a paper for publication and the actual date of publication.

The publication output of the source journals is dominated by single authors, the DC in the journals varied from 0.21 to 0.4. As DC value does not exceed 0.5, it is further deduced that single-authored contributions occupy the prominent position during this study period. Articles were the major channel of communication.

The challenges faced UNZA journals included lack of financial support, inadequate submissions, lack of coverage in international indexing databases, poor international visibility, inability to attract international authors, and lack of expertise in journal publishing. These journals also vary in terms of quality particularly in relation to formatting, citation and referencing styles, and inclusion of abstracts and indexing terms (keywords), and authors' institutional affiliation and country of origin. Most of the journals did not provide this information.

The following recommendations were made:

1. The University of Zambia should provide adequate funding to its institutional journals
2. The editorial boards should strive to convert their journals into open access electronic journals in order to a) minimise printing costs, b) increase their visibility, c) attract international researchers, and improve their impact.
3. The journals should be indexed in international indexing databases such as the African Online Journal (AJOL)

4. The journals should be archived in the institutional repository
5. Regular workshops for researchers should be conducted to impart skills in research and publishing
6. Editorial boards should promote collaboration at various levels, departmental, institutional, and national levels
7. Encourage participation at workshops and seminars both at local and international levels
8. Encourage turning postgraduate research into journal articles
9. The journals should strive to reduce the time lag between the date of receipt of papers and the date of publication

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## Factors Contributing to Low Research Productivity at the University of Zambia

Akakandelwa Akakandelwa, Christine W. Kanyengo and Francina N. Makondo

### 1.1 Introduction

This report has attempted to analyze UNZA's performance regarding one of its key functions, which is conducting research, over the past 50 years, as one of the ways of commemorating the institution's 50<sup>th</sup> anniversary. By looking at the research productivity of UNZA, the authors investigated the factors that influenced research, research collaboration, research trends, and impact of the research in terms of quality and reputation. All relevant indicators show that despite the existence of a number of highly productive scholars and academic units, overall the research productivity of UNZA, the oldest and largest university in Zambia, is lagging far behind productivity when compared to similar universities in the rest of the world. UNZA ranked 66<sup>th</sup> on the top 100 African universities, and 3,970<sup>th</sup> on world rankings.

### 1.2 Factors Contributing to Low Research Productivity

Four main factors were identified as impacting on research productivity – that is, individual factors, lack of infrastructure and organisational factors, funding, and research culture.

#### 1.2.1 Lack of funding

It is obvious that funding has a major impact on the nature and sustainability of research capacity at UNZA, and consequently on the University's research productivity. Very little funding is allocated to research in the annual budget of the University. Therefore, most of the research conducted by faculty depends on their personal funding, or in a few cases on external donor funding. Low salaries limit the extent to which lecturers can engage in meaningful research. It also limits the nature of research they can engage in. In cases where UNZA has received donor funding for research, in most cases the university's leadership has limited to no influence on how this money is invested in the institution's research activities. Although several international agencies have provided specific scientific and technological research and development support, this support is usually piece meal and only offered to a few sections of the institution. These include the JICA, INASP, and Triple S, UNESCO, among others.

### 1.2.2 Lack of Infrastructure

Absence of incentive structures, poor infrastructure and lack of a professional research management – are to a large extent the result of a lack of consistent and adequate funding earmarked for research. Unlike the situation in research universities in the OECD or South Africa, the institutional leadership at UNZA lacks the level of institutional research income needed to build an adequate academic and infrastructural foundation for institutional research activities. This makes it very difficult for UNZA to develop a collective, organisational dimension in research activities. In the last two decades the federal budget has not been stable. It is tied closely to oil revenues, which have been unstable. The consequences of unstable funding are reflected in poorly-equipped laboratories, outdated libraries, poorly- remunerated staff, crumbling academic facilities, and low research output.

### 1.2.3 Low staffing levels and high teaching loads

Due to understaffing and ever increasing large numbers of students, most faculty have no time to devote to research as they spend most of their teaching and assessing students. Most faculty are overloaded with teaching and administration schedules which leave little time for research. The University of Zambia has very high enrolments without accompanying adjustments in the recruitment of academic faculty. As a result, staff/student ratios have worsened to the detriment of student learning and academic research. The ability of UNZA to produce quality graduates depends largely on the quantity and quality of teachers available. Adequacy of faculty is a result of many factors, which include funding, student enrolment over time, and staff turnover.

### 1.2.3 Lack of research culture and lack of mentorship

Although the University's human resource policy stimulates academic staff members with to engage in research as one of the most important requirements for promotion, research is not weighted highly in the annual appraisal system, and other reward systems. Academic staff members have no accountability to the institution with regard to engagement in research unless at the point of seeking promotion and renewal of contract. Furthermore, the current situation in which UNZA uses the income from tuition fees generated from privately sponsored students to pay lecturers who have additional teaching loads – evening, and extra-mural – does not contribute in one way or another to strengthen the institutional research culture.

The lack of a research culture may also be attributed to obsolete research facilities. Laboratories are not well-equipped and in some cases practically non-existent. It is not uncommon for the

University to offer computer science courses without computer laboratories, let alone Internet connectivity. Libraries have become archives of stale, archaic, and irrelevant materials.

Over the years UNZA has been experiencing a decline of staff quality as a result of mainly high rates of "brain drain," the declining numbers of professors and assistant professors within the university system, and their falling levels of post-graduate preparation. This has resulted into a lack of core senior staff who can provide effective mentorship in teaching and research to a young cadre of academic staff joining the University.

### 1.1 Summary

### 1.2 Conclusion

### 1.3 Recommendation

UNZA needs to revitalise its research function. In order to do this the University improve the research environment, which will stimulate the strengthening of an institutional research culture by, for example, introducing adequate incentives and rewards for academics who engage in research.

#### 1. *Promote in-house journals*

The study has revealed that most faculty publish their research in in-house journals as compared to international journals. The University management should therefore support the existing in-house journals as well as supporting new ones. The in-house journals will encourage staff to publish more and this will in turn boost research productivity of the institution.

#### 2. *Enhance research infrastructure*

The University must improve the existing research infrastructure such as the libraries, science laboratories, Internet access, and computer and computer laboratories. More funds should be allocated to the libraries for subscription to electronic databases, journals, and e-books. In addition, funds should be allocated to improved Internet access both on-campus and off campus, subscription to server versions of research software such as quantitative and qualitative statistical software, etc.

3. ***Establish research centres and strengthen existing ones***

The University management should establish research centres while enhancing the existing ones. The research centres in the schools should coordinate all research activities in the schools, establish linkages and partnerships for collaborative research with local and international partners. The University management should re-examine the current position of the Assistant Dean-Research to strengthen the responsibilities of this position and its accountability.

4. ***Improve allocation of funding for research***

The University should identify, assess and undertake programs that will attract funding for research and attract donors in order to boost the level of funding. Furthermore, measures should be put in place to enhance accessibility of available funds, and reduce bureaucratic procedures involved while ensuring transparency and accountability.

5. ***Conduct regular training in research methodology***

The University should promote regular training of its staff in research methodology through short courses, workshops and seminars. The University should establish a Framework for Research Development aimed at playing a transformative role, with the Emerging Researcher Programme (ERP) specifically catering for academics who are not yet established researchers. The ERP should use current and retired professors to offer group and individual mentoring and a range of seminars and workshops designed to support emerging researchers to complete their doctoral degrees, publish in appropriate international journals, and raise research funds through successful funding proposals. The main objective of this ongoing series of interventions is to develop the next generation of research leaders and to grow and transform the current demographic profile of active researchers. Researchers should not be left in a vacuum but continue to receive support through wide range of initiatives, including mentoring, seminars and workshops, for mid-career researchers. The Supervision Training Programme is open to all academic staff, whether they are supervising postgraduate students for the first time or whether they are seasoned academics who wish to update and hone their supervision skills.

6. ***Promote electronic (online) publishing and electronic institutional repositories***

7. ***Promote linkage with industry***

UNZA should encourage research programs in relevant disciplines (e.g. agriculture, engineering, materials science, computer science) oriented towards issues that impact the local economy and industries. For this to happen, there is need for greater interaction with external stakeholders through various events, associations, and networking initiatives. Furthermore, there is need to encourage interactions across teams of researchers with complementary expertise, regardless of their disciplinary or departmental affiliation. Innovation in industry does not happen within disciplinary silos. Multidisciplinary teams of experts are better positioned to address complex problem by bringing together theories, knowledge, skills and methods from

various fields and applying them to generate solutions. Interdisciplinary research programs that include industry partners should be encouraged in all the programs.

**8. Conduct regular evaluation of research output**

UNZA should development an internal evaluation system that will provide regular reports of its research output (both qualitatively and quantitatively). It would be in University's self-interest to demonstrate its efficiency and effectiveness by publishing output measures that are more comprehensible and meaningful to the public. The results of this internal evaluation should be easily accessible to the research community and general publics.

9.

## About the Contributors

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Dr. Akakandelwa Akakandelwa is a Senior Lecturer in the School of Education at the University of Zambia. He is also the Coordinator for the Master of Library and Information Science Programme. He holds a PhD (University of Antwerp, Belgium); MLIS (University of Botswana, Botswana); BALIS (University of Zambia, Zambia). His research interests include: informetrics/bibliometrics, information seeking behaviour, information literacy, knowledge management processing and retrieval (cataloguing, classification, indexing and abstracting), e-government, social media studies. He previously worked at the University of Zambia Library where he held positions of Senior Librarian, Head of Veterinary Medicine Library, and Head of Cataloguing Department. He has also worked as secondary school teacher in the Ministry of Education, and Senior Lecturer at Evelyn Hone College of Applied Arts and Commerce. He is Editor-in-Chief of the Zambia Journal of Library and Information Science, and Associate Editor of the Library and Information Association of Zambia Journal.



### **Mrs. Francina N. Makondo**

Francina Makondo is currently the acting Deputy University of Zambia Librarian. She holds a Master of Library and Information Studies Degree from University of Botswana and a Bachelor of Arts Degree with Library Studies from the University of Zambia. She has previously held positions of Head of Technical Services, Head of Medical Library, Head of Public services and Head of Collection development in the University of Zambia Library. Her research interests are online search behavior, Information Technologies, Integrated library management systems, Electronic library management and Information retrieval systems. Mrs Makondo is a trainer in the use of Moodle e-learning management system. She has been a resource person at a number of workshops at national and international levels sponsored by the International Network for the Availability of Scientific Publications, UK. She is also lectures in the Department of Library and Information Science at the University of Zambia She is an active member of Library and Information Association of Zambia and served as its President from 2009 to 2013.



### ***Pilate Chewe***

Paillet Chewe was born in Chinsali, Muchinga Province, in 1961. He received the B.A. degree in Library and Information Studies from the University of Zambia (UNZA), in 1985, and the MLIS degree from UNZA in 2011. In 1999, he joined UNZA Library as an Assistant Librarian, and in 2011 he was promoted to the position of Librarian III after obtaining an MLIS degree. He has been heading the Collection Development Department since 2012 in an acting capacity. His current research interests include application of Web2.0/Social media tools in libraries, e-Government/e-Governance issues and information seeking behaviour. Mr. Chewe is a member of the Library and Information Science Association of Zambia (LIAZ).



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**Henry Panganani Zulu** was born on 16<sup>th</sup> January, 1960 at Mawanda Village in Chipata District of the Eastern Province of Zambia. He received his primary education at Mpezeni Park Primary and secondary education at Chipata Day Secondary School. In 1999 he obtained a B.A. degree in Library and Information Studies with Merit from the University of Zambia, and in 2010 a Masters in Library and Information Science from Northeast Normal University, Changchun, Jilin Province in the Peoples' Republic of China. In 1981, he joined the Library, University of Zambia, as a Library Attendant and in 1999 was appointed Assistant Librarian, a position he held until 2010 when was appointed Librarian III. Between 1999 and to-date he has Acted as Head for Serials Department, Medical Library and currently is Librarian II and Acting Head Technical Services Department. In addition, from 1999 to 2005 he was a Tutor in the Department of Social and Development Studies, School of Humanities where he tutored in Industrial Sociology, Social Change and Development, Rural Sociology, Sociological Theories, and Introduction to Sociology. His research interests include indigenous knowledge management, user education, and Information and Communication Technologies (ICTs).



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#### **Mr. Mubanga Lumpa**

Mr. Mubanga Lumpa was born in Kafue, Lusaka Province, in 1984. He obtained his Diploma in Library and Information Studies from the Evelyn Hone College of Applied Arts and Commerce in Lusaka Zambia in 2006. He is currently a BALIS finalist at the University of Zambia in Library and Information Studies and Political Science. In 2007, he joined the Department of National Archives in the Ministry of Affairs as Assistant Librarian. In 2009, he joined the University of Zambia Library, as a Senior Library Assistant, the position he currently holds.



His current research interests include media communication, particularly the use of print and electronic media in disseminating knowledge in library and information science to library users. Between 2012 and 2013, he was a contributor to a weekly column in the *Post* Newspaper called "talking information". He is currently working as a producer for a radio programme, *The Librarian* at

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