RESEARCH PRODUCTIVITY: h-INDEX AND i10-INDEX OF ACADEMICS IN NIGERIAN UNIVERSITIES

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ABSTRACT: *This study examined the research productivity of academic staff of Nigerian universities. Research productivity was measured using Google Scholar h-index and i10-index. Effect-to-Cause Causal-Comparative Ex Post Facto Design was adopted. A sample of 1073, composed of 713, 266 and 94 staff of Federal, State and Private Universities with School of Graduate Studies in the South-South geopolitical region. Six research questions and null hypotheses were respectively answered and tested. One-way ANOVA and independent samples t-test were used to test the null hypotheses at 0.05 level of significance. Findings showed no statistically significant difference between the research productivity of Federal, State and Private Universities: (h-index, F (2, 1072) = 2.853, P>0.05; and i10-index, F (2, 1072) = 2.288, P>0.05). The findings interestingly revealed statistically significant difference in h-index: F (8, 1064) = 40.666, P < 0.05; and i10-index: F (8, 1064) = 22.321, P < 0.05 between the nine faculties (areas of specialization). The research productivity of staff in Faculties of Health Science, Natural/Applied Sciences, and Agriculture is overwhelmingly (significantly) greater than those of staff in Faculties of Law, Humanities, Education, Social Sciences, Management Sciences, and Engineering. The study exposed that female academics are less productive in research in comparison with their male counterparts. It recommended frequent adoption of the two productivity measures (h-index and i10-index) as well as numerous publication of research works online to boost research productivity of staff in the universities.*

KEYWORDS: Research productivity; h-index; i10-index; academic staff; Nigerian universities; Faculties; Google Scholar; Effect-to-cause causal-comparative ex-post facto design; Federal, state and private universities.

INTRODUCTION

A nation's greatness, glory and wealth are primarily rooted in its education. The lofty goals of any national policy on education can best be met through concerted efforts on research and teaching by the academic staff of universities in the country. To achieve this, universities formulate their vision, mission and objectives to meet the national educational goals. Based on this, while some universities in a continent have the vision of being among the best universities worldwide in terms of research engagement, some aspire to be the best in a particular continent (Africa, Asia, Europe, North America, South America, Antarctica, or Oceania) and yet other universities aspire to simply be the best in the country where they are located (Kpolovie & Lale, 2017).

To realise the vision, mission and objectives, the vice-chancellor who doubles as Chief accounting officer, academic and administrative head of the institution and his retinue of assistants must work assiduously. The administrative and academic crews through their various committees must recruit quality academic staffs who are career-oriented. Clark (1987) in Kuri

(2005) opined that to be an academic means to work in a higher education institution as a specialist in some disciplinary or professional field. He distinguished between individual academic career and academic trajectories. According to Clark, career trajectory is determined by higher education institutions (HEIs). They establish the procedures for recruitment, remuneration and other conditions that may enhance the academics and the attainment of institution's goals and objectives. An individual's academic career commences from the day he enrolled in pursuit of a postgraduate degree in one discipline in preference to others and decides to work for an HEI. This could occur in more than one HEI and field of study. Most importantly, the attainment of a university's vision, mission and goals depend virtually on the research productivity (used interchangeably with academic productivity) of its teaching staff.

Based on the concept of the individual trajectory of the academic staff of universities in a country, information on the research productivity of the academic staff could act as a data-based feedback to institutions' administrators on which to anchor decisions about the staff. Such data-based decisions include hiring and firing of staff, promotions, appointment to hold higher and sensitive positions, scholarship award to pursue further education, fund allocation to conduct researches just to mention a few. Even the individual academic will greatly benefit from the knowledge of his/her research productivity. The fact that the Senate of a university typically rewards research productivity to encourage further engagement in research activities will propel academics to set higher career goals for themselves and enthusiastically work to actualize them. In this way, the entire body of students, both graduates and undergraduates, within the four walls of a given university and outside will be beneficiaries of any undertaking that enhances research productivity of academics. Enhanced scholarly productivity is bound to make more quality information accessible to students who will, in turn, improve teaching-learning transformation in the institutions of higher learning. Enhancement of academic productivity in universities is an essential step in striving to attain national goals via higher education (Ogunkule Adekola, 2013). The development of skilled manpower and advancement in science, technology and engineering that are associated with improvement in scholarly or research productivity would not only advance the national economy but also capable of putting the country in a strategic position to compete favorably and benefit significantly in the competitive globalized economy of the radically changing Information Communication and Technology Age (Kpolovie & Lale, 2017).

Universities are the pinnacle of higher education institutions. The Federal Republic of Nigeria (FRN, 2004) substantiated this in her National Policy on Education when it referred to education undertaken in Colleges of Education, Monotechnics, Polytechnics and Universities after Secondary School Education. In recognition of the relevance of knowledge gained through education especially at the higher level for a scientific, technological, economic and social advancement of any nation, the government of the Federal Republic of Nigeria has the goals of higher education as follows (FRN, 2004, 36):

a) Contribution to national development through high-level relevant manpower training.
b) Develop and inculcate proper values for the survival of the individual and society.
c) Develop the intellectual capacity of individuals to understand and appreciate their local and external environments.
d) Acquire both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society.
e) Promote and encourage scholarship and community service.
f) Forge and cement national unity.

g) Promote national and international understanding and interaction.

These seven goals of tertiary education in Nigeria were structured to directly serve as the ultimate means for the attainment of the Country's five national goals (FRN, 2004, 6). The five national goals have since been endorsed as the necessary foundation for the National Policy on Education. The national goals are the building of:

a) a free and democratic society;

b) a just and egalitarian society;

c) a united, strong and self-reliant nation;

d) a great and dynamic economy;

e) a land full of bright opportunities for all citizens.

To accomplish the seven lofty goals of tertiary education in Nigeria, both government and institutions of higher education need to put certain structures on the ground. Apart from the formulation of worthwhile policies, the government must deal with the issues of funding and build bridges for private-public collaboration; the universities, on the other hand, need to offer courses and programs that can foster effective and efficient teaching/learning and research oriented atmosphere.

The core responsibilities of academic staff (lecturers) of universities are teaching and research activities. All lecturers are expected to remain current in their scholarship via research; and teach effectively and participate in service to their institution and community (The California State University, 1997). The California State University (1997) further states that the scholarship duties of the academic staff of universities include research and publication of findings and development of instructional materials. On the other hand, teaching responsibilities has to do with traditional pedagogy and supervision of students' research works, distance and technology-based learning/instructions in addition to organising and directing of group/collaborative learning and general students mentoring/advising. While service has to be rendered to the institution, profession and community institutional service leads to improvement of the institution's quality of education through the holding of offices and participation in committee and other meetings; and mentoring of junior by senior colleagues. Service to the profession involves participation in exhibitions, conferences and other scholarly activities organised by professional bodies and associations. Community service encompasses all activities involving free expert and volunteer works to benefit the institution and its immediate environment. The preceding underscores the need for academics to continually search for and update their knowledge in their various fields.

Research activity is a sine qua non for acquisition and transmission of knowledge. It is for that reason that research productivity as measured by Google Scholar h-index and i10-index depend primarily on it (Kpolovie, 2015; Webometrics, 2015; Kpolovie & Lale, 2017). Ogbogu (2013) reechoed widely opinionated and accepted assumption about higher education institutions that "Higher educational institutions are recognised all over the world as centres of excellence where knowledge is not only acquired but also disseminated to those who require it, through teaching and research". She further substantiated the importance of knowledge towards economic development and productivity cited a World Bank's report, World Bank (1999) which says "knowledge has become the most important factor for economic development in

the 21st century and it constitutes the foundation of a country's competitive advantage because of its capacity to augment productivity. Unarguably, scholarly and research driven education earnestly starts at graduate school. Consequently, academic staff in graduate schools can only foster knowledge acquisition of graduate students to their level of interest and achievement in research productivity. The research findings of academics in each university published constitute research productivity. Therefore, the research productivity of academic staffs of universities is very vital for assessment.

Where do Nigerian universities stand in the world and even African ranking of Universities? Table 1 obtained by Ogbogu (2013) displays the dismal standing of Nigerian universities.

Table 1: Ranking of Nigerian Universities in the World and Africa.

UNIVERSITIES	WORLD RANKING	AFRICAN RANKING
University of Ibadan	6,304	57
Obafemi Awolowo University	6,645	69
University of Benin	6,769	78
University of Lagos	7,181	90
University of Jos	7,369	98

Source: Adapted from Ogbogu (2013): An analysis of female research productivity in Nigerian universities

Webometrics, the most liberal assessor in 2013, placed the best university in Nigeria, Obafemi Awolowo University (OAU) below 1,100 top best universities in the world. In the same assessment, the University of Ibadan, American University in Nigeria, University of Port Harcourt, and the University of Uyo were ranked 2,109, 6,367, 7,326 and 9,471 respectively (Kpolovie, 2013). Kpolovie also affirmed that 101 Universities in Nigeria out of 125 did not qualify to even fall within the best 10,000 universities in the world.

The first international ranking of universities of the world dates back to 2003. It was conducted by the Shanghai Jiao Tong University, located in Shanghai, China. This was known as Academic Ranking of World Universities (ARWU). Other ranking bodies that followed ARWU are the Times Higher Education (THE), Quacquarelli-Symonds (QS), University of Leiden Ranking (ULR), Webometrics, SClmango Institutions Ranking (SIR), ranking at international or world level and U map, U-Multirank, and Folha University Ranking (FUR), operating at regional levels. These ranking bodies emerged with their different methods and approaches as to the indicators adopted in ranking institutions. They even adopted different modes of presentation of ranking (Nassi-Calo, 2013). But a review of what counts amongst other measures of ranking institutions by these nine bodies unequivocally hold in high esteem is the number of publications and citations of such works in other works and hence relevance or impact in their respective disciplines as indicators of academic productivity.

Times Higher Education (THE), the United Kingdom-based authoritative source of information about higher education ranked University of Port Harcourt sixth in Africa and the first in Nigeria by (UNIPORT, 2015). This is contained in THE report on July 31, 2015, preceding attempts at African Universities Summit to evolve a full-scale ranking of African Universities, by the World University Ranking body. South Africa topped the list of the ten countries that were screened (THE World University Ranking Body, 2015). According to the report, South Africa dominated the list of 30 universities by claiming 12 spots. Egypt which came second has six universities while Morocco and Tunisia emerged third with three

universities each. Bracing the trail with one university each are Cameroun, Ethiopia, Ghana, Kenya, Nigeria and Uganda. Details of the ranking of best 30 universities in Africa by Times Higher Education (THE) can be seen from this functional link: https://www.timeshighereducation.com/news/top-30-african-universities-times-higher-education-reveals-snapshot-university-ranking

The primary criterion used for inclusion on the table was the publication of a minimum of 500 research papers between 2009 and 2013 with an institution having research output of at least 50 papers per year for the period. The ranking of the institutions was based on the volume of publications for the period under consideration, and the citations pooled. This development seriously and urgently calls for increased productivity by academics in Nigerian Universities.

In another pre-African Universities summit to hold on April 27-29, 2016 at the University of Ghana, THE World Universities Ranking body released the ranking of 15 best universities in Africa on April 21, 2016. Like the July 31, 2015, report, South Africa, Egypt and Morocco clinched the first, second and third positions with 6, 3, and two universities respectively. Ghana, Kenya, Nigeria and Uganda have one university each in the ranking (THE World University Ranking Body, 2016). The depressing and agonising issue in this ranking is that the University of Ibadan, the only Nigerian university which featured on the table is second from the bottom, which is the 14th position. See Table 2 for details or follow this link for confirmation: https://www.timeshighereducation.com/world-university-rankings/best-universities-in-africa-2016

Table 2: Best Universities in Africa 2016: Top 15

RANK	INSTITUTION	COUNTRY
1	University of Cape Town	South Africa
2	University of the Witwatersrand	South Africa
3	Stellenbosch University	South Africa
4	Makerere University	Uganda
5	University of KwaZulu-Natal	South Africa
6	University of Pretoria	South Africa
7	University of Ghana	Ghana
8	University of Nairobi	Kenya
9	Suez Canal University	Egypt
10	Alexandria University	Egypt
11	Cairo University	Egypt
12	University of Marrakech Cadi Ayyad	Morocco
13	University of South Africa	South Africa
14	University of Ibadan	Nigeria
15	Mohammed V University of Rabat	Morocco

Source: *THE*DataPoints © *THE*data@timeshighereducation.com

With these unimpressive rankings, Nigeria is never likely to realise her Vision 20: 2020 (Kpolovie & Obilor, 2013b; 2013a; 2013c). Hence the necessity to investigate the research productivity of academics in Nigerian higher education institutions.

The situation must not be glossed over because it is paradoxical to the stance of Nigeria's claim as the giant of Africa. For Nigeria's claim to become a living reality, it must reflect on all spheres of life, the education industry in particular. This is because education demands to be in the driver's seat for Nigeria to actually become the giant of Africa. Unharnessed vast human and natural resources can not suffice. A research driven education is a necessity, not a luxury for the nation to establish its claim. Consequently, the call for Nigeria to establish conditions favourable for research and development can never be enough (Kpolovie & Obilor, 2013a; 2013a; 2013c; Kpolovie, Obilor & Ololube, 2015).

It has been pointed out that the core duties of the academic staff of universities are scholarship, teaching and service. Also highlighted are the lofty goals of Nigeria higher education. The very low ranking of Nigerian universities was amply exposed. This presupposes the fact that there are issues to be resolved in the research productivity of Nigerian academics. Research is mainly to identify a problem and proffer appropriate solutions through proper scientific investigation. Meaningful economic and national development cannot take place without a virile educational development. The low ranking of Nigerian universities by different ranking bodies is an indication that the nation's educational system is not performing to expectation. Universities all over the world are assessed based on the relevance and impact made in research and teaching. All world universities ranking bodies without exception amongst other indicators place a very high premium on the number of publications and citations of such in other works. The quantity and quality of published research findings of an academic give his/her research productivity. This research productivity index, technically and popularly referred to as "h-index and i10-index" is used in ranking individual academics, institutions and the entire country (Kpolovie, 2015a; 2015; Webometrics, 2015). The low ranking of Nigerian universities in the community of world and African universities is suggestive of low research productivity of her academic staff. The possible gains/benefits accruable from research productivity indices stimulated the researchers' interest to undertake this study.

This research is therefore aimed at ascertaining the research productivity index of the academic staff of Nigerian universities. Research productivity in this study is measured by two Google Scholar indexes. They are Hirsch index (**h-index**) and Index Ten (**i10-index**). The necessity to ascertain the level of interest and accomplishment in research by academics in Nigeria stemmed from the recognition of the place of research productivity in the ranking of universities worldwide. Specifically, the objectives of this study include:

1. Determination of the research productivity index, measured with h-index and i10-index, of the academic staff of Nigerian universities.

2. With the use of h-index and i10-index, determine differences if any between the research productivity of academic staff of Nigerian universities regarding ownership.

3. To ascertain and compare the productivity of academic staff in different faculties (broad areas of specialisation) in Nigeria, using h-index and i10-index.

4. Determine the research productivity of female and male academic staff of universities in Nigeria, using h-index and i10-index.

Research Questions

This study has provided answers to the following research questions:

1. What is the h-index of the academic staff of Federal, State, and Privately owned universities in Nigeria?

2. What is the i10-index of the academic staff of federal, state and privately owned universities in Nigeria?

3. What is the h-index of the academic staff of the various Faculties (areas of specialisation) in Nigerian universities?

4. What is the i10-index of the academic staff of various Faculties in Nigerian universities?

5. What is the h-index of female and male academic staff in Nigerian universities?

6. What is the i10-index of female and male academic staff of Nigerian universities?

Hypotheses Postulation

The study which focused on the academic staff of Graduate Schools of federal, state, and privately-owned universities in the South-South geo-political zone of Nigeria was guided by six research questions posed and six corresponding null hypotheses. The null hypotheses tested in the study were that there is no significant difference in the:

1. h-index of academic staff of federal, state and privately owned universities in Nigeria;

2. i10-index of academic staff of federal, state and privately owned universities in Nigeria;

3. h-index of academic staff in the different faculties in Nigerian universities.

4. There is no significant difference in the i10-index of academic staff in the different faculties in Nigerian universities;

5. h-index of female and male academic staff of universities in Nigeria; and

6. i10-index of female and male academic staff of universities in Nigeria.

Related existing works were extensively reviewed in this study to cover conceptual, theoretical, and empirical issues. The conceptual review embraced literature on the concepts of Research, Research Productivity, Development of Information and Communication Technology (I C T) and its impact on Research Productivity, Citation Indexes and Relevance of the Internet for Research Publication. As a part of the researchers' contention, the research productivity of Academic Staff of Nigerian universities is low as evident in the rankings presented earlier. And this has a direct link with the way and manner the various tiers of government, other owners and institutions administration manages the academic staff on the one hand, and the academic staff themselves, on the other hand, manage their affairs as the productive individuals they ought to be. With this in mind, the researchers presented two theories which when properly articulated shall boost the research productivity of academics in Nigerian universities. The first is Drucker's Knowledge-Worker Productivity (1999) while the second is Gilkey's General Theory of Productivity (2008). The choice of Drucker's theory is to highlight the roles and

responsibilities of owners or managers of universities and academic staff in this 21st Century and beyond where all facets of human endeavours are knowledge driven. The Gilkey's theory is included to help academics to re-appraise their status and reposition themselves if they must pass as Knowledge-Workers as demanded by the present times that is termed by Kpolovie and Lale (2017) as "Revolutionary Information and Communication Technology Age". The empirical review segment is divided into two. The first subsection will anchor the literature reviewed in works on Research/Academic Productivity outside the shores of Nigeria which established the well-known predictors or indicators of research productivity. The second subsection is an expository on research productivity works carried out within the shores of Nigeria with an attempt to establish an agreement or otherwise of findings obtained with the acclaimed predictors/indicators. Appraisal of literature reviewed critically analysed the methodologies and finding of the existing related works on the problem under study. These were done establish gaps in the literature reviewed which this present investigation has successfully filled and thereby open new frontiers of knowledge on the research productivity of Academic Staffs of Nigerian universities. And if the Drucker's and Gilkey's Models are adopted in Nigeria educational system, the ranking of Nigeria might tremendously increase in the community of World Universities.

RESEARCH

Lertputtarak (2008) citing Oxford University (1995) says research means the careful study or investigation, especially in order to discover new facts or information. Kpolovie (2016; and 2010) sees the concept of research as the logical, systematic and objective collection, analysis, synthesis, evaluation and recording of accurate and controlled observations to aid informed generalizations, establishment of principles and theories that foster description, explanation, prediction and control of natural occurrence to meet man's needs.

The above definition indicates that research is concerned with the provision of solutions to man's needs and improvement of the quality of life-based on identified problems. The process of collecting, analysing, synthesising, evaluating and recording of information to solve identified problems involves the adoption of scientific principles. And one of this steps which are very crucial is reporting, communicating or disseminating of research findings. This is the only means by which the results of research are made available to and utilisable by man.

It is very important to stress the core components of scientific research at this juncture. They include- identification of a problem, proffering of solution through the appropriate collection of data and statistical analysis and subsequent unveiling of the results to the general public. The stress on the core components of research is apt because of distinctions made by some writers. Altbach (2014) opined that most universities are teaching institutions concerned with only teaching and learning activities and do not need any research credentials. But this stand totally negates some forms of academic productivity. In all fields, be it physical or natural sciences, medicine, social sciences, arts, education, etc., there are myriads of problems begging for solutions. And these solutions can only be attained through concerted and rigorous efforts in research endeavour and publication of findings. Bai (2010) confirmed this posture when she referenced Elen et al. (2007), Wodarski (1991), and Zamorski (2002), stating that research is meant to enhance teaching and learning. According to her, this is the stance of well-established research universities where teaching and learning are led by research. Reese (2014) corroborated this stance when he said research is an important component of an academic

career. He emphasised that to be an important voice in any given field; one needs to have research publications to show for it.

There are two main types of research regarding application of findings. They are Basic and Applied Research. Basic or fundamental research produce concepts, principles, theories and practices for the advancement of scientific knowledge in the different fields of human endeavours. On the other hand, applied research adopts the results of basic research for technological and economic development. Basic or fundamental researches are often expensive (particularly in the hard sciences and biomedical fields) and require sponsorship or funding by external interest groups. But this is proving problematic in many countries as no one earns a direct profit from basic research. The result of basic research is for the ultimate good of the public and society in general (Altbach and Salmi (2011). Furthermore, Altbach and Salmi (2011) citing slaughter and Rhodes (2004) observed that basic research is at a disadvantage point with respect to applied research. The reason is that sponsors such as corporate bodies show more interest in applied research because of immediate financial or economic gains. However, it should be noted that without unearthing the concepts, principles, theories, etc., no application can be done. Hence the necessity to balance the two types of research.

According to Kpolovie (2016), research can only be successfully executed by someone who is self-disciplined. Self-discipline in this context embraces the characteristics of curiosity, persistence and objectivity. Any university academic who possess these characteristics can wake up early, sleep late, studying widely and remaining focused on identified problem until it is beneficially resolved.

Productivity

The concept of productivity can be defined in various ways depending on context. An integral part of its definition or meaning irrespective of whether it is in the core sciences, social sciences, education, industry, and so on, as expressed in WordNet3.0 (2012) is the relative magnitude of two quantities expressed as a quotient. This gives the status of performance indicator to productivity. Consequently, the productivity of an individual, a factory, machine, and methods can be measured and compared.

Over the ages, the idea of productivity has undergone four major developmental stages. The first stage was when scientists referred to productivity as reproduction. This occurred in the 19th century to advance science through the utilisation of statistics on reproduction to investigate and explain the decline in civilisation and races. The second stage saw productivity as output. Psychologists adopted this meaning in trying to establish Psychology as a worthwhile academic field of science in the early 20th century using reproduction statistics. The approach was to use statistics of articles published as a measure of academic and scientific productivity. Bibliometric (number of articles published) alone was not sufficient as a measure of excellence in productivity. The contribution or impact of the article to the pool of knowledge is very important. This led to the introduction of Science Citation Index (SCI). Productivity as efficiency is the third stage of productivity development came on board in the 1920s. This marked the advent of industrial organisations and governmental bodies in the sponsorship of research works. Productivity in this regard must yield results that give value to the funds invested. The measure of efficiency to this end is the profit accruable to the sponsors of research activities. The last but not the least stage considered productivity as the outcome. This fourth stage which began in the 1930s used multiplier effect of scientific advancement on the economy. For example, job creation arising from funds investments on the improvement of

existing or novel technologies. By this measure, which considers the "right value for the money", regarded any research endeavour which does not cause an immediate outcome unproductive. To a reasonable extent, this negates the principle of long term investment because some novel knowledge or technology such as Information and Communication Technology (ICT) only begin to manifest after a considerable length of time. And some of the benefits are not easily measurable. (Mose & Lyhne, 2014)

Research Productivity

In this research work, research is an academic activity which takes place in higher education institutions, especially in the universities. This involves the identification of a problem or an issue of interest and investigating it to provide a solution and further existing knowledge in a given field. In this regard, it does not matter whether the academic is in research or teaching/learning institution, physical, biological or medical sciences, engineering, social sciences, arts or education. There is no field that has reached its zenith and can therefore not be improved upon via research. If there is any such field, then it is on the verge of going into extinction.

 Stage two of the history of development or metamorphoses of productivity is considered most appropriate for this study. In other words, research or academic productivity will be measured by the outputs of the academics. As stated earlier, the number of publications arising from research works alone is not adequate to judge the productivity of an academic, department, faculty or institution. The relevance, impact and contribution of the publication in furtherance of knowledge as reflected by the volume of citation that the publications get are very crucial.

The impact factor to be considered here in respect number of publications is the citations or referencing by other researchers or knowledge seekers in their attempts to make a contribution to already existing knowledge in the field (Fullick, 2014). In this wise, the medium of communication or dissemination of research findings plays a vital role. Therefore, any academic should not under-estimate the inestimable importance of using mediums which have the potentials of being accessed by many (Ololube, Kpolovie & Makewa, 2015; Kpolovie & Awusaku, 2016; Kpolovie, 2017).

Bako (2005) in his work "Universities, Research and Development in Nigeria: Time for a Paradigmatic Shift" referencing Karani (1997) and Okebukola (2002) says

> *"Even though the main number one function of the first and second Nigerian universities was not specifically researched, yet it would be interesting to see how it was accommodated and promoted to the optimal level and international acclaim. The period between the 1960s and 1980s was not only the golden age of university education but also its research. In fact it was unanimously agreed by the World Bank, the National Universities Commission, the Nigerian Academic Staff Union of Universities and industries that employ graduates, that in terms of quality and quantity of research output of tertiary institutions, Nigeria was the best and leading in Sub-Saharan Africa from 1960s to the late 1980s" (p.1)*

Though the factors that led to the collapse of research in Nigerian universities is not within the purview of this study, it is pertinent to expose them because the research productivity of

academic staff of Nigerian universities cannot be boosted in their absence. The National Universities Commission (NUC) summarized the factors that contributed to the decline from late 1988 to 1996, and subsequent collapse from 1997 to date to include lack of equipment, funds, modern skills and methods needed to carry out state-of-the-art research, brain drain that led to the scarcity of seasoned and senior researchers to mentor junior ones and encumbrance of teaching and administrative workload that leaves little or no time for research engagement.

Development of Information and Communication Technology (ICT)

One of the many meanings ascribed to communication by Dictionary of English (Wiktionary, 2015) refers to it as a concept or state of exchange of information between entities. The information may be a message, conversation, discourse or data. Deriving a meaning for technology from technique implies a method adopted to get things done. Based on these definitions, the beginning of information and communication technology (ICT) development can be said to be as old as mankind. From inception, man has always devised means of interacting with one another either non-verbally or verbally.

However, the ability to transmit information from one generation to another dates back to about 30,000 BC. The age involved carving and painting of happenings on rocks and stones. The act of printing started about 1215AD. Needless to state here that communication within this time line was highly localised. The late 18th to early 19th centuries witnessed a wider communication space with the introduction or invention of telegraphs, telephones, the radio and television (Brady and Elkner, 2011; ITU, 2015).

The introduction of computers in the 1930s and rapid improvements in types and mode of operations in the 1970s greatly revolutionised and broadened the scope of ICT. Satellite and Mobile Communications are cohorts in this revolution. The crown of the development of ICT is the emergence of the Internet and World Wide Web (www). In 1990, the World Wide Web was made freely available. (Brady and Elkner 2011; ITU, 2015; Schwartz, 1998 in Barnes; Ballarat ICT Limited, 2015; CS 1105 Group Reports, 2008). In other words, anybody with the right gadgets can access and post information on the web. This development has the potential of eliminating geographical space thereby reducing the world to a global village.

From the fore-going, it is clear that the techniques and mode of exchange of information have passed through many phases and exert multiple influences on human activities today. To embrace all these, information and communication technology can be regarded as the integration of information, processing, computing and communication technologies. This embraces all devices that are capable storage, retrieval, and manipulating, transmitting or receiving information electronically in a digital form and such devices which are connected with these processes (CS 1105 Group Reports, 2008). There is practically no facet of human activities where ICT does not find an application. Therefore, academics in their research activities must utilise the myriads of advantages of ICT, especially the publication of research works online.

Before the advent of the internet, the bulk of worlds' research findings and academic knowledge were disseminated by a relatively small number of peer-reviewed journals published by commercial publishers which enjoyed wide recognition in the academic community. Production and consumption of knowledge were highly restricted to few countries and universities in Europe, North America and South America (OECD, 2014; 2015; 2016; 2016a; 2016b). Though countries like China, Brazil, Russia and others have joined the league of

producers and consumers of quality scholarship, the traditional knowledge centres still dominate the scene (Altbach, 2014). According to him, access to the journals was becoming more and more difficult to budding academics. The top journals were becoming more selective to sustain the domineering status quo and very high access fees charged by the multinational publishers. Consequently, the new open access internet should be auspiciously embraced by the academic staff of universities in all the continents of the world.

Nigerian academics may need to join their peers in other parts of the globe who have taken advantage of the open access and other ICT resources to improve tremendously on their research productivity. To buttress the fact that the open access to the internet has reduced the dominance of erstwhile top universities and journals, Kim, Morse and Zingales (2009) in a study to investigate elite universities competitive edge over time found a positive effect of many universities struggling to affiliate with a top 25 university in the 1970s. The effect diminished in the 1980s and became insignificant in the 1990s. Their conclusion was that the disappearance was due to innovations in communication technology which reduced the need for physical access to professional colleagues. The internet gives academics in remote places access in their research and tools to communicate with distant colleagues for collaboration and feedback. Kim, et al. (2008) citing Ellison (2006) says "He finds a trend among Harvard faculty toward forgoing journal publication process that for them carries the fewer advantage of visibility due to the availability of internet distribution".

This advancement in ICT has not only increased research productivity of academics through collaborative efforts with distant like minds resulting from elimination of geographic space but also expanded or even broken down the walls of the lecture halls. Publications in the net and other e-resources can be accessed by the direct students of the academic and other students from far and wide.

Mode of Dissemination of Research Findings

The concept of publication or dissemination of research findings illustrated below is an allegory from the Bible (Matthew 5:15) "Neither do men light a lamp and put it under a bushel, but on a stand and it giveth light unto all that are in the house". The main purpose of research works is to shed light on naturally occurring events and observations of everyday life. In the diagrams below the bulb emitting light represents research work. Figure 1in which the light is encased in an opaque container represents a scenario where a researcher fails to publish the results of his/her research works. No matter the intensity or brightness of the light, it cannot illuminate any one's path. In like manner no matter the degree of the potential of benefits the work may portend, it is utterly useless. It was better the work was never embarked upon. No matter how insignificant a work seems, it should be made public. Given this, Might (2011) advised researchers to delete the word "perfect" from their vocabulary and replace it with "good enough". According to him, submitted good-enough papers stands a better chance of being published than perfect ones that never came.
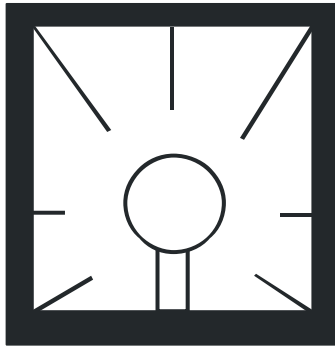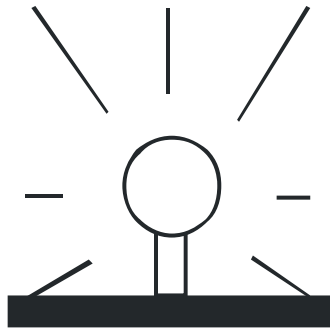
Figure 1: Unpublished research findings/works

Figure 2 is a light placed in a translucent container. The translucent material dims the intensity of the light thereby reducing its spread and luminosity. This depicts research works which are published only in departmental, local and national journals. Due to the limited scope of circulation of these journals accessibility of such works is narrow. The resultant effect is that even results of very useful research works have very little or no impact on humanity, the field and career of the academic.
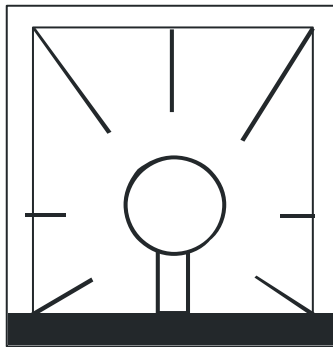
Figure 2: Research findings/works published in departmental journals, local and national journals

Figure 3 is a light placed in a transparent covering. This is a reminiscence of a lamp after lighting is placed on a lamp stand. The light's brightness in this stance is uninhibited. This light can illuminate the path of many way farers. This epitomises research endeavours published in internationally circulated journals and the internet. The coverage and impact of such materials are worldwide. Such works have proof of verifiable originality traceable to the academic and hence the acceptance of its contribution to the furtherance of knowledge in the given field of study. This has been made possible through the advancement in Information and Communication Technology. It is this researcher's yearning that all academics are required to key into and make the best of it in this radically changing Revolutionary Information and Communication Technology Age (Kpolovie & Lale, 2017).

Figure 3: Research findings/works published in international journals and the internet

Once more, the analogy is that men in the quotation are researchers; the lamp represents research works, and the stand connotes publication or dissemination of research findings. In a study carried out by Sullivan (1996) cited in Bai (2010), the respondents were emphatic that it is the social responsibility of researchers to disseminate knowledge through published research. In this age of advanced ICT, online publishing on the Internet through Open Access Scholarly Publishing is the in-thing because it has the most unrestricted access to fellow researchers and reduction of geographical space compared to other mediums. This results in increased visibility of researchers.

Citation Indexes and Research Productivity

Citation, cited references or simply references are terminologies used interchangeably in citation indexing to refer to an entry in a bibliography or footnote of a particular research work that refers to an earlier research work. Citation indexes afford researchers a tool to find papers in which earlier papers were cited. They also reveal how many times a paper of a researcher has been referenced by others and to determine the quality of journals in different fields of study (Institute of Scientific Information (ISI), 2016). Of the different uses of citation indexes reviewed, the second application for a researcher to know the relevance of his work(s) through cited references by other researchers is adopted in this study.

The history of citation indexing could be traced back to the 1950s after World War II. It began with the manual compilation of articles published in journals in specific disciplines which constituted existing literature. The rapid growth of literature to be indexed posed some challenges. This necessitated the need to develop a more cost-effective and efficient method of indexing and retrieval of literature that can eliminate long time lag required by the human model of indexing materials. Automation through computerization was contemplated. The Government of the United States of America played leading role in this regard through the launch of some projects. The present day Thomson Reuters is the result of the efforts to automate indexing which was spearheaded by Dr Eugene Garfield between the late 1950s and early 1960s through and out of sponsorship (Thomson Reuters, 2015). Thomson Reuter has three citation indexes – Sciences Citation Index (SCI), Social Sciences Citation Index (SSCI) and Arts and Humanities Citation Index (AHCI). However, the Science Citation Index is the most popular and accepted index because all research endeavours now tend to adopt the scientific approach of inquiry.

The concept of citation indexing rests the recognition of the fact that the value of information is determined by those who use it. Therefore, the best way to assess the quality of work is to

measure its impact on the community at large. To state it in the words of (Thomson Reuters, 2015), "The widest possible population within the scholarly community (i.e. the number of persons who uses and cite the source material) determines the influence or impact of the idea and its originator on our body of knowledge."

In the course of development of citation indexes, other metrics or altmetrics now exist side by side with the traditional bibliometries. Amongst these altmetrics in order of versatility and aptness in the determination of the scholarly impact of scientists and researchers, in general, are the h-index, i10-index, g-index and k-index. The h-index and i10-index by Google Scholar are favoured and adopted in this study.

The h-index was introduced by Jorge E Hirsch in 2005. This index measures both the scientific productivity and citation impact of the works of a scientist or scholar. The index can also be used to determine the productivity and impact of the academic staff of universities, a department and the entire institution. The index considers the researcher's papers which are most cited and the number of citations received from other publications (University of Illinois, 2015). More details on how to obtain the h-index are presented under the methodology of this investigation.

There are numerous databases on the internet that provide information on the h-index and i10-index of scholars. While some are restrictive or limited in their database, some are robust and rich in coverage. The resources with the robust database are Web of Science, Scopus and Google Scholar, etc. of which Google Scholar has the widest coverage.

Google Scholar as a resource for h-index and i10-index were established in July 2011. They were developed to enable scholars/academics to track the citation of their works. Google Scholar is renowned for detailed studies to have the best coverage for conferences and most journals. But have limited coverage of publications before 1990. In spite of its criticisms of producing phantom citations and non-adherence to Boolean logic when combining search terms (Wikipedia, 2015), Google Scholar remains a veritable tool of ascertaining the research productivity of academics all over the world.

The h-index of a scholar is simply the total number of publications h that has at least h citations. For example, h-index of one (h = 1) means that the scholar has at least one publication that has been cited once by another scholar. In other words, h-index is an indicator of some publications and citations which now act as a measure of research productivity. On the other hand, i10-index is the number of publications that has got at least ten citations each. That is, a researcher with 20 publications with each of the eight most cited receiving at least ten citations has an i10-index of 8.

Theoretical Review

Though a reference has been made in passing to four developmental stages of productivity which started in the 19th century, the history of productivity dated back to the 8th century B.C. and 700 years later by great poets, Hesiod (Greek) and Virgil (Roman) in their songs about the work of a farmer. Karl Max wrote about manual work and manual workers in 1900 (the birth of scientific management). Like Hesiod and Virgil who never engaged in the activities of the farmer he too did not perform manual jobs (The Regents of the University of California, 1999). There were other advocates of the scientific approach to productivity management. Among

them are Henry L. Gantt – Gantt's task and bonus system and the Gantt chart in 1903, and Lillian Gilbreth and Frank Gilbert- Time- Motion study in 1908 (Wong, 2012).

However, the productivity of manual work was revolutionised in 1911 by Frederick W. Taylor who was the first man to work as a manual worker and engaged in the study of manual work. It took Taylor over 20 years of experimentation to establish his principle of increasing productivity through analysis of tasks, motion, physical effort and time needed to accomplish the requisite motions for the job. Through this, unnecessary motions are eliminated and better tools and machines fashioned out to ease and quicken completion of tasks. The principles of Taylor were arduously criticised by some other comers who were interested in increased productivity output. Mary P. Follet (1920), who was acknowledged as "The Prophet of Management". Her approach was seen to oppose Taylor's. She emphasised team participation in decision making. Others included George Elton Mayo's Human Relationships Management in 1933 and William Edwards Deming's Quality Management and Deming's System of Profound Knowledge in 1950 (Wong, 2012). In spite of the criticisms, Taylor's principles remains towering over and above other approaches. Other approaches are mainly based on modification of Taylor's principle. The Regents of the University of California (1999, 8) asserted that:

> Nevertheless, every method during these past hundred years that has had the slightest success in raising the productivity of manual workers- and with it their real wages-has been based on Taylor's principle, no matter how loudly his antagonists proclaimed their differences with Taylor. This is true of "work enlargement," "work enrichment," and "job rotation"-all of which use Taylor's methods to lessen the worker's fatigue and thereby increase the worker's productivity. It is also true of such extensions of Taylor's principle of task analysis and industrial engineering as Henry Ford's assembly line (developed after 1914, when Taylor himself was already sick, old, and retired). It is just as true of the Japanese "Quality Circle," "Continuous Improvement," and "Just-in-Time Delivery".

Drucker reviewed all the approaches (Geldart, 1999) in the 20th century and acknowledged the wonderful contributions of various methods of which Taylor's work was uppermost for the increase manual workers productivity. He at the same time asserted that in the approaching 21st century and beyond, the sustenance of relevance of any nation will be dependent on the wealth of knowledge it harbours. To this end, Drucker hinted the necessity for increase in knowledge workers. And he coined the term **"Knowledge-Work**" in 1959 to describe workers who work with intangible resources and know about their jobs more than anyone else in the organisation.

In the previous section, the researchers articulated manual work and the success recorded in the productivity of the manual worker through the pioneering work of Taylor and others that followed on his trail. Drucker in his analysis opined that the future prosperity in the 21st century of developed countries is largely dependent on knowledge work as opposed to manual work. Hence he declared that in the 21st century, the challenge is increasing knowledge-workers productivity. In contradistinction to the mode of operations of manual worker, Drucker (2001) in (Wong, 2012) states that knowledge-worker refer to workers who work with intangible resources and know about their jobs more than anyone else in the organisation.

Savage (1995) cited in Wikipedia (2016) says the knowledge age is the third wave of human socio-economic development. According to him, in this age wealth is determined by those who have large knowledge capital and the ability to use it to create or improve goods and services. On the other hand, Thomas Davenport says knowledge workers are individuals who have high degrees of education, expertise or experience and can transform this into creation, distribution or application of knowledge (Kardos, 2012).

It is pertinent to note here that the concepts, Knowledge-Work and Knowledge-Worker also suffer the same fate as majority of psychological, social and economic phenomena. Many definitions of the terminologies have included a wide range of jobs or tasks within the purview of knowledge work and hence knowledge-worker. Two of such definitions are given below.

According to Searcherm.techtarget.com/definitions (2005), Knowledge – worker is a term first used by Peter F. Drucker in his book in 1959 "Land – marks of Tomorrow" to embrace anyone whose works to a living involve tasks of developing or using Knowledge. These definitions include persons involved in info tech and even non-info tech practitioners like lawyers, teachers, scientists, and student of all kinds.

Mosco and Mckercher (2007) in Wikipedia (2016) see the knowledge – worker from three perspectives. The first considers those who create an original knowledge product or impact significant improvement on an existing knowledge. The second view included people who handle and distribute information (ICT practitioner) while the third view embraced all workers in the chain of production and distribution of knowledge products.

From the above definitions/meanings, it is clear that there are two categories of knowledge-workers. The CORE and PERIPHERAL groups of knowledge-workers. The core group of knowledge-workers is knowledge generators. The core knowledge-worker is engaged in identifying problems, proffering solutions through collection of data, statistical analysis, and publication of findings. The peripheral groups of knowledge-workers utilise or apply the generated knowledge to improve human lives. These two classes exist side-by-side in all fields or facets of endeavour. Drucker recognised the two groups and called the peripheral group "Technologists" (The Regent of University of California, 1999). This category of workers is now the fastest growing and largest even in developing countries. The peripheral knowledge-workers work or job consist both knowledge and manual components.

This study considers the Academic Staff of Nigerian Universities as belonging to core knowledge-workers. Their jobs involve expert thinking, complex communication and traces of routine cognitive tasks (North, 2009), and their main capital is knowledge derived from education and training. Drucker (2001) elucidated six major factors on which the productivity of knowledge-workers (lecturers in this case) depend. These include issues of tasks definition, autonomy, and creativity, collaboration to deepen knowledge, quality and assets. The management of these factors by an institution will determine its success in the 21st century. Six major factors determine knowledge-worker productivity.

    i.   Knowledge-worker productivity demands that we ask the question: "What is the task?"

    ii.   It demands that we impose the responsibility for their productivity on the individual knowledge-workers themselves. Knowledge-workers have to manage themselves. They have to have autonomy.

iii. Continuing innovation has to be part of the work, the task and the responsibility of knowledge-workers.

iv. Knowledge work requires continuous learning on the part of the knowledge-worker, but equally continuous teaching on the part of knowledge-worker.

v. The productivity of a knowledge-worker is not -at least not primarily- a matter of the quantity of output. Quality is at least as important.

vi. Finally, knowledge-worker productivity requires that the knowledge-worker is both seen and treated as an "asset" rather than a "cost." It requires that knowledge-workers want to work for the organisation in preference to all other opportunities.

How academic staff in Nigerian universities could fit into the knowledge-worker productivity theory

"The most valuable asset of a 21st-century institution will be its Knowledge workers and their productivity." (Drucker, 2001). In the current study, "institution" in the quotation is considered as any formal organisation which engages in activities aimed at improving the worth of its members, solving problems and improving economy and well-being of her stakeholders. In this regard a country, company, governmental departments, agencies and educational institutions, especially institutions of higher learning are included. Hence Nigerian universities cannot be excluded from Drucker's statement.

The crux of this study is the research productivity of Academic Staff of Nigerian Universities. The sole essence of research is the provision of solutions to man's needs to improve the quality of life based on identified problems. This requires the researcher (Academic Staff of Nigeria universities) to use their degree of education, expertise and experience to create and distribute knowledge for application to better human existence. In doing this, the academic staff applies convergent, divergent and creative thinking (Wikipedia, 2016) which are the main capital of the core knowledge-worker.

The statement of the problem of this investigation has articulated that the research productivity of academics in Nigerian universities is low. This assertion is sequel to the ranking of Nigerian universities by various organisations. To turn the appalling situation around, this study has tried to fit the tripartite variables -ownership of institutions, institution management and academic staff of institutions- into the Drucker's Theory. It is with the strong belief that a thorough understanding of the model and concerted efforts by each group to apply it where and how it concerns it shall result in increased productivity. This demands that the counterparts must synergize and collaborate to ensure attainment of goals and objectives set. In other words, the various groups must work as a system to improve knowledge work and the productivity of knowledge-worker.

However, the Academic Staffs of Nigerian universities, as core knowledge-workers, are the pivot of this inquiry. The owners and management of institutions -Federal, State and Private- shall be mentioned where they ought to play prominent roles in the model. The first factor and most crucial considered by Drucker is provision of clear and unequivocal answers to the question "What is the task?"

The duties or responsibilities of academics of scholarship, teaching and service have been well explicated. From the engagement or appointment of the individual as academic staff, the person

should be certain of the specific tasks to perform. With tasks correctly defined the academic staff has the responsibility to tackle the next three factors of autonomy, innovation and, continuous learning and teaching to trigger off increase in productivity. The task of owners and managers of institutions in this context are provision of viral management and leadership. And the academic staffs should be assessed on tasks for which they were engaged.

Reviewed literature revealed that the advancement of the academic staff of Nigerian universities trajectory on research productivity is unfair. The argument is that many universities are not research oriented. Others argue that academic staffs are saddled with administrative works which may not foster research productivity. Viewed from Drucker's model, the issue is more of lack of proper streamlining of tasks. With effective demarcation of roles and responsibilities of the academic and measuring productivity along such lines will eliminate excuses for unproductive academic staff. And will also solve the problem of one measure not fitting all (Altbach, 2014) measures of research productivity.

Productivity cannot be contemplated without the twin brother quantity and quality. Effective and efficient systems ensure quantity count. Quality, on the other hand, involves value-added counts. Quality is paramount in knowledge-worker productivity. Quality guarantees continuous utilisation of a product, and this sustains and strategically place the producer. Issues of quality can again be handled where tasks are properly marshalled out.

As already stated in several parts of the study, research or academic productivity is not just a matter of publication counts. The value added component which determines its impact amongst other things is citation by others. Consequently, the research productivity of academic staffs of Nigerian universities should combine quality and quantity to earn high citation index especially the most popular h-index and i10-index which are used in this study.

In economics, capital is considered an asset while cost is seen as a liability. Costs increase the organisation's expenses, therefore; it must be controlled and reduced. On the contrary, assets which are needed to increase productivity and profit are jealously cared for and grown. Workers are treated as costs which culminate in low or poor remuneration mostly in third world countries like Nigeria. The outcome is low productivity or subjection of workers to near slave labour situation. Drucker in his sixth factor to increase knowledge-worker productivity says the knowledge-worker should be regarded as an asset for two obvious reasons. Firstly, is the recognition that the survival of institutions will depend on their comparative advantage in making the knowledge-worker more productive. Secondly, the knowledge-worker with his knowledge capital as a factor of production could be mobile. To limit the mobility, organisations need to provide incentives and motivation that can make the knowledge-worker prefer to work for only such organisation.

From the fore-going, for Nigeria to advance as a great economy, the different owners of universities, need to see and treat the institutions as "assets" rather than "costs" or liabilities. In like manner, the universities should consider their academic staff as assets. In this way, appropriate policies and leadership or management styles can be instituted to enhance the realisation of the overall goals of the institutions.

The various indicators or determinants of academic productivity could be summarised into three main dimensions - innate abilities, experience and availability of resources. A possible fourth dimension is management. Innate abilities here refer to individual qualities like self-concept, motivation, attitude and aptitude. Experience embraces qualification, training to

acquire requisite skills and competencies. While funding availability of accessible laboratories/workshops, physical and virtual libraries with internet facilities and constant supply of electricity belong to the realm of resources. The afore-mentioned determinants of productivity by research academics can be harnessed to boost output through a conducive atmosphere of good management/leadership of Nigerian universities. The relevance of adoption of the two models in promoting research productivity of academic staff of Nigerian universities becomes apparent when the determinants of productivity are matched against the focuses of the theories.

Gilkey (2008) general theory of productivity focus is on the individual researcher and how he/she can develop to become a high producer of knowledge. Creative energy, focus, motivation and aptitude are personal characteristics or attributes of the researcher. Gilkey stressed that these qualities are enablers to productivity. The implication is that the higher the degree of presence of these qualities in the academic staffs of Nigerian universities the greater the academic research output. Consequently, anything that can boost these qualities in our academic staff will necessarily increase research output. This is the point where the other two dimensions-experience and resources- come handy. Gilkey also proffers solutions to tackling the existence of inhibiting factors. He emphasised proper and diligent planning to remain productive. The inhibitors which are mainly external like distractions and complexity of tasks, which steal the time for productive activities must be eliminated or at least greatly reduced through proper planning and stratification. Application of Gilkey's model by academic staff of Nigerian universities may make the statement "He that is in me is greater than he that is in the world" (Bible: 1John 4:4, reframed), come to pass. And the research productivity of academic staff of Nigerian universities will increase tremendously.

A major critic of research productivity measurement as an indicator of ranking universities is the classification of some universities as being teaching or research oriented. The first point addressed by Drucker (2001) in his theory/model of increasing knowledge-worker productivity is a clear and distinct definition of tasks. Once this is achieved, it implies that a different method of measuring productivity has to be devised. Again this settles the issue of "no one measure fits all" (Altbach, 2015). The next three factors that trail task are autonomy, innovation and non-stop learning and teaching. The fifth factor is quality production. With the assurance of autonomy by owners of universities, innovative thinking and continued learning and teaching to improve productivity now devolves on the academic staff. Like Gilkey's model, this model places high demands on innate abilities and experience of academic staff.

The availability of resources which is a vital force to research productivity is a responsibility of owners and managers of institutions. When resources are available, the abilities and experience of academic staff of Nigerian universities can translate into increased research productivity. One cannot function optimally in the absence of the other. Two scenarios are painted here.

"You can only force a horse (an academic staff) to the stream, but you cannot force it (him/her) to drink water".

"A horse (an academic staff) led to a dry stream (absence of research and development facilities) cannot drink water no matter how thirsty it is, and perhaps how much it tries".

The first scenario is a situation whereby owners/managers of institutions provide adequate and accessible resources, but the academic staff lacks abilities, experience, and passion to research

and publish widely on the Internet. While the second portrays circumstances where the academic staff possesses abilities, experience, and the passion to execute and to widely publish on the Internet but the needed resources are absent. In both cases, the result will be either no or low research productivity. However, let it be said here that the researcher has taken for granted that the owners and managers of Nigerian universities shall key into Drucker's idea of treating academic staff as assets. Were it is not the case, the necessary resources will be provided.

The crux of Drucker (2001) knowledge-workers productivity is the management of knowledge-workers productivity. He asserted that for advanced nations and economies of the world to maintain their leading roles in the 21st century, they must grapple with the management of their knowledge-workers productivity. Drucker painted a very gloomy picture when he posited that developing economics (like Nigeria) in the 21st century will be where the developed economies were in the early 20th century with manual-worker productivity. This underscores the relevance of leadership in Nigerian universities. That is the reason the researchers included leadership as the fourth dimension that can have decisive effect on academic staff research productivity. Discussions stemming from Drucker's assertions started since 1999 and the first decade of the 21st century in the developed worlds. Sticking to archaic and unproductive management theories by Nigerian government and owners of universities/management shall not move the research productivity of Nigerian academics an inch forward. The researcher, therefore strongly recommend critical examination of the Drucker's model and work out a possible implementation within the Nigerian context.

Gilkey's General Theory of Productivity

Charlie Gilkey in 2008 proposed a General Theory/Model of Productivity. He termed his model of productivity to be effectiveness-oriented. Understandably, an efficiency model cannot be wholly applied to research productivity because it only addresses quantity (publication count) while neglecting quality (impact). Gilkey (2008) substantiated this when he affirmed that it would be tantamount to moving backwards when a myriad of tasks are accomplished in recorded time without advancing any meaningful goal. The implication of this is for any system to function optimally, there must be appropriate blend of effectiveness and efficiency. As a result, the theory incorporated ideal time as a dimension.

Gilkey's productivity model is made up of seven (7) dimensions expressed in a formula thus

$$P = \frac{(C + F + M + A + T)}{(Dt + D)}$$

The connotation of the alphabets are given below

P=Productivity; C=Creative energy; F=Focus; M=Motivation; A=Aptitude;

T=Ideal time; Dt=Difficulty of task; and D=Distraction.

I. Creative energy=Energy is the capacity or ability to do work. The work done with the energy can be creative or destructive. When energy is directed towards improving any field of endeavour and better human life in general (intangible force moving an intangible load), it is termed creative energy. Academic staffs of Nigerian universities like other human beings are compendium of energy. All that is needed is to direct it to

creativity. Gilkey says that there are times when human beings are insanely innately creative.

II. Focus- This is the ability of an individual to concentrate on a task damning all odds until goals are met. Academic staff when laser-focused on one project or idea and target time has enhanced productivity. Focus according to Gilkey makes physical necessities to melt away. This concord with Kpolovie (2010) when he expounded on the characteristics needed for research productivity.

III. Motivation- Gilkey emphasised that task accomplishment, is dependent on motivation. The higher motivation is, the more likelihood of staying on and completing a task.

IV. Aptitude- People can accomplish given task at different length of time even with practice. One with natural or innate capabilities will complete a given task faster. When training complement natural proficiency, it enhances expertise. Experts at a task are far more productive than neophytes.

V. Ideal time- Productivity is hampered when execution and completion of a task fall short of ideal time. Granted that various projects need different duration of time to complete, researchers must consider ideal time in planning and executing tasks.

VI. Difficulty of task- There are tasks which are inherently harder to perform. Such tasks may therefore require more creative energy, focus, motivation, aptitude and of course time to finish them. Complex or difficult tasks should be broken into simpler components to ease accomplishment.

VII. Distractions- Anything that is capable of reducing or interfering with the focus of a researcher. They are mostly from outside the individual. Ill-health, marital responsibilities, lack of resources and even habits to mention just a few are examples of distractions. To be productive, academic staff of universities must strive to effectively and efficiently manage distractions.

Gilkey referred to the numerator dimensions as ENABLERS. This means these dimensions positively affect productivity when they are readily available. He confirms that the enablers are INTERNAL, and are part of man's innate nature. The enabling dimensions are highly interconnected. And this interconnectivity can either positively or negatively influence productivity. This is to the extent that one dimension has the tendency to increase the others and vice versa. The implication is that a researcher should identify low enablers in him/her and work assiduously to boost them.

On the other hand, the denominator dimensions, Gilkey call DETRACTORS which have the ability to reduce productivity when the magnitude is high. The detractors are EXTERNAL influences. The academic staff of Nigerian universities as researchers must learn how to manage and overcome the detractors. In tackling difficult tasks, researchers should not resort to outside sources. The researcher should instead draw on his/her account of enablers. Doing otherwise, the researcher may end up being more distracted.

The Gilkey's theory is very useful to researchers in the sense that individuals can:

(i) Create habits that increase the enablers.

(ii)   Examine the task and plan an ideal time to complete it. This can take care of efficiency as an integral part of productivity.

(iii)   Eliminate avoidable distraction and plan to minimise the effects of unavoidable ones.

(iv)   Simplify complex and arduous tasks.

(v)   Provide beneficial answers to the questions of "Why am I either or not productive?" "How can I become more productive?"

Overview of productivity theories reviewed

This section showcases a brief history of productivity. Taylor's scientific approach is the most outstanding. His approach resulted in over fifty percent increase in manual-workers' productivity and wages earned. Improvements by others like Deming produced the world's first or developed economics in the 20th century. In the close of the 20th century, Drucker said that there must be a shift from manual-workers to knowledge-workers productivity and how to manage knowledge-workers productivity in the 21st century. Drucker asserted that the survival and comparative advantage would be dependent on the productivity of knowledge-workers in the advancing economies. Knowledge-workers accomplish their tasks with intangible resources which are the knowledge capital they possess. Drucker referred to the second class of knowledge-workers he called technologists. This is the fastest growing group presently who combine application of knowledge and manual work in their tasks. The two knowledge-workers groups are termed as core and peripheral knowledge-workers. The current researchers believe that Academic Staff of Nigeria universities belongs to the core group. To be a successful academic requires high degree of education, experience and expertise which are brought to bear in creation and dissemination of knowledge. Drucker's six major factors that affect knowledge-worker productivity were outlined and expounded upon. These include concise definition of tasks, autonomy for individual knowledge-worker to collaborate and manage him/herself, continuous and sustained innovation to improve and move the institution where he/she works to the next level, learning and teaching as a continuous process of self-improvement and furthering goals attainment, high consideration of quality (not just quantity of product) as a responsibility of knowledge-worker, and the last but not by any means the least is the all-important need for management and leadership to accept knowledge-workers as assets instead of cost.

In the segment on integration of academic staff of Nigerian universities into the Drucker's model, the researchers have tried to articulate points of divergence and convergence of responsibilities and roles of organisations and knowledge-workers. The researchers opinionated that tasks definition should be the responsibility of the owners and managers of Nigeria universities. The recruitment of academic staff should be anchored on the predicted abilities of the individuals, and their assessment or appraisal should be so done on the basis of their research productivity measured with h-index and i-10 index. There is need for university owners to grant autonomy to institution and institution grant autonomy to the academic staff as core knowledge-workers. Issues of continuous innovation, learning and teaching, and quality are to be taken on by the academic staff. These are the areas where they can showcase their knowledge, experience and expertise to justify the enormous resources placed at their disposal. Again the researcher says that owners of institutions consider institutions as assets while institution management sees academic staff in like manner. Gilkey's General Theory/Model of Productivity is effectiveness-oriented. He considers five out of the seven dimensions that

determine level of productivity as enablers while the other two are detractors. The enablers are creative energy, focus, motivation, aptitude and ideal time which form the numerator of his model because all these are directly within the control of individual researcher. Difficulty of task and distractions which constitute the denominator are detractors. He also states that the enablers are intrinsic and detractors are extrinsic factors to an individual's productivity. The model made it clear that a high level of the enablers and low level of detractors could enhance academic or research productivity. Consequently, academic staff of Nigerian universities must strive to increase the degree of the enablers they possess. Manage difficult tasks effectively and minimise distractions. In treading this path, the academic staff of Nigerian universities can figure out how they can increase their research productivity.

Related existing empirical works

Though studies on research productivity in the United States of America dates back to 1962, the earliest reference to academic productivity was in 1990 (Okiki, 2013; 2013a). Gonzalez-Brambila and Veloso (2007) in their work on the determinants of research productivity of Mexican researchers considered age as a life cycle. Jung (2012) in studying Faculty Research Productivity across academic discipline in Hong Kong, identified individual background as a predictor of academics' research productivity. Individual backgrounds include age and gender that constitute demographic variables; and motivation, ambition and self-esteem that were considered as psychological traits. Jung (2012) also made reference to the possible role of institutional variables like institutions mission, colleagueship, governance and reward system.

In literature review for his study titled 'An Investigation of Factors Related to Research Productivity in a Public University in Thailand: A Case Study," Lertputtarak (2008) examined four wide areas of demographic, environmental, institutional and personal career development factors. Demographic factors reviewed were age, gender and marital status. Faculty (academic staff) productivity and age were viewed regarding categories of biological, psychological, sociological and social-psychological perspectives. Environmental factors highlighted were collegial commitment and leadership. These factors mould and form an institution's cultural climate concerning the interpersonal relationship and collaborative efforts to meet departmental goals. Lerputtarak (2008) discussed types of institutions as department, mode of selection of academics, remuneration/reward and institutional supports. Personal career development factors which are expressly attributed to individual academics were also addressed. Among such factors which are found to be crucial to increase productivity are individual ability/interest, attitude to research, academic origin, qualification, experience, skills and training, rank and tenure status.

In a PhD study on enhancing research productivity of Teaching English as a Foreign Language (TEFL) in China higher education institutions, Bai (2010) used an initial survey of 182 TEFL academics from three Chinese higher education institutions, and individual and institutional characteristics that influenced their research productivity. With the use of interviews and documents as the data gathering instruments, Bai's subsequent qualitative case study of two purposively-sampled Chinese TEFL departments provided insights into Chinese TEFL academics' perceptions about research, and individual, institutional and departmental efforts in meeting the research expectation. Results showed that the 182 Chinese TEFL academics' research productivity during 2004-2008 was relatively low in terms of the quality of their research. The study further identified four influences that impacted on Chinese TEFL academics' research productivity to be (a) TEFL disciplinary influences, (b) institutional and departmental research environments, (c) individual characteristics desirable for research, and

(d) TEFL academics' perceptions about research. Consequently, Bai (2010) synthesised the findings from the study and presented a framework for Chinese institutions and TEFL departments to enhance their TEFL academics' research capacity.

From the above section the determinants or factors that affect academic research productivity investigated in foreign countries are -age, rank, qualification, tenure, gender, marital status, health status, religion, motivation, self-concept, research training, networking/collaboration, research strategies , research time, culture, resources', incentives, type of institution, location and leadership (Altbach, 2015; Pacheco-Vega, 2013; Lariviere & Costas, 2016; Spicer, 2015). Depending on investigators, these factors are grouped into various categories and different terminologies adopted. However, on a very broad outline, they are divided into individual and institutional factors or influences. Individual influence is further categorised into demographic, psychological and academic status of academic staff of universities. It is important to state here that findings of majority of the demographic factors (age, gender, rank, religion, etc.) present conflicting pictures (Gonzalez-Brambila, 2007; Jung, 2012; and Lertputtarak, 2008). Individual and institutional factors that consistently influence productivity positively are qualification, motivation, self-concept, time allotted to research, and culture of institution/department, resources, incentives and institution's type (Bai, 2010).

Okonedo, Popoola, Emmanuel and Bamigboye (2015) studied the relationship between demographic factors and self-concept and research productivity in South-West Nigeria. The study used 142 librarians in public universities in the geo-political zone. Two of the three hypotheses tested were rejected. A significant relationship was found between self-concept and productivity as exhibited by the respondent librarians. For demographic factors, only tenure positively influenced productivity. The study also revealed lack of joint impact on research productivity by demographic factors and self-concept.

Using a sample of three hundred and forty-nine (349) respondents, Archibong, Effiom, Omoike and Edet (2010) investigated the disposition of academic staff towards the promotion criteria employed in Nigerian universities. The study's findings reveal that respondents who accepted publication criterion but were ill-disposed to the use of computer literacy and publications in international journals as criteria for promotion. While rejecting the criteria which can increase their visibility in the academic world, they clamoured for local inputs such as assessment by students, oral interviews and assignment of equal weight to all promotion criteria.

The work of Uluocha and Mabawonku (2014) corroborated the claim that there are conflicts in the findings of the effects of demographic factors on academic research productivity. In a descriptive survey using a questionnaire on 414 respondents, they reported that age, rank, experience, geopolitical zone and ownership of institution positively affect productivity. In the same study, they found negative correlation between gender and qualification, and research productivity of law faculties in Nigerian universities.

It is an open secret to assert that research productivity of academics in Sub-Saharan Africa especially Nigeria is low. Given this uncomplimentary stand, Obembe (2012) embarked on a study to fathom the scientific productivity of academics of Nigerian universities. He used a sample of 77 subjects from Obafemi Awolowo University, Ile-Ife and University of Ibadan, Ibadan. The findings indicated that academic rank, attendance of conferences and collaboration as members of professional bodies are the predictors of research productivity in the two universities.

An analysis of female research productivity in Nigerian universities by Ogbogu (2009) probed into the factors hampering research output of female academics and proffered strategies to boost their productivity within the context of Nigerian Universities system. The study drew a sample of three hundred and 381 female academics from twelve (12) universities in the six geo-political zones of Nigeria. Findings exposed very low research performance as seen from the results of the investigation. From the findings only, about 27% of the participants published two papers per annum. The study identified marital status, religion, rank, and lecture workload as having an adverse effect on female academics productivity.

Okiki (2013) executed quantitative study on productivity of teaching faculty members in Nigerian federal universities. The findings indicated that the research outputs of respondents were high in many respects but progressively decline from the North-East geo-political zone, South-West, North-Central, South-East, North-West to South-South. The paper also reveals low internet bandwidth and finance as constraints to academic research productivity. The study utilised a sample size of participants.

Sunday (2012) embarked on a study to fathom the use of the internet by Nigerian academics arising from rank. The study involved 274 academics from four universities in South-South zone of Nigeria. Results from analysis of the data collected showed that 13.5% of the sampled subject which were Professors had 7.49 mean score and 5.8% who were Graduate assistants a mean score of 7.50. Consequently, Sunday (2012) reported that academics irrespective of rank use information from the internet in research publications.

Oyekan (2014) investigated establishing relationship between resources situation in universities and research productivity. The findings reported exposed availability of resources that positively correlated with research output. The correlation coefficient of 0.288, 0.199 and 0.201 (calculated) for physical, human and material resources vis-à-vis productivity respectively were statistically significant at 0.05 alpha.

In an earlier study conducted by Okiki (2013), he reported that information resources were readily available in the institutions investigated, but there was no significant relationship between information resources availability and academics actual research productivity. The scenarios presented by the study reported by Ani, Ngulube and Onyancha (2015) were similar to Oyekan (2014). Ani et al. (2015) investigated accessibility and utilisation of electronic resources on productivity of academic staff of selected Nigerian universities. They reported perceived significant positive effect of accessibility and use of the variables on academic productivity of staff. The study's findings also stated that no significant positive relation exists between discipline and gender on the variables and productivity.

Research findings not communicated and shared is like a lamp lit and covered. No benefits accrue from that place. Therefore, the importance of knowledge sharing in the academic world cannot be over-emphasized in enhancement of research productivity. To this end, Osunade, Phillips and Ojo (2007) conducted research on the limitations of knowledge sharing by academia during a computer training exercise for 100 participants from tertiary institutions in South-West Nigeria. The findings indicated that only very few respondents use the internet and its services towards their academic pursuits (7%) regarding personal web page, online publications of articles and online hosting of thesis. Other than the well-known power problem in Nigeria, the findings established lack of skills in computer operation, limited search skills to access meaningful information on the net through the various search engines, as militating against effective knowledge sharing by academic staff of Nigerian universities.

In spite of the fact that only research works that are published internationally online that counts in research productivity in this 21st century, some academics in Nigeria still have research works which are not visible to their peers. This has to do with publication of research findings locally. This could arise from both individual influences such as personal skill development or lack of funds and institutional factors. About two decades back, the cost and bureaucratic process of publishing in a renowned journal were enormous and time-consuming. Thanks to the proponents and sponsors of Open Access. Musa, Sanusi, Yusuf and Shittu (2015) opined that Open Access provides global visibility to enable research findings/outputs are easily accessed globally. With the use of open access journals and open access repositories or institutional repositories, individual researchers and universities can project themselves into global visibility for recognition. Open access literature is digital, online, free of charge to access, and free of most copyright and licensing restrictions.

METHODOLOGY

The study entailed the collection of data from a database harbouring the research publication and citation counts of academic staff of Nigerian universities to measure research productivity of the staff. The study also sought to fathom whether Nigerian academics have research works published in obscured media which can be migrated into media of international repute in order to enhance their visibility and thereby contribute to their productivity. The data to be collected and analysed pre-date the study. It is thus clear that the study is quantitative in nature. Consequently, quantitative research approach was adopted. Quantitative research entails the assemblage of numerical data and rigorous statistical analysis to facilitate description, explanation, prediction and control of the phenomenon of interest (Kpolovie, 2017; 2016; 2011; 2010; Gay, Mills & Airasian, 2006). The effect-to-cause Causal-comparative ex-post facto research design was employed in the investigation. This design is the most suitable for investigating the variables and testing the hypotheses of the study. To ensure elimination of interference of extraneous variables and enhance internal and external experimental validity of the study, homogeneous subgroups formed the sample of the study. This informed the decision to use a particular geo-political zone, academic staff of graduate schools with the same mission though with different ownership status.

Though population refer to the people living within a given political or geopolitical boundary; in research parlance, population is a phenomenon which denotes the entire elements distinctly identified to possess certain given characteristic(s) of interest to be investigated or studied (Kpolovie, 2017). The element here represents any group of animate and inanimate objects or occurrences having the qualities of interest, people and events for example. The population could be small or large. It could range from a relatively small set of numbers to a large but finite set of numbers, or a large and infinite set of numbers. From this population, the researcher draws a small portion that truly represents the population to carefully investigate the characteristic(s) of interest. The researcher from the results of the findings obtained from his/her study gain extensive knowledge of the group to offer explanations and may make generalisations (Gay, Mills & Airasian, 2006, Kpolovie, 2011, and Howell, (2002).

Nigeria has one hundred and thirty (130) universities in 2015 NUC records. This number is made up of 40 Federal, 39 State, and 51 Private universities. Geo-political zones distribution of the figures is nine, six, seven, seven, five, and six federal universities; there are seven, five, six, nine, five, and seven state universities; and one, two, seven, 24, eight, and nine private

universities respectively in the North-West (NW), North-East (NE), North-Central (NC), South-West (SW), South-East (SE) and South-South (SS). Table showing Nigerian universities and their distribution according to geo-political zones.

Table 3: Distribution of Nigeria Universities According to Geo-Political Zones (Excluding 2015 Schools)

Geo-political Zones / Universities	NW	NE	NC	SW	SE	SS	Total
Federal	9	6	7	7	5	6	40
State	7	5	6	9	5	7	39
Private	1	2	7	24	8	9	51
Total	17	13	20	40	18	22	130

Sixty-three universities out of the 130 universities have Graduate Schools which undertake Postgraduate studies. This is composed of 26 Federal, 22 State, and 15 Private. Along geopolitical boundaries, the distribution is four, three, five, six, four, and four federal; one, two, four, five, five, and five state; and zero, one, three, nine, zero, and two private universities in the NW, NE, NC, SW, SE, and SS, respectively as shown in Table 4.

Table 4: **Distribution of Nigeria universities with Graduate Schools according to geopolitical zones**

Geo-political zones / Universities	NW	NE	NC	SW	SE	SS	Total
Federal	4	3	5	6	4	4	26
State	1	2	4	5	5	5	22
Private	0	1	3	9	0	2	15
Total	5	6	12	20	9	11	63

All the universities above approved by National Universities Commission (NUC) to run postgraduate courses have research as a major part of their vision. While some aim to be the best at national level, some strive to be sub-regional best, and others aspire to be among the best globally. A research endeavour which seeks to investigate research productivity must carefully examine the research activities of these institutions. Consequently, the academic staff at these institutions constitute the population of this study. In other words, the population utilized for this investigation consists of academic staff of the universities in the South-South geo-political zone that run Postgraduate academic programmes. This consists of eleven (11) universities with total academic staff strength of 7,784. Table 5 indicates the various

universities and their respective teaching staff as supplied by National Universities Commission (NUC) on September 22, 2016.

Table 5: **Academic staff of Nigerian universities in the South-south geo-political zone 2010-2011.**

S/N	NAME OF INSTITUTION*	PROF/READER CADRE	SNR LECTURER CADRE	LECTURER1 & BELOW	TOTAL ACADEMIC STAFF
1.	UNIBEN	267	330	328	925
2.	UNICAL	183	438	363	984
3.	UNIPORT	267	288	845	1400
4.	UNIUYO	246	219	594	1059
5.	AAU	121	97	305	523
6.	CRUTECH	-	-	-	-
7.	DELSU	124	152	930	1206
8.	RSUST	92	104	259	455
9.	NDU	124	101	528	753
10.	BIU	30	24	141	195
11.	IUO	58	39	187	284
	Grand Total	**1512**	**1792**	**4480**	**7784**

*Abbreviations of the universities refer in full to:

1.   *Federal Universities*

UNIBEN = University of Benin, Benin City,

UNICAL = University of   Calabar, Calabar,

UNIPORT = University of Port- Harcourt, Port Harcourt, and

UNIUYO = University of Uyo, Uyo.

2.   *State Universities*

AAU = Ambrose Alli University, Ekpoma,

CRUTECH = Cross River University of Technology, Calabar,

DELSU = Delta State University, Abraka,

NDU = Niger Delta University, Yenagoa, and

RSUST = Rivers State University of Science and Technology, Port Harcourt.

3.   *Private Universities*

IUO = Igbinedion University, Okada, and

BIU = Benson Idahosa University, Benin-City.

Sample

This study focused on the universities in the South-South geopolitical zone that have the approval of NUC to run Postgraduate studies. The analysis shows that there are four Federal, five State and two Private universities certified to operate Graduate Schools in the zone. From each category in terms of ownership, one university was randomly sampled for this investigation. All the academic staff of College/School of Graduate Studies of the sampled universities constituted the sample of this investigation. The sampled universities are University of Port Harcourt (UNIPORT) to represent Federal universities; Delta State University (DELSU), Abraka to represent state universities; and Benson Idahosa University (BIU), Benin City, Edo State that represents private universities. That is, the investigators considered two levels of sampling. The first was based on institution type and the second on academic staff of institutions that lecture in Postgraduate academic programmes.

Table 6: **Showing sample institutions, their total academic staff strength, and numbers of sampled academic staff.**

S/N	Name of Institution	Total Academic Staff	Sampled Academic Staff
1.	UNIPORT	1400	713
2.	DELSU	1206	266
3.	BIU	195	94
	TOTAL	**2801**	**1073**

The 1073 subjects of this study were drawn from academic staff who lecture postgraduate students. Although all academics whether they lecture undergraduate or graduate students should be productive, those who take postgraduate courses should be more productive. It is in Graduate school that the actual fashioning of professionals and academics begin. Consequently, academics in this sector are supposed to be more productive because it is their expertise and experience that they would draw on to accomplish their scholarly and mentoring responsibilities. Names of the sampled academic staff were obtained from their institution's Prospectus/Handbooks (Benson Idahosa University, 2014; University of Port Harcourt, 2014 & Delta State University, 2014).

Sampling procedures used for a study is a crucial determinant of the tenability, authenticity and acceptability of the results obtained from the study. This is the case because the most appropriate and suitable sampling technique is a function of the characteristics of the population and variables under consideration (Howell, 2002; Kpolovie, 2011; 2017).Broadly, there are two sampling techniques – Non-Probability and Probability. Non-probability is further divided into convenience, purposive and quota sampling. On the other hand, probability or random sampling techniques include simple, systematic, stratified and cluster sampling approaches. Agreeably, Howell (2002) and Kpolovie (2017; 2011) affirmed that the random methods provide the most ideal outcomes. However, under certain situations, the non-random methods becomes more handy and feasible.

To have a sample that is truly representative of the population, and which has accuracy and precision for this investigation, mixed sampling techniques were employed. Simple random sampling was used to draw the Geo-political zone and the universities from the sampled zone. Cluster sampling was equally used for the study because all the Postgraduate lecturers in of the

three sampled universities, representing each of the three clusters of universities in terms of ownership constituted members of the sample of this study. The adopted multistage sampling was in line with the assertions of Gay, Mills and Airasian (2006); Kpolovie (2010); Kpolovie (2017); and BetterEvaluation (2014) on how sampling should be done to best ensure external experimental validity of an investigation.

An empirical study cannot be conducted without adequate consideration of how data can be sourced and the actual mining of the data because quantitative empirical research involves data collection and detailed analysis (Penn Online Research Tutorial, 2013; Hox & Boeije, 2005; Gaasbeck, no date). To effectively accomplish the missions of this study, the researchers used the h-index and i10-index of the sampled academic staff as archived in and determinable from Google Scholar database, the largest database of indexed works and citations for determination of research productivity (NSBA, 2011; Ahmad, 2010; Ambient Insight Research, 2009; Andone, Holotescu & Grosseck, 2014).

Data collection

Interest in the study stemmed from the all low ranking of universities in Nigeria by World Universities Ranking bodies. In the opinion of the researchers, the low ranking arising from publications may not be unconnected with insufficient involvement in research endeavours and the use of inappropriate mediums for dissemination of the research findings. Improper mediums for propagation of research findings may be affiliated with low visibility of Nigerian academics. Consequently, the researchers in construing methods to collect data and instrumentation for the study, decided to use data from Google Scholar database that is most accessible to academics globally for visibility enhancement.

First and foremost, the researchers had to satisfy the terms and conditions for the use of googlescholar.com. The researchers entered the full name of each academic staff that constitutes the sample of this study into Google Search Engine at www.scholar.google.com. Then they analysed the list of publications that emerged to ascertain the h-index and i10-index of each lecturer. These were collated for each academic in the various faculties of the different universities sampled for the investigation. The following procedures were followed in obtaining information from Google Scholar:

1.   Switch on a system (laptop) to boot.

2.   Connect an internet device (Wi-Fi, hotspot, modem, router, etc.) with secure network connectivity.

3.   Click on browser and key, "scholar.google.com" into the address bar and enter.

4.   Google Scholar Search Engine appear.

5.   Type in the first name and surname of the subject (e.g., Peter Okebukola). The "User profiles for Peter Okebukola" appears.

6.   Click the "User profiles for Peter Okebukola", and his complete citations index with the h-index and i10-index automatically appears if the person has Google Scholar citations account. Such information was used. For a subject who does not have Google Scholar citations account, additional measures were taken as follows to get his/her h-index and i10-index.

7.   Type in the initials and surname of the subject in the Google Scholar search engine (e.g., P. J. Kpolovie). Note that the punctuations and use of upper case for the initials are not mandatory.

8.   Now click on the "Search" button. Automatically all the publications authored by the subject and related topics by other authors are displayed.

9.   Then, the researchers painstakingly sifted out publications by the subject, copied and pasted them into Microsoft Word. It was painstaking because many search pages may be displayed. After collecting all works found, they were saved with the name of the author, the subject in question.

The researchers conducted the search for all the subjects that constitute the sample within one week. A short and concise duration is very vital as the information from the search engine is not stagnant. The shorter the duration, the more authentic the data collected with regard to variations that may occur in the publications and citations counts of the subjects for comparison. This ensured or enhanced the validity and reliability of the data.

10.   Finally, researchers recorded each publication and its corresponding citation(s) with which the h-index and i10-index were determined for each subject of the study.

Use of suitable instrument for collection of relevant data for research is a fundamental necessity for research. This is so important because the entire result and findings of a study depend on the quality of data collected. Humanity will be endangered when information on which conclusions, generalisations and decisions are predicated are false and misleading. Therefore, any instrument or tool used to gather information for research must collect only the data relevant to it and be able to collect the same data when used at any other time or place. This was asserted by Gay, Mill and Airasian (2006) and Kpolovie (2010; 2011; 2016; 2017) when they asserted that poor instrumentation is a major threat to internal experimental validity. For this study, the prospectus/Handbook of the institutions was used to derive names of the academic staff in each institution. The names of all academic staff in each faculty and departments as laid out in this source were utilised. A well-prepared prospectus will include the name of academic staff indicating the surname, first and middle/other names, qualifications with dates, awarding institution(s), areas of specialisation and gender identification.

It is important to reiterate once more at this juncture that the source of data for this study is Google Scholar that is an indisputable **highly valid and reliable** database for measurement of research productivity globally (Becker Guides, 2016; Library Guides, 2017; Spicer, 2015; Google Scholar, 2017; Research Guides, 2016; Marnett, 2017; Lariviere & Costas, 2016; Nature, 2015; Thesis Wisperer, 2016; Altbach, 2015; Pacheco-Vega, 2013; Mattmight, 2015). It is common knowledge that two different persons can bear the same name. Consequently, the names of the academics were keyed into Google Scholar in various formats. Each publication was opened to ascertain the affiliation as a confirmation that it belongs to the particular academic in the institution that is being investigated. The academic staff's trajectory of publications history also plaid a major role here. This was to elimination of any chance of crediting a work of Peter Okebukola of the University of Lagos, for instance, to any other Peter Okebukola anywhere else in the world. This was done to ensure that the h-index and i10-index obtained from www.scholar.google.com are really those of the academic staff in the targeted

universities which thereby guaranteed the validity and reliability of the data collected for use in the study.

Data only become comprehensible when presented after some form of analysis "A collection of raw data taken by itself is no more exciting or informative than junk mail before election day" (Howell, 2002). Kpolovie (2014) says data collected are meaningless unless they are analysed and interpreted. The analysis pursues a course appropriate for testing the null hypotheses and providing answers to the research questions of the study. For Gay, Mills and Airasian (2006), the most appropriate descriptive statistics for Effect-to-Cause Ex Post Facto Comparative Research Design are mean and standard deviation. The T-test and analysis of variance (ANOVA) are equally that critical for inferential statistics to execute testing of null hypotheses. The researchers, therefore, made use of descriptive statistics (mean and standard deviation) to provide answers to the research questions posed for this study. Analysis of variance (ANOVA) and T-test were employed in testing the null hypotheses at 0.05 alpha in this study. These analyses were done with IBM SPSS® Statistics, Version 23.

The researchers assumed that individual factors play major role in the academic research productivity of academic staff of Nigerian universities as in other institutions of learning world-over. Were it otherwise, the research productivity of all academic staff in an institution or faculty (area of specialisation) should be the same. This is on the premise that all staff in the respective categories are exposed to similar funding, infrastructural situations and governance or managers.

RESULTS AND DISCUSSION
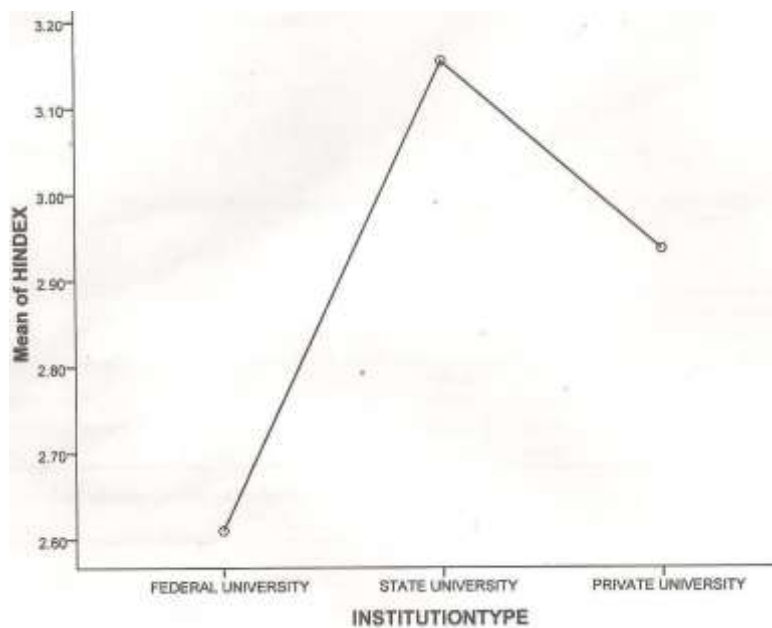
Research Question One

What is the h-index of academic staff of Federal, State and Privately owned universities in Nigeria?

Tables 7: **Showing h-index of academic staff of Federal, State and Private Universities.**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max
					Lower Bound	Upper Bound		
FEDERAL UNIVERSITY	713	2.6101	3.20542	.12004	2.3744	2.8458	.00	23.00
STATE UNIVERSITY	266	3.1541	3.44043	.21095	2.7388	3.5695	.00	16.00
PRIVATE UNIVERSITY	94	2.9362	2.95416	.30470	2.3311	3.5412	.00	12.00
TOTAL	1073	2.7735	3.25014	.09922	2.5788	2.9682	.00	23.00

The Table 7 shows that federal university has a sample size (N) of 713, mean value of 2.6101, standard deviation and error of 3.20542 and 0.12004 respectively, the lower and upper boundary of confidence interval for means at 95% lies between 2.3744 and 2.8458. The state

university has sample size of 266, mean of 3.1541, standard deviation of 3.44043, standard error of error of mean of 0.21095, the confidence interval lie between 2.7388 and 3.5695. For Private University, the sample size is 94, mean value of 2.9362, standard deviation and error of mean stands at 2.95416 and 0.30470 respectively with the confidence level ranging between 2.3311 and 3.5412. The minimum h-index for the institutions is 0.00. While the maximum is 23.00, 16.00 and 12.00 for federal, state and private universities respectively. The total sample size is 1073, mean of 2.7735, standard deviation of 3.25014, mean standard error of 0.09922, lower and upper boundaries of 2.5788 and 2.9682 respectively, minimum h-index 0.00 and maximum of 23.00. Figure 4 means plots obtained from the results of analysis vividly highlight differences in the means of the various categories of institutions.

Figure 4: Means Plots

Null Hypothesis One

There is no significant difference in the h-index of academic staff of federal, state and privately owned universities in Nigeria.

The results of the one-way ANOVA executed on the h-index computed for the study are displayed in Table 8.

Table 8: One-way ANOVA on h-index of institutions.

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	60.064	2	30.032		
Within Groups	11263.905	1070	10.527	2.853	.058
Total	11323.968	1072			

Sum of squares between federal, state and private universities is 60.064 with 2 degrees of freedom (df) and mean square of 30.032. Sum of squares within federal, state and private universities is 11263.905, 1070 degrees of freedom with 10.527 mean square value. The total sum of squares of 11323.968 has 1072 degrees of freedom. The Table 8 reveals that the F-ratio is 2.853 and the p-value (sig) is 0.058. The p-value of 0.058 is greater than the chosen alpha (α) of 0.05. Therefore, there is no statistically significant difference (i.e., $F(2, 1070) = 2.853$, $p > 0.05$. Consequently, the null hypothesis is retained.
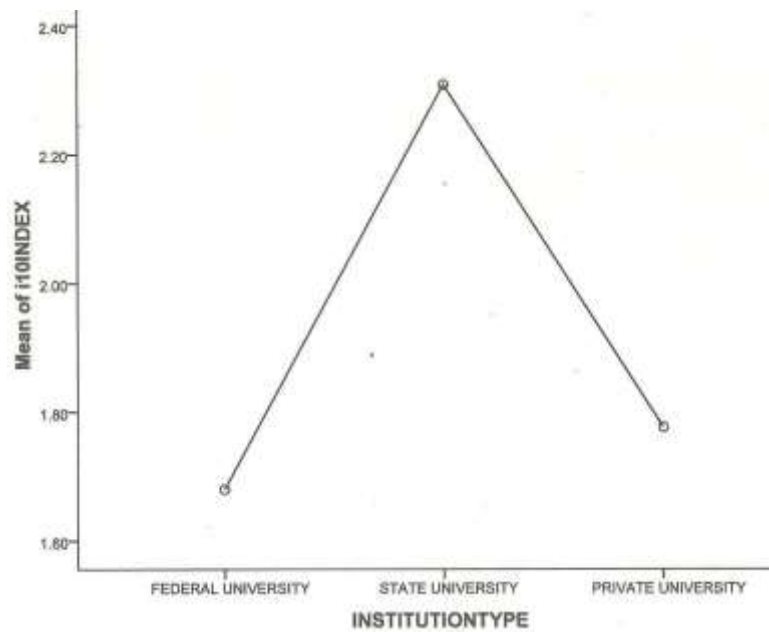
Research Question Two

What is the i10-index of academic staff of federal, state and privately owned universities in Nigeria?

Tables 9: **Showing i10-index of academic staff of Federal, State and Private Universities.**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max
					Lower Bound	Upper Bound		
FEDERAL UNIVERSITY	713	1.6802	4.18315	.15666	1.3727	1.9878	.00	40.00
STATE UNIVERSITY	266	2.3083	4.25717	.26102	1.7943	2.8222	.00	26.00
PRIVATE UNIVERSITY	94	1.7766	2.77529	.28625	1.2082	2.3450	.00	12.00
Total	1073	1.8444	4.10394	.12529	1.5985	2.0902	.00	40.00

The Table 9 shows that federal university has a sample size (N) of 713, mean value of 1.6802, standard deviation and standard error of 4.18315 and 1.5666 respectively, the lower and upper boundary of confidence interval for means at 95% lies between 1.3727 and 1.9878. The state university has sample size of 266, mean of 2.3083, standard deviation of 4.25717, standard error of mean of 0.26102, the confidence intervals lie between 1.7943 and 2.8222. For Private University, the sample size is 94, mean value of 1.7766, standard deviation and error of mean stands at 2.77529 and 0.28625 respectively with the confidence intervals ranging from 1.2082 to 2.3450. The minimum i10-index for the institutions is 0.00. While the maximum is 40.00, 26.00 and 12.00 for federal, state and private universities respectively. The total sample size is 1073, mean of 1.8444, standard deviation of 4.10394, mean standard error of 0.12529, lower and upper boundaries of 1.5985 and 2.0902 respectively, minimum i10-index is 0.00, and the maximum is 40.00.

The means plots obtained from the results of analysis vividly highlight differences in the means of the various categories of institutions as can be seen in Fig 5.

Figure 5: Means Plots

Null Hypothesis Two

There is no significant difference in the i10-index of academic staff of Federal, State and Privately owned universities in Nigeria.

Table 10: One-way ANOVA on i10-index of institutions.

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups Within Groups Total	76.887 17978.12118 055.008	2 1070 1072	38.443 16.802	2.288	.102

Sum of squares between federal, state and private universities is 76.887 with 2 degrees of freedom (df) and mean square of 38.443. Sum of squares within federal, state and private universities is 17978.121, 1070 degrees of freedom with 16.802 mean square value. The total sum of squares of 18055.008 has 1072 degrees of freedom. The Table 10 reveals F-ratio of 2.288 and p-value (sig) of 0.102. The p-value of 0.102 is greater than the chosen alpha (α) of 0.05, indicating an absence statistically significant difference (i.e., $F(2, 1070) = 2.288$, $p > 0.05$ in the i10-index of federal, state and private universities in Nigeria. As a result, the null hypothesis is sustained.
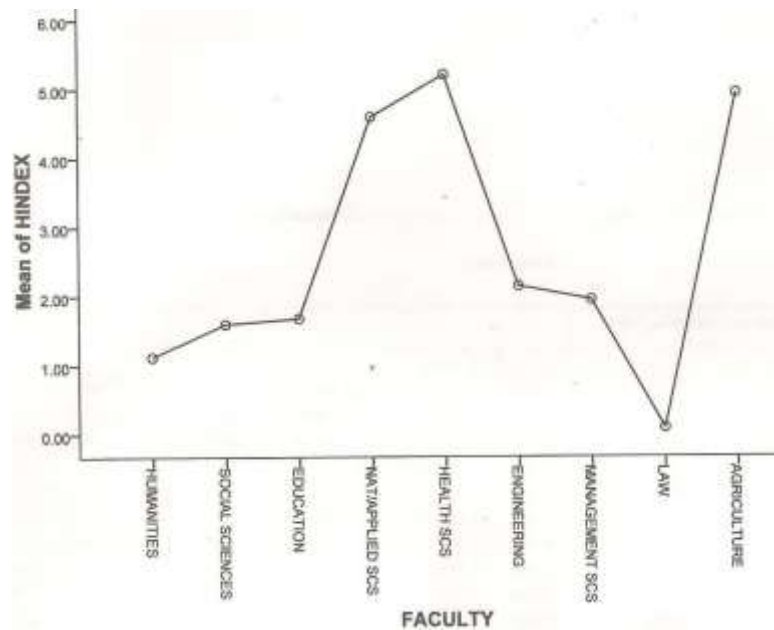
Research Question Three

What is the h-index of academic staff in the various Faculties in Nigerian universities?

Table 11: **Descriptive statistics of h-index Faculties in Nigerian universities.**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
HUMANITIES	174	1.1207	1.71101	.12971	.8647	1.3767	.00	10.00
SOCIAL SCIENCES	127	1.5984	1.97709	.17544	1.2512	1.9456	.00	12.00
EDUCATION	163	1.6748	2.26319	.17727	1.3248	2.0249	.00	18.00
NAT/APPLIED SCS	268	4.5933	3.85149	.23527	4.1301	5.0565	.00	23.00
HEALTH SCS	89	5.2022	4.22164	.44749	4.3129	6.0915	.00	17.00
ENGINEERING	92	2.1413	2.22168	.23163	1.6812	2.6014	.00	10.00
MANAGE-MENT SCS	106	1.9434	2.21609	.21525	1.5166	2.3702	.00	14.00
LAW	12	.0833	.28868	.08333	-.1001	.2667	.00	1.00
AGRICULTURE	42	4.9286	2.91667	.45005	4.0197	5.8375	.00	13.00
Total	1073	2.7735	3.25014	.09922	2.5788	2.9682	.00	23.00

The Table 11 Total displays the sample size of 1073, mean h-index of 2.7735, standard deviation and error of mean of 3.25014 and 0.09922, the lower and upper boundaries at 95% confidence level spread from 2.5788 to 2.9682, with minimum and maximum values of 0.00 and 23.00 respectively. Of these, Humanities sample size is 174, mean is 1.1207, standard deviation and standard error of 1.71101 and 0.12971, 95% confidence levels of 0.8647 and 1.3767. Social Sciences has 127 sample size, mean of 1.5984, standard deviation of 1.97709, standard error of 0.17544, lower boundary of 1.2512, and upper boundary of 1.9456. Education sample size is 163 with 1.6748 mean, standard deviation and error of 2.26319 and 0.17727, lower and upper boundaries of 1.3248 and 2.0249, respectively. Natural and Applied Sciences has 268 subjects, 4.5933, 3.85149, 0.23527, 4.1301 and 5.0565 mean, standard deviation, standard error, lower and upper 95% confidence intervals for mean respectively. Faculty of Health Sciences has 89, 5.2022, 4.22164, 0.44749, 4.3129, 6.0915 sample size, mean, standard deviation, standard error, lower and upper boundaries correspondingly. Engineering has a sample size of 92 mean of 2.1413, standard deviation of 2.22168, with 0.23163 standard error and bounded by 1.6812 and 2.6014 confidences intervals at 95% certainty. In like manner, 106, 1.9434, 2.21609, 0.21525, 1.5166 and 2.3702 are the figures of sample size, mean, standard deviation, standard error, lower and upper boundaries respectively for Management Sciences. Law Faculty sample size is 12, mean of 0.0833, standard deviation of 0.28868, standard error of 0.08333, lower boundary of -0.1001 and upper boundary of 0.2667. Agriculture, on the other hand, has 42 sample size, 4.9286 mean, 2.91667 standard deviation, 0.45005 standard error, 4.0197 lower boundary and 5.8375 upper boundaries. All the Faculties studied have 0.00 as their minimum h-index. The maximum h-index for Humanities, Social Sciences, Natural/Applied Sciences, Health Sciences, Engineering, Management Sciences, Law, Agriculture and Total is 10.00, 12.00, 18.00, 23.00, 17.00, 10.00, 14.00, 1.00, 13.00 and 23.00 respectively.

Means plot of h-index across Faculties is displayed in Figure 6.

Figure 6: Means Plots

The means plots conspicuously show that Law has the lowest h-index while Health Sciences has the highest h-index.

Null Hypothesis Three

There is no significant difference between the h-index of the academic staff of the various faculties in Nigerian universities.

Table 12 exhibits the results of the one-way ANOVA performed on the data to test the null hypothesis formulated for the research endeavor.

Table 12: **One-way ANOVA on h-index of academic staff in various Faculties.**

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	2651.663	8	331.458		
Within Groups	8672.305	1064	8.151	40.666	.000
Total	11323.968	1072			

Between Faculties (groups) sum of squares is 2651.663, 8 degrees of freedom and 331.458 mean square. Sum of squares within Faculties is 8672.305, degrees of freedom 1064 and mean square of 8.151. Total sum of squares of the Faculties is 11323.968 and 1072 degrees of freedom. The F-ratio is 40.666 with significance (sig) or p-value of 0.001. The probability level or sig of 0.001 is less than the chosen α of 0.05. This confirms the existence of a statistically significant difference between the h-index of the academic staff in the various Faculties of Universities in Nigeria (i.e., $F(2, 1064) = 40.666$, $P < 0.05$. Hence the null hypothesis of "no significant difference between the h-index of the academic staff of the various faculties in

Nigerian universities" is discarded. To ascertain the Faculties that significantly fifer, Post Hock Multiple comparisons was done, using Sheffe as shown in Table 13.

Table 13: **Multiple comparisons of academic staff's h-index across Faculties.**

H-INDEX SHEFFE (I) FACULTY (J) FACULTY	Mean Difference (I – J)	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
HUMANITIES SOCIAL SCIENCES EDUCATION NAT/APPLIED SCS HEALTH SCS ENGINEERING MANAGEMENT SCS LAW AGRICULTURE	-.47774 -.55416 -3.47259* -4.08156* -1.02061 -.82271 1.03736 -3.80788*	.33320 .31120 .27795 .37205 .36802 .35176 .85209 .49082	.979 .923 .000 .000 .465 .706 .993 .000	-1.7928 -1.7824 -4.5696 -5.5500 -2.4731 -2.2110 -2.3256 -5.7450	.8373 .6741 -2.3756 -2.6132 .4319 .5656 4.4003 -1.8707
SOCIAL SCIENCES HUMANITIES EDUCATION NAT/APPLIED SCS HEALTH SCS ENGINEERING MANAGEMENT SCS LAW AGRICULTURE	.47774 -.07642 -2.99486* -3.60382* -.54288 -.34497 1.51509 -3.33015*	.33320 .33791 .30756 .39466 .39086 .37559 .86221 .50818	.979 1.000 .000 .000 .983 .999 .928 .000	-.8373 -1.4101 -4.2087 -5.1615 -2.0855 -1.8273 -1.8878 -5.3358	1.7928 1.2572 -1.7810 -2.0462 .9997 1.1374 4.9180 -1.3245
EDUCATION HUMANITIES SOCIAL SCIENCES NAT/APPLIED SCS	.55416 .07642 -2.91844* -3.52740* -.46646 -.26855 1.59151	.31120 .33791 .28358 .37628 .37229 .35623 .85395	.923 1.000 .000 .000 .991 1.000 .901	-.6741 -1.2572 -4.0376 -5.0125 -1.9358 -1.6745 -1.7788	1.7824 1.4101 -1.7992 -2.0423 1.0029 1.1374 4.9618

HEALTH SCS ENGINEERING MANAGEMENT SCS LAW AGRICULTURE	-3.25372*	.49403	.000	-5.2035	-1.3039
NAT/APPLIED SCS	3.47259*	.27795	.000	2.3756	4.5696
HUMANITIES	2.99486*	.30756	.000	1.7810	4.2087
SOCIAL SCIENCES	2.91844*	.28358	.000	1.7992	4.0376
	-.60896	.34928	.932	-1.9875	.7695
EDUCATION	2.45198*	.34497	.000	1.0905	3.8135
HEALTH	2.64989*	.32758	.000	1.3570	3.9427
SCS	4.50995*	.84240	.000	1.1852	7.8347
ENGINEERING MANAGEMENT SCS LAW AGRICULTURE	-.33529	.47379	1.000	-2.2052	1.5346
HEALTH SCS	4.08156*	.37205	.000	2.6132	5.5500
HUMANITIES	3.60382*	.39466	.000	2.0462	5.1615
SOCIAL SCIENCES	3.52740*	.37628	.000	2.0423	5.0125
	.60896	.34928	.932	-.7695	1.9875
EDUCATION	3.06094*	.42447	.000	1.3857	4.7362
	3.25885*	.41046	.000	1.6389	4.8788
NAT/APPLIED SCS	5.11891*	.87795	.000	1.6539	8.5840
ENGINEERING MANAGEMENT SCS LAW AGRICULTURE	.27368	.53446	1.000	-1.8357	2.3830
ENGINEERING	1.02061	.36802	.465	-.4319	2.4731
HUMANITIES	.54288	.39086	.983	-.9997	2.0855
SOCIAL SCIENCES	.46646	.37229	.991	-1.0029	1.9358
	-2.45198*	.34497	.000	-3.8135	-1.0905
	-3.06094*	.42447	.000	-4.7362	-1.3857
EDUCATION	.19791	.40680	1.000	-1.4076	1.8034
	2.05797	.87625	.701	-1.4004	5.5163
NAT/APPLIED SCS	-2.78727*	.53166	.001	-4.8856	-.6890

HEALTH SCS					
MANAGEMENT SCS LAW					
AGRICULTURE					
MANAGEMENT SCS	.82271	.35176	.706	-.5656	2.2110
HUMANITIES	.34497	.37559	.999	-1.1374	1.8273
SOCIAL	.26855	.35623	1.000	-1.1374	1.6745
SCIENCES	-2.64989*	.32758	.000	-3.9427	-1.3570
	-3.25885*	.41046	.000	-4.8788	-1.6389
EDUCATION	-.19791	.40680	1.000	-1.8034	1.4076
	1.86006	.86955	.801	-1.5718	5.2919
NAT/APPLIED SCS	-2.98518*	.52053	.000	-5.0396	-.9308
ENGINEERING					
ENGINEERING LAW					
AGRICULTURE					
LAW	-1.03736	.85209	.993	-4.4003	2.3256
HUMANITIES	-1.51509	.86221	.928	-4.9180	1.8878
SOCIAL	-1.59151	.85395	.901	-4.9618	1.7788
SCIENCES	-4.50995*	.84240	.000	-7.8347	-1.1852
	-5.11891*	.87795	.000	-8.5840	-1.6539
EDUCATION	-2.05797	.87625	.701	-5.5163	1.4004
	-1.86006	.86955	.801	-5.2919	1.5718
NAT/APPLIED SCS	-4.84524*	.93450	.001	-8.5335	-1.1570
HEALTH SCS					
ENGINEERING					
MANAGEMENT SCS					
AGRICULTURE					
AGRICULTURE	3.80788*	.49082	.000	1.8707	5.7450
HUMANITIES	3.33015*	.50818	.000	1.3245	5.3358
SOCIAL	3.25372*	.49403	.000	1.3039	5.2035
SCIENCES	.33529	.47379	1.000	-1.5346	2.2052
	-.27368	.53446	1.000	-2.3830	1.8357
EDUCATION	2.78727*	.53166	.001	.6890	4.8856
	2.98518*	.52053	.000	.9308	5.0396
NAT/APPLIED SCS	4.84524*	.93450	.001	1.1570	8.5335
HEALTH SCS					

ENGINEERING					
MANAGEMENT SCS					
LAW					

*The mean difference is significant at the 0.05 level.

It can be discerned from the multiple comparisons in Table 13 that of the nine Faculties investigated, the academic staff in six Faculties (Humanities, Education, Social Sciences, Management Sciences, Law, and Engineering) have h-indexes that are significantly lower than the h-indexes of their counterpart academic staff in the other three Faculties (Health Science, Natural/Applied Sciences, and Agriculture). The former six Faculties do not differ from one another in their h-indexes; the latter three Faculties too do not significantly vary from one another in their h-indexes. That is, the h-indexes of academic staff in Faculties of Health Science, Natural/Applied Sciences, and Agriculture do not significantly differ from one another; but each of them has h-index that is overwhelmingly greater significantly than the h-indexes of academic staff in Law, Humanities, Education, Social Sciences, Management Sciences, and Engineering in Nigeria.

Research Question Four

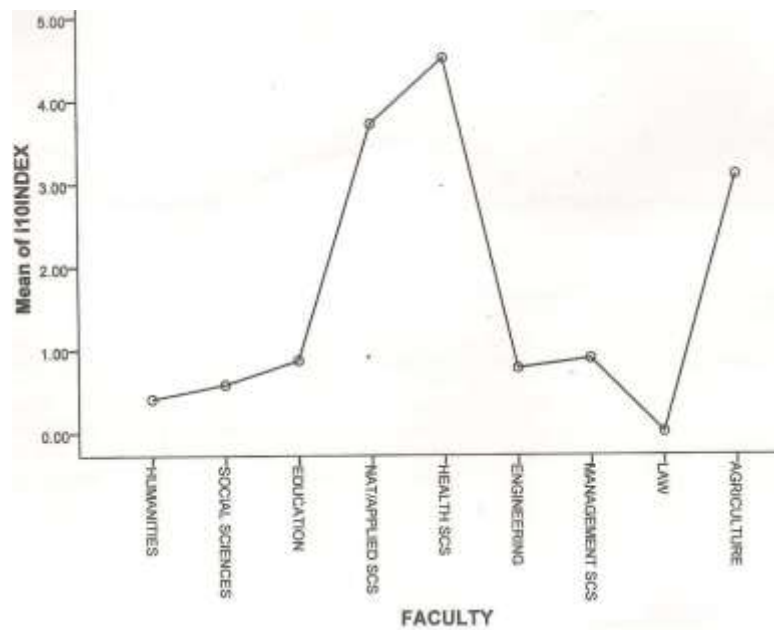What is the i10-index of the academic staff of various Faculties in Nigerian Universities?

Table 14: **Descriptive statistics of i10-index of Faculties in Nigerian universities.**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
HUMANITIES	174	.40800	1.51300	.11470	.1817	.6344	.00	12.00
SOCIAL SCIENCES	127	.5827	1.52462	.13529	.3149	.8504	.00	12.00
EDUCATION	163	.8712			.3599	1.3825	.00	36.00
NAT/APPLIED SCS	268	3.7164	3.30571	.25892	3.0361	4.3968	.00	40.00
HEALTH SCS	89				3.2610	5.7503	.00	26.00
ENGINEERING	92	4.5056	5.65700	.34556	.3473	1.1962	.00	11.00
MANAGE-MENT SCS	106	.7717			.4756	1.2980	.00	14.00
LAW	12	.8868	5.90863	.62631	.0000	.0000	.00	.00
AGRIC.	42				1.9816	4.2089	.00	15.00
Total	1073	.0000 3.0952 1.8444	2.04941 2.13506	.21367 .20738	1.5985	2.0902	.00	40.00

			3.57368	.00000				
			4.10394	.55143				
				.12529				

The Table 14 Total displays the sample size of 1073, i10-index mean of 1.8444, standard deviation and standard error of mean of 4.10394 and 0.12529 respectively, the lower and upper boundaries at 95% confidence level spread from 1.5985 to 2.0902, with minimum and maximum values of 0.00 and 40.00 respectively. Of these, Humanities sample size is 174, mean is 0.4080, standard deviation and standard error are 1.5300 and 0.11470, with 95% confidence levels of 0.1817 to 0.6344. Social Sciences has127 sample size, mean of 0.5827, standard deviation of 1.52462, standard error of 0.13529, lower boundary of 0.3149, and upper boundary of 0.8504. Education sample size is 163, mean is 0.8712, standard deviation and standard error of 3.30571 and 0.25892, with lower and upper boundaries of 0.3599 and 1.3825 respectively. Natural/Applied Sciences has 268 subjects, 3.7164, 5.65700, 0.34556, and 3.0361 and 4.3968 mean, standard deviation, standard error, and lower and upper 95% confidence interval for mean respectively. Health Science has 89, 4.5056, 5.90863, 0.62631, 3.2610, 5.7503 sample size, mean, standard deviation, standard error, lower and upper boundaries correspondingly. Engineering has a sample size of 92, mean of 0.7717, standard deviation of 2.04941, 0.21367 standard error and bounded by 0.3473 and 1.1962 confidence intervals at 95%. In like manner, 106, 0.8868, 2.13506, 0.20738, 0.4756 and 1.2980 are the figures of sample size, mean, standard deviation, standard error, lower and upper boundaries respectively for Management Sciences. Law Faculty sample size is 12, mean of 0.0000, standard deviation of 0.00000, standard error of 0.00000, lower boundary of 0.0000 and upper boundary of 0.0000. Agriculture, on the other hand, has 42 sample size, 3.0952 mean, 3.57368 standard deviation, 0.55143 standard error, 1.9816 lower boundary and 4.2089 upper boundary. All the Faculties studied have 0.00 as their minimum i10-index. The maximum i10-index for Humanities, Social Sciences, Natural/Applied Sciences, Health Sciences, Engineering, Management Sciences, Law, Agriculture and Total are 12.00, 12.00, 36.00, 40.00, 26.00, 11.00, 14.00, 0.00, 15.00 and 40.00, respectively.

Means plots of i10-index versus Faculty is displayed in Figure 7.

Figure 7: Means Plots

The means plots conspicuously show that Law has the least i10-index while Health Sciences has the most.

Null Hypothesis Four

There is no significant difference in the i10-index of the academic staff of the various Faculties in Nigerian universities.

Table 15 exhibits the results of the one-way ANOVA performed on the data to test the null hypothesis formulated for the research endeavour.

Table 15: **One-way ANOVA for i10-index of Faculties.**

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	2594.641	8	324.330		
Within Groups	15460.367	1064	14.530	22.321	.000
Total	18055.008	1072			

Between Faculties' (groups) sum of squares is 2594.641, 8 degrees of freedom and 324.330 mean square. Sum of squares within Faculties is 15460.367, degrees of freedom is 1064 and mean square is 14.530. The total sum of squares of the Faculties is 18055.008 and 1072 degrees of freedom. The F-ratio on the table is 22.321 with significance (sig) or p-value of 0.001. The sig 0.001 is less than the chosen α of 0.05, meaning that there is indeed a statistically significant difference between the i10-index of the academic staff in the various Faculties of Universities in Nigeria (i.e., $F(8, 1064) = 22.321$, $P < 0.05$). While the postulated null hypothesis is rejected, the corresponding alternate or research hypothesis is sustained. With the rejection of the null hypothesis of no significant difference in the i10-index of academic staff in the various Faculties; Post Hock Multiple Comparisons were executed using Sheffe as shown in Table 16.

Table 16: **Multiple Comparisons of academic staff's i10-index across Faculties.**

I10-INDEX SHEFFE (I) FACULTY (J) FACULTY	Mean Difference (I – J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
HUMANITIES SOCIAL SCIENCES	-.17463	.44488	1.000	-1.9305	1.5812
EDUCATION	-.46312	.41551	.996	-2.1030	1.1768
NAT/APPLIED SCS	-3.30837*	.37111	.000	-4.7731	-1.8437
HEALTH SCS	-4.09757*	.49676	.000	-6.0582	-2.1370
ENGINEERING	-.36369	.49137	1.000	-2.3030	1.5756
MANAGEMENT SCS	-.47875	.46967	.998	-2.3324	1.3749
LAW	.40805	1.13771	1.000	-4.0822	4.8983
AGRIULTURE	-2.68719*	.65534	.033	-5.2736	-.1007
SOCIAL SCIENCES HUMANITIES	.17463	.44488	1.000	-1.5812	1.9305
EDUCATION	-.28849	.45117	1.000	-2.0691	1.4922
NAT/APPLIED SCS	-3.13374*	.41065	.000	-4.7545	-1.5130
HEALTH SCS	-3.92294*	.52695	.000	-6.0027	-1.8432
ENGINEERING	-.18906	.52187	1.000	-2.2488	1.8706
MANAGEMENT SCS	-.30412	.50149	1.000	-2.2834	1.6751
LAW	.58268	1.15121	1.000	-3.9608	5.1262
AGRICULTURE	-2.51256	.67851	.091	-5.1905	.1653
EDUCATION HUMANITIES	.46312	.41551	.996	-1.1768	2.1030
SOCIAL SCIENCES	.28849	.45117	1.000	-1.4922	2.0691
NAT/APPLIED SCS	-2.84525*	.37863	.000	-4.3396	-1.3509
HEALTH SCS	-3.63445*	.50240	.000	-5.6173	-1.6516
ENGINEERING	.09943	.49707	1.000	-1.8624	2.0612
MANAGEMENT SCS	-.01563	.47563	1.000	-1.8928	1.8616
LAW	.87117	1.14018	1.000	-3.6288	5.3712
AGRICULTURE	-2.22407	.65963	.183	-4.8274	.3793

NAT/APPLIED SCS	3.30837*	.37111	.000	1.8437	4.7731
HUMANITIES	3.13374*	.41065	.000	1.5130	4.7545
	2.84525*	.37863	.000	1.3509	4.3396
SOCIAL SCIENCES	-.78920	.46635	.942	-2.6298	1.0514
	2.94468*	.46061	.000	1.1268	4.7626
EDUCATION	2.82963*	.43738	.000	1.1034	4.5558
	3.71642*	1.12476	.208	-.7227	8.1555
HEALTH SCS	.62118	.63260	.998	-1.8755	3.1179
ENGINEERING					
MANAGEMENT SCS					
LAW					
AGRICULTURE					
HEALTH SCS	4.09757*	.49676	.000	2.1370	6.0582
HUMANITIES	3.92294*	.52695	.000	1.8432	6.0027
	3.63445*	.50240	.000	1.6516	5.6173
SOCIAL SCIENCES	.78920	.46635	.942	-1.0514	2.6298
	3.73388*	.56675	.000	1.4971	5.9707
EDUCATION	3.61883*	.54804	.000	1.4559	5.7818
	4.50562*	1.17223	.065	-.1209	9.1321
NAT/APPLIED	1.41038	.71360	.865	-1.4060	4.2268
ENGINEERING					
MANAGEMENT SCS					
LAW					
AGRICULTURE					
ENGINEERING	.36369	.49137	1.000	-1.5756	2.3030
HUMANITIES	.18906	.52187	1.000	-1.8706	2.2488
	-.09943	.49707	1.000	-2.0612	1.8624
SOCIAL SCIENCES	-2.94468*	.46061	.000	-4.7626	-1.1268
	-3.73388*	.56675	.000	-5.9707	-1.4971
EDUCATION	-.11505	.54316	1.000	-2.2587	2.0286
	.77174	1.16996	1.000	-3.8458	5.3893
NAT/APPLIED SCS	-2.32350	.70986	.220	-5.1251	.4781
HEALTH SCS					
MANAGEMENT SCS					
LAW					
AGRICULTURE					
MANAGEMENT SCS	.47875	.46967	.998	-1.3749	2.3324
HUMANITIES	.30412	.50149	1.000	-1.6751	2.2834
	.01563	.47563	1.000	-1.8616	1.8928

SOCIAL SCIENCES	-2.82963*	.43738	.000	-4.5558	-1.1034
EDUCATION	-3.61883*	.54804	.000	-5.7818	-1.4559
	.11505	.54316	1.000	-2.0286	2.2587
NAT/APPLIED	.88679	1.16101	1.000	-3.6954	5.4690
	-2.20845	.69501	.260	-4.9515	.5346
HEALTH SCS					
ENGINEERING					
LAW					
AGRICULTURE					
LAW	-.40805	1.13771	1.000	-4.8983	4.0822
HUMANITIES	-.58268	1.15121	1.000	-5.1262	3.9608
SOCIAL SCIENCES	-.87117	1.14018	1.000	-5.3712	3.6288
EDUCATION	-3.71642*	1.12476	.208	-8.1555	.7227
NAT/APPLIED SCS	-4.50562*	1.17223	.065	-9.1321	.1209
HEALTH SCS	-.77174	1.16996	1.000	-5.3893	3.8458
ENGINEERING	-.88679	1.16101	1.000	-5.4690	3.6954
MANAGEMENT SCS	-3.09524*	1.24773	.630	-8.0197	1.8292
AGRICULTURE					
AGRICULTURE	2.68719*	.65534	.033	.1007	5.2736
HUMANITIES	2.51256	.67851	.091	-.1653	5.1905
SOCIAL SCIENCES	2.22407	.65963	.183	-.3793	4.8274
EDUCATION	-.62118	.63260	.998	-3.1179	1.8755
NAT/APPLIED	-1.41038	.71360	.865	-4.2268	1.4060
HEALTH SCS	2.32350	.70986	.220	-.4781	5.1251
ENGINEERING	2.20845	.69501	.260	-.5346	4.9515
MANAGEMENT SCS	3.09524*	1.24773	.630	-1.8292	8.0197
LAW					

*The mean difference is significant at the 0.05 level.

It can be discerned from the multiple comparisons in Table 16 that of the nine Faculties investigated, the academic staff in the Faculties of Health Sciences and Natural/Applied Science and Agriculture have i10-indexes that are significantly higher than the i10-indexes of academic staff in Humanities, Education, Social Sciences, Management Sciences, Engineering, and Law. Furthermore, the i10-indexses of staff in Agriculture are significantly higher than those of staff in the Faculties of Humanities and Law. The i10-indexes of staff in Health Sciences do not statistically differ significantly from those in the Faculties of Natural/Applied Sciences, and Agriculture. The i10-indexes of academic staff in the Faculties of Humanities, Education, Social Sciences, Management Sciences, Engineering, and Law do not significantly vary from one another in Nigeria.

Research Question Five

What is the h-index of female and male academic staff in Nigerian universities?

Table 17 below shows the group statistics of the h-index of the academic staff of Nigerian universities gender wise. Female sample size of 158, mean h-index of 2.2405 having a standard deviation of 2.87628 and 0.22882 standard error. The corresponding values for male are 915, 2.9158, 3.66582 and 0.12119.

Table 17: **Group Statistics for female and male academic staff of Nigerian universities.**

GENDER		N	Mean	Std. Deviation	Std. Error Mean
HINDEX	FEMALE	158	2.2405	2.87628	.22882
	MALE	915	2.9158	3.66582	.12119

Null Hypothesis Five

There is no significant difference in the h-index of female and male academic staff in Nigerian universities?

Table 18: **Independent sample test for h-index of female and male academic staff.**

	Levene's Test for Equality of Variances		t-test for Equality of Means							
									95% Confidence Interval of the Difference	
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
INDEX Equal variances assumed	5.623	.018	-2.201	1071	.028	-.67534	.30679	-1.27731	-.07337
Equal variances not assumed			-2.608	253.993	.010	-.67534	.25893	-1.18527	-.16541

Table 18 indicates Levene's test for equality of variances with F ratio of 5.623 and sig 0.018. Since P (0.018) is less than the chosen α (0.05), there is no equality of variance in the data

analysed. That is "equal variances not assumed." Hence the values of equal variances not assumed are used in testing the postulated null hypothesis. Table 18 reveals calculated t of -2.608, 253.993 degrees of freedom, sig (2-tailed) of 0.010, mean difference of 0.67534 with a standard error of the difference of 0.25893, the 95% confidence interval of the difference lie between -1.18527 and -0.16541. The sig of 0.010 2-tailed is lower than the chosen α of 0.05. Therefore t(253.993) = 2.608, P < 0.05 which is statistically significant 2-tailed. The null hypothesis which says there is no significant difference between the h-index of female and male academics in Nigerian universities is rejected in favour of male academic staff. That is, male academic staff have significantly higher h-index than their counterpart female academic staff in Nigerian universities.

Research Question Six

What is the i10-index of female and male academic staff of Nigerian universities?

Table 19 below shows the group statistics of the i10-index of the academic staff of Nigerian universities gender-wise. Female sample size of 158, mean i10-index of 1.4367 having a standard deviation of 3.96069 and 0.31510 standard error. The corresponding values for male are 915, 1.9148, 4.12620 and 0.13641.

Table 19: **Group statistic for female and male academic staff's i10-index in Nigerian universities.**

GENDER		N	Mean	Std. Deviation	Std. Error Mean
HINDEX	FEMALE	158	1.4367	3.96069	.31510
	MALE	915	1.9148	4.12620	.13641

Null Hypothesis Six

There is no significant difference in the i10-index of female and male academic staff of Nigerian universities.

Table 20: **Independent sample test for i10-index of female and male academic staff.**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
INDEX Equal variances assumed	2.924	.088	-1.353	1071	.176	-.47805	.35342	-1.17152	.21543
Equal variances not assumed			-1.392	220.034	.165	-.47805	.34335	-1.15473	.19864

The Table 20 indicates Levene's test for equality of variances with F ratio of 2.924 and sig 0.088. Since P (0.088) is greater than the chosen α (0.05) there is equality of variances in the data analysed. Hence the values of equal variances assumed are used in testing the null hypothesis postulated. Table 20 reveals calculated t of 1.353, 1071 degrees of freedom, sig (2-tailed) of 0.176, mean difference of 0.47805 with a standard error of the difference of 0.35342, and the 95% confidence interval of the difference lie between -1.17152 and 0.21543. The sig of 0.176 2-tailed is more than the chosen α. $t(1071) = 1.353$, $P > 0.05$ which is not statistically significant 2-tailed. The null hypothesis of no significant difference between the i10-index of female and male academics in Nigerian universities is retained.

DISCUSSION OF FINDINGS

The results of data collected and analysed have been laid bare. Research productivity in this study is a composite of h-index and i10-index of the academic staff as measured with the enormous database of Google Scholar. Therefore, the results from the two citation indexes analysed constitute the basis of discussion of the research productivity of the academic staff of Nigerian universities in line with the objectives of this study.

The results showed that the research productivity of the academic staff of Nigerian universities regarding h-index and i10-index are respectively 2.77 and 1.84 on the average. These figures are very small compared to even the maximum values of 23 and 40 obtained from data collected for h-index and i10-index respectively. The findings indicate a very low level of research productivity. This is a true reflection of the low ranking reported by Ogbogu (2013) and Kpolovie (2013) in his study of quality assurance and quality control in the Nigerian educational system – matters arising. It is little wonder that Kpolovie and Obilor (2013b; 2013a) in their investigations concluded that Nigerian universities bag ludicrous ranks in world rankings of universities; and that even the national education policy of "higher education for all in need through the National Open University of Nigeria is a mere paradox in policy practice." The very low academic productivity of university academics in Nigeria confirms the findings of Okiki (2013) who reported that the productivity of teaching faculty members in Nigerian federal universities was least in the South-South geo-political zone.

The average h-index of 2.77 and very highest h-index of 23 for researchers or scientists in universities in Nigeria is damn too infinitesimal to be compared with world standards (Hirsch, 2005; Becker Guides, 2016; Thomson Reuters, 2010; Meho, 2007; Webometrics, 2017) that:

1. To become a member or an associate member of the National Academy of Sciences, one must have h-index that is 45 and above.

2. To be a truly unique individual, one must have h-index of 60 after 20 years, or h-index of 90 after 30 years of research.

3. To be characterised as an outstanding scientist, one must have h-index of at least 40 after 20 years of scientific activity.

4. To be characterised as a successful scientist, one must have at least 20 h-index after 20 years of scientific activity.

With the infinitesimally small h-index of 2.77 revealed by this study, the day that lecturers in Nigerian universities will have h-indexes as high as those of Sigmund Freud, Graham Colditz, Eugene Braunwald and others as at January 2017, tabulated herein (Webometrics, 2017) can never even be imagined.

Table 21: **Example of h-index that lecturers in other universities in the world have.**

RANK	NAME	ORGANIZATION	H-INDEX	CITATIONS
1	Sigmund Freud	University of Vienna	269	488396
2	Graham Colditz	Washington University in St Louis	264	256415
3	Eugene Braunwald	Brigham and Women's Hospital; Harvard Medical School	246	290831
4	Ronald C Kessler	Harvard University	245	263006
5	Pierre Bourdieu	Centre de Sociologie Européenne; Collège de France	242	528228
7	Solomon H Snyder	Johns Hopkins University	240	216313
6	Michel Foucault	Collège de France	237	690001
8	Robert Langer	Massachusetts Institute of Technology MIT	232	216122
9	Bert Vogelstein	Johns Hopkins University	230	315600
10	Eric Lander	Broad Institute Harvard-MIT	225	294683
11	Michael Karin	University of California San Diego	223	210430
12	Gordon Guyatt	McMaster University	217	187432
13	Michael Graetzel	Ecole Polytechnique Fédérale de Lausanne	216	235390
14	Salim Yusuf	McMaster University	214	248236
15	Richard A Flavell	Yale University; HHMI	214	171241
16	Frank B Hu	Harvard University	206	158298
17	T W Robbins	University of Cambridge	206	130965
18	Carlo Croce	Ohio State University	203	181398
19	Peter Barnes	Imperial College London	202	178101

20	Eric Topol	Scripps Research Institute	200	178348
21	A S Fauci	National Institutes of Health NIH	200	168338
22	Chris Frith	University College London	200	152183

Measuring research productivity with h-index and placing the productivity of researchers in different faculties (areas of specialisation) in descending order in this study has Health Sciences, Agriculture, Natural/Applied Sciences, Engineering, Management Sciences, Education, Social Sciences, Humanities and Law. Only three Faculties could be said to be highly productive in the Nigerian scenario since their h-index is above the average figure of 2.77, and they are also found to be having h-indexes that are significantly higher than those of the other faculties. The null hypotheses of no significant difference in research productivity of academic staff in the various Faculties was rejected in favour of the three faculties (Health Sciences, Agriculture, Natural/Applied Sciences) as they have significantly higher h-index than the other six faculties. The findings further showed that there is no significant difference between the research productivities of the homogenous subsets of highly productive faculties (Health Science, Agriculture, and Natural/Applied Sciences). Similarly, the faculties that are low in productivity (Engineering, Management Sciences, Education, Social Sciences, Humanities and Law) do not differ statistically from one another. This was confirmed with the Sheffe's Post Hock Multiple Comparisons that were executed.

The finding that researchers in different areas of specialization (faculties) differ significantly in their h-index; with those in health science, agriculture, and natural/applied sciences having the highest positions is very much in concordance with the findings of Hirsch (2005), Peterson (2005), Meho and Yang (2007), Becker Guides (2016), Lariviere and Coster (2016), Google Scholar (2017), Spicer (2015), and Meho (2007). This certainly implies that in taking of data-based decisions about an individual with regards to h-index, comparison of his/her h-index should only be made to the h-indexes of other researchers in his/her field or broad area of specialisation. The h-index of an academic in natural/applied sciences faculty can best be compared with those of other academics in the faculty of natural/applied sciences. A researcher in health science or agriculture should as a scientific rule-of-thumb be compared with other scientists in health science or agriculture, respectively. Similarly, the h-index of a researcher in Education, Management Sciences, Engineering, Social Sciences, and Humanities can and should best be compared with the h-indexes of other scientists who are respectively in faculties of Education, Management Sciences, Engineering, Social Sciences, and Humanities. The findings and implications of h-index as explained herein are equally true with i10-index (Google Scholar, 2017).

Female academics have a mean h-index of 2.24 while males have 2.92 h-index. The analysis revealed a statistical significant difference in the research productivity of female and male academic staff which led to the rejection of the null hypothesis posed in the study with regards to gender difference in h-index. This result confirmed the information in the works of Lertputtarak (2008) and Gonzalez-Brambila and Veloso (2007) in favour of male researchers. But the situation changed with i10-index which did not show any significant gender difference. The results of this investigation on i10-index revealed insignificant means (1.4367 and 1.9148) difference for female and male academic staff, respectively. This implies that female and male academic staff in Nigerian universities do not differ in their research productivity in terms of number of individual published works that have each been cited by others up to 10 times. Jung

(2012) had also debunked the assertion of male academics being more productive than female academics on the basis of mere citation counts.

An academic staff whose full names and initials with surname were correctly spelt in the Google Scholar search engine, but no publication at all was found, denotes that the person has no published research work that is internationally accessible on the Internet from Google Scholar database. Such academic simply had 0 h-index and 0 i10-index. In addition to this category, there were some academic staff in Nigeria who had published works that were seen in Google Scholar search engine, but none of the publications has been cited. Such persons also got 0 h-index and 0 i10-index. This accounts for why the descriptive statistics showed 0 as the minimum h-index and i10-index at each stage of the data analysis. There were yet some academics who had published works that some have been cited, but none of the works has been cited up to 10 times. A researcher in this category also got 0 i10-index. An academic staff having 0 h-index and i10-index may not necessarily mean that the person has not executed and published any research work at all. The person might have most probably published his/her works in local journals only, journals that are invisible internationally or are not on the Internet (Nafukho & Irby, 2015; Selwyn, 2011; OECD, 2016a).

Works published locally do not get disseminated to the audience and therefore cannot be replicated for authenticity or cited by other scientists (Ololube, Umunadi & Kpolovie, 2014). Technically and scientifically, a research work that is only published locally in this "Revolutionary Information Age" (Kpolovie & Lale, 2017) is not a research and is not a published work as the complete scientific knowledge gathering cycle or steps demands wide dissemination or communication of the findings (Ololube, Ajayi, Kpolovie & Usoro, 2012; Ololube, Emejuru, Kpolovie, Amaele & Uzorka, 2012). Communication of research results at this Revolutionary Information Age demands having the work published in a peer-reviewed medium that guarantees automatic international accessibility. In fact, the need for publication of research works in internationally available journals cannot be overemphasised (OECD, 2016b; 2014). A bad research work that is published internationally is better than a good research work that is published locally. Local publication of research work in the Knowledge Age is equivalent to zero publication. Universities in Nigeria should stop forcing people to publish their research works locally as a necessary condition for promotion. Local publication kills the scientific spirit that makes a university universal in knowledge discovery, dissemination, service delivery, and in the internationalisation of its graduates (Kpolovie & Lale, 2017).

Two theories which the researchers considered relevant in improving research productivity and based the work on are Drucker's Knowledge-Worker Productivity (1999) and Gilkey's General Theory of Productivity (2008). Drucker's six factors (tasks definition, autonomy, innovativeness, constant learning and teaching, quantity and quality, and asset) which affect knowledge-worker productivity are apt at addressing the roles and responsibilities of the major key players in the chain of research productivity. The Gilkey's theory that is focused on the individual academic staff was reflected in the findings. The theory emphasises the need to increase productivity enablers – creative energy, focus, motivation, aptitude and ideal time on the one hand; and minimise the detractors – difficulty of task and distractions. Individual researchers could improve their academic productivity by substantially increasing their research works and publishing them in internationally available journals of high repute. These the researcher can do by maximising his enablers and minimising his distractors. There is need for harmonisation of the four dimensions of innate abilities, experience, availability of

resources and responsive leadership (Ololube & Kpolovie, 2012). The researchers strongly advocate that the Federal Government of Nigeria through different relevant agencies should critically examine these models and work out a possible implementation in the Nigerian context. This could give credence to the potential of the two theories to enhance the productivity of academic staff of Nigerian universities.

The general low research productivity of teaching staff of universities in Nigeria revealed in this study could not have impacted positively on the ranking of Nigerian universities among the global community of universities. When researchers in Nigeria get spurred by the findings of this study and do take every necessary step to improve their academic productivity steadily, Nigerian universities may likely experience marked improvement in world rankings.

This study stands out to portray the true position of research productivity of academics in Nigerian universities. The information on which the findings of the present study are hinged are authentic world acclaimed sources, Google Scholar citation databases, h-index and i10-index, in particular. This study will help to popularise the great need for adoption of h-index and i10-index as measures of research productivity in Nigeria as against the erstwhile commonly used self-reporting instrument (questionnaire), and citations count for investigations of scholarly productivity in Nigeria.

Some academic staff (mostly senior lecturers and above) investigated who have low or even 0 h- and i10-index may be having their publications in local and internationally invisible journals. Such publications are in some non-visible media and therefore cannot count to positively affect research productivity in this present era of ICT and the Internet. Such works should be upgraded and republished in or migrated to online journals with high visibility. This process may also translate such academics from digital non-natives to digital natives by immigration. Such digital immigration (Ololube, Kpolovie, Amaele, Amanchukwu & Briggs, 2013) can boost the research productivity of academics in Nigeria and probably uplift the ranking of Nigerian universities not only in Africa but globally.

Of greatest importance, is the indispensable need for researchers to widely review literature online and correctly cite them to increase the probability of citing some related works done by Nigerians that have been published in journals that are readily available on the World Wide Web. The greater the number of citations made of works that are available on the Internet, the greater the probability of citing some that were done by researchers in Nigeria. When more of such works are cited, the h-index and i10-index of researchers in Nigerian universities will likely improve.

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