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Measurements and Determinants of Productivity in Nigeria: A Historical Perspective

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Abstract: Scholars observes a sharp decline in the research productivity of academics in terms of the number of articles published in Nigeria from 1980-1989 and 1990-1999 based on an analysis of 21 core Nigerian Library and Information Science (LIS) journals indexed in Social Science Citation Index database. They also observe that Nigeria has the highest proportion of rejected papers in Africa out of the papers submitted to the African Journal of Library, Archives and Information Science (AJLAIS) for publication. In an attempt to reinforce the notion of a low publication output in Africa, the UNESCO Statistical Yearbook which reports that 55 titles are being published per one million readers in the developing world as against the 487 titles per one million readers in the developed world. In the same vein, while reporting on low research output in Nigerian universities, The World Education News and Review (2006), states that Nigerian academics' research output is relatively low. The report shows that out of over 70 universities in the country as at the time of the study, only 20 were found to have performed creditably well in terms of academic research production. This view has been corroborated by Agarin and Nwagwu (2006), to the effect that in 2005, Nigeria was ranked next to the least of the countries in the world with the evidence of scientific research. The paper historically reviewed the determinants of research productivity among Nigerian researchers. It concludes based on available statistics that Nigerian scholars' position in terms of their contribution to international acceptable journals has continued to remain low. The paper urged the government of Nigeria to create the necessary institutional framework and support that will enable Nigerian academics to enhance their productivity.
Keywords: Determinants, Measurements, Nigeria, Productivity.

INTRODUCTION

An Overview of Workers Productivity

According to Zakkah [1] work by no means is simple behaviour, it is merely doing something. Work involves doing something and exchanging time, effort and skill for some form of pay. According to Ovuovie [2], work slowly widens varying degree of effort, energy, attitudes, skills, efficiency or productivity and workers satisfaction. Work is an input and is the extent to which employment develops and utilizes the highest aptitudes, talents and skills of workers. Productivity is the product of work, though not a measure of how hard we work, but how well we use our intelligence, our imaginations and our capital. The term productivity" has been defined in many ways though showing difference on terminology and opinion. According to Richardson [3], productivity is the output per man-hour; such definition implies that manpower is the single source of productivity change. Ovuvie [2] posited that productivity is the result of work usually expressed in terms of the mission of the organization. This shows that, it is simple to produce more with the same amount of efforts.

Porter posited that productivity is effective when workers comply with the following conditions [4]:

- Worker must be willing to join and stay as long as needed in the employing organization. This is the need for low labour turnover.
- Once the workers join and stay in the employment organization, they must be available when their services are needed. This is the need for time punctuality, low absenteeism and frequent mass work stoppage.
- There is the necessity for the workers who fulfill their presence at work to actually perform their specific tasks and duties at the same work place.
- Employees must co-operate with fellow workers.

Roberts sees productivity in a broader viewpoint, according to him; productivity is a matter of getting employees to work efficiently, not of making their work longer or harder [5]. Increased productivity according to him, results mostly from better planning, improved technology, greater efficiency of equipment, more inventiveness and more ingenuity. This shows that

productivity is a result from better exercise of the functions of management. According to Hackman increased productivity may also result from improving working conditions and talking boredom out of routine tasks [6]. Similarly, he argued that productivity depends upon the attitude of workers toward their works. He also opined that costs and profit are highly sensitive in productivity concept. When productivity increases, unit costs typically declines and profit increase. Conversely, when productivity deteriorates, unit costs rises and profit falls.

Nwachkwu defines productivity as the measure of how well resources are brought together in organizations and utilized for accomplishing a set of results [7]. To him, productivity is reaching the highest level of performance with the least expenditure of resources. He opined that productivity is often seen as total output over total input, the effectiveness of the use of the factors of production to produce goods or services. Thus, the productivity of an employee is seen as the relationship between unit of labour inputs and unit of outputs. Productivity, based on his opinion has three major elements such as the output, the resource committed and time. Awujo and Urieto argued that productivity is not a judgment on how hard or tedious people are working [8]. It is another name for efficiency or how well, cleverly, and innovatively organizations use each of the elements that go into creating a product or services. Productivity in this context is another means of evaluating a business system. Motarari *et al.*, sees productivity as the firms' performance in relation to its effectiveness [9]. Effectiveness is a measure of short term and long term viability of the organization. The effectiveness measured may be financial, operational and behavioral. Finance measures asses the financial performance of the organization. Organizational measure on the other asses the effectiveness of work flow and work support. Behavioral measures determine individual performance. Thus Awujo and Uriet identified factors such as adaptability, satisfaction, profitability, and resource acquisition among others. Others include absence of strain, control over environment, Efficiency and Employee reaction [8].

Technically, Productivity can be in two ways; increase in the numerator (output), or decrease in the denominator (input) [10]. A similar effect would be seen if both input and output increased, but output increased faster than the input or alternatively if the input and output decreased, but the input decreased faster. He opined that organizations have many options for use of this formula. Productivity can take the form of labour productivity, machine productivity, capital productivity, energy productivity and so on. A productivity ratio may be computed for a single operation, a department, a facility, an organization or even an entire country.

Steven asserts that productivity is an objective concept. As an objective concept, it can measure ideally against a universal standard. As such organizations can monitor productivity for strategic reasons such as corporate planning, organization improvement or comparison for competitions. It can also be used according to him, for tactical reason such project control or controlling performance of budget [11].

Productivity is also a scientific concept and can be logically defined and empirically observed. It can be measured in quantitative terms which qualify it as a variable. Therefore, it can be defined and measured in absolute forms. However, an absolute definition of productivity is not very useful according to Steven [11]. It is much more useful as a concept dealing with relative productivity or as productivity factor. He further argued that productivity is useful as relative measure of actual output of production compared to the actual input of resources measured across firms or against common entities. As output increase for level of input, or as the amount of input decreases for a constant level of output, an increase in the productivity occurs. Therefore, productivity measure describes how well the resources of an organization are being used to produce output. Productivity is often confused with efficiency. Efficiency according to Khen is generally seen as the ratio of the time needed to perform a task to some pre-determined standard time [12]. However doing unnecessary work efficiently is not exactly being productive. It would be more correct to interpret productivity as a measure of effectiveness (doing the right thing efficiently), which is outcome oriented rather than out-put oriented.

Challenges Associated With Measuring Productivity

One of major challenges of productivity has been a challenge of measurement. Productivity is difficult to measure and can only be measured indirectly, that is, by measuring other variables and then, calculating productivity from them. This difficulty in measurement stems from the fact that inputs and output are not difficult to define, but are also difficult to quantify.

Any productivity measurement system should produce some sort of overall index of productivity. A smart measurement program combines productivity measurement into an overall rating of performance. This type of system should be flexible in order to accommodate changes in goal and policies over time. It should also have ability to aggregate measurement systems off different units into a single system and be able to compare productivity across different units [13]. The ways in which inputs and outputs are measured can provide productivity measures. Disadvantages of productivity measures have been the distortion of the measure by fixed expenses and also the inability of productivity measures to consider quality changes (e.g. output per hours might increase, but it may cause the

effect rate to skyrocket). It is easier to conceive output as tangible unit such as number of items produced. But other factors such as quality should be considered. Experts such as Simbeye have cited a need for measurement program that gives an equal weight to quality as well as productivity [14]. If quality is included in the ratio, output may have to be defined as something like, the number of defects-free units of production or the number of units which meets expectation or requirement.

Stevenson opined finally, that the determination of when productivity measures are appropriate performance measure depends on two criteria [15]. The first is the independent of the transformation process from other process within the organization. Second is the correspondence between the input and output in the productivity measurement process.

Uses of Productivity Measures

Productivity is a required tool for evaluating and monitoring performance of an organization hence, when directed at specific issue of problems, productivity measures can be powerful. In essence, productivity measures are yardsticks for effective resource utilization. Managers are concerned with productivity as it relates to making improvement in their firm. Proper use of productivity measures can give the manager an indication of how to increase productivity: either increases the number of measures or decreases the denominator or both [15]. Within a time period, productivity measures can be used to compare the firm's performance against industry-wide data, compare its performance with similar firms and competitors, compare performance among different departments or compare the performance improving or decreasing over time. Productivity measures can be used to evaluate the performance of an entire industry or the productivity of a country as a whole. These are aggregate measures determined by combining productivity measures of various companies or segments of the economy.

Productivity Index

Since productivity is relative measure, for it to be meaningful or useful, it must be compared to something, for example business can compare their productivity value to that of similar firms or other departments within the same firm or against past productivity data for the same firm or departments. This allows firms to measure productivity improvement over time or measures the impact of certain decision such as the introduction of new process, equipment and worker motivation techniques. In order to have a value for comparison purpose, organizations compute their productivity index. A productivity index according to encyclopedia of business (2003, second edition) is the ratio of productivity measured in some time period, to the productivity measured in a base period. For example if the base periods productivity is calculated to be 3.0 and the following period productivity is calculated to be 4.0, the resulting productivity index will be 4:00 / 3:00 = 1.1 this would mean that the productivity of the firm have increased by 10%. However, if the following periods' productivity measurements fell to 2:00 the productivity index of 2:00/3:00 = 0.95 it will indicate that the organizations productivity has fallen to 95% of the productivity of the base period. By tracking productivity indexes overtime, managers can evaluate the success or lack thereof of projects and decisions.

How to Improve Productivity

Williams asserts that productivity improvement can be achieved in a number of ways i.e. if the level of output increases faster than the level of input, productivity will increase [16]. Conversely, according to him productivity will increase if the level of input is decreased faster than that of output. Also, an organization may realize a productivity increase from producing more outputs with the same level of input. Finally, producing more output with a reversed level of input will result in increased productivity. Any of these scenarios may be realized through improved methods, investment in machinery and technology, improved quality and an improvement in techniques and philosophies such as just-in-time, total quality management, supply chain management principles and theory of constraints. Stevenson suggested a numbers of key steps towards improving productivity, these steps include [15]:

- Develop productivity measures for all operations; measurement is the first step in managing and controlling an organization.
- Look at the system as a whole in deciding which operations are most critical; it is the over-all productivity that is important in this respect.
- Develop methods for achieving productivity improvement, such as soliciting ideas from workers (perhaps organizing teams of workers, and mangers), studying how other firms have increased productivity and examining the way work is done.
- Establish reasonable goals for improvement.
- Make it clear that management supports and encourages productivity improvement. Consider incentives as rewards for workers for their contributions.
- Measure improvements and publicize them.

Stevenson opined that management should try as much as possible, not to confuse productivity with efficiency [15]; efficiency according to him in a narrower concept that pertains to getting the most out of a given set of resources; productivity is a broader concept that pertains to use of overall resources. As, a cautionary word, he advised that organizations must be careful not to focus solely on productivity as the driver of the organizations. Organizations must consider overall competitive ability. Hence, firm success is

categorized by quality, cycle time, reasonable lead time, innovation and host of other factors directed at achieving or improving customer service and satisfaction.

Quality of Productivity Rating Among Nigerian Scholars

Research productivity in Nigerian universities cannot be studied in isolation. One of the strategies for determining research productivity is to assess the quantity of publication which researchers communicated through primary or other sources. Research productivity include research publication in professional journals and in conference proceedings, writing a book or chapter, gathering and analyzing original evidence, working with post-graduate students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing monographs, developing experimental designs, producing works of an artistic or creative nature and engaging in public debates and commentaries [17].

While reporting on research productivity in developing countries, Arunachallam [18] cited by Nwagwu [19], opines that South Africa and Nigeria are the only two African countries whose scholarly works dominate developing countries 13 per cent contributions in the 140,000 periodicals titles listed in Ulrich's Directory of Science Serials. Nwagwu adds that in Nigeria, there is no reliable local statistics about science production. On the other hand, Karani notes that in terms of quality and quantity of research output, Nigerian academics are rated the best in sub-Saharan Africa up to the late 1980s before it thereafter declined [20]. This view is further supported by Okebukola, while summarizing the factors which contributed to the decline between the late 1980s and 1996 before its subsequent collapse from 1997 till date [21]. These factors include Lack of research skills in modern methods; Lack of equipment for carrying out state-of-the art research; Overloaded teaching and administration schedules which leave little time for research; Difficulty in accessing research funds; and diminishing ability of seasoned and senior researchers to mentor junior researchers due to brain drain.

Uzun also observes a sharp decline in the research productivity of academics in terms of the number of articles published in Nigeria from 1980-1989 and 1990-1999 based on an analysis of 21 core Nigerian Library and Information Science (LIS) journals indexed in Social Science Citation Index database [22]. A similar scenario was also reported by Aina and Mabawonku when they observe that Nigeria has the highest proportion of rejected papers in Africa out of the papers submitted to the African Journal of Library, Archives and Information Science (AJLAIS) for publication [23]. In an attempt to reinforce the notion of a low publication output in Africa, Ali [24], cites the UNESCO Statistical Yearbook which reports that 55 titles are being published per one million readers in the developing world as against the 487 titles per one million readers in the developed world. In the same vein, while reporting on low research output in Nigerian universities, The World Education News and Review [25], states that Nigerian academics research output is relatively low. The report shows that out of over 70 universities in the country as at the time of the study, only 20 were found to have performed creditably well in terms of academic research production. This view has been corroborated by Agarin and Nwagwu [26], to the effect that in 2005, Nigeria was ranked next to the least of the countries in the world with the evidence of scientific research.

In addition, Aiyepeku conducts a study on bibliographic research on local scholarly works in local literature in Nigeria [27]. He carries out a bibliometric and documentation study on geographic literature by Nigerian academics, and test the validity of Brookes probability theory. According to Nwagwu, Bradford's law serves as a general guideline to information scientists in determining the number as well as distribution of core journals in any given field [19].

Literature reveals that a few studies have been conducted into the research productivity of academic staff members in Nigeria. Nwagwu carries out a bibliometric and documentation analysis of biomedical authors literature in Nigeria between 1967 and 2002, using Lotkas law [19]. Lotka predicates his analysis on the power of relation. The law is generally useful for understanding the productivity patterns of an author in a bibliography [28]. Using this method, Nwagwu [19], reports that only the co-author category differs from the inverse power of the law, while the other categories do not. In the same vein, Chiemeke, Longe, Longe and Shaib conduct an empirical appraisal research on research output from Nigerian tertiary institutions and found out that publication remains a yardstick for promotion in academia in Nigeria [29]. Braimoh, also reviews the role of African universities on national and continental developments while placing his emphasis on the significance of research and publication efforts among university lecturers as the process of improving their teaching as well as demonstrating their abilities to create and disseminate knowledge for the solution of societal problems [30].

Agboola and Oduwole [31], *investigate publication output of Nigerian academic librarians. The study seeks information on the status of the librarians, publication requirements for promotion, frequency of staff seminars, role of seminar secretaries, category of staff involved, order of presentation of papers and finally, comments on the role of staff seminars in enhancing staff publication output. They report further that staff seminars have impacted positively on the publication*

outputs of library and information science (LIS) professionals.

Determinants of Research Productivity in the University Environment

Faculty publishing productivity is often used as an index of departmental and institutional prestige and is strongly associated with an individual academic staff member's reputation, visibility and advancement in the academic reward structure, particularly at research institutions [32]. Owing from the above, the paper proceeds to examine this from different dimensions i.e. demographic, institutional support and professional variables that affects the productivity of University academic staff. These include;

Demographic Variables

Demographic variables have generally been associated with research productivity. The following variables will be discussed: age, gender and marital status. Age has been studied in numerous studies with conflicting results. Many studies about productivity have indicated that the relationship between career publication and age is not linear, although the overall rate of publication generally declines with age [33, 34]. According to Over, research productivity of academics slightly decreases with age [35]. However, when productivity was investigated in groups by birth date, younger academics produced more at an earlier career stage than older faculty members.

In addition, Bland and Berquist, observe that average productivity of academic members drops with age but many senior academic members remains active and that there is no significant evidence that age determines a drop in productivity [36]. Teodorescu investigates faculty publication across 10 countries and discovers that age significantly influences research productivity in the United States [34]. Kotrlik *et al*., [37] in a study using a random sampling of 228 colleges and universities' agricultural education academics members in the United States, finds that age does not significantly affect research productivity, while Williams, Bartlett, Kotrlik, and Higgins finds similar results within United States Academy of Human Resource Development (AHRD) faculty members [37].

Gender has been assessed in numerous studies with mixed results. Blackburn, Bieber, Lawrence, and Trautvetter state that the relationship between gender and researchers' productivity has been addressed in many studies [38]; Again, these findings are sometimes contradictory and sometimes show correlation. Many researchers insist that men have had higher levels of research productivity than women. Most results submit that female researchers are less productive than their male counterparts [37]. Smith, Anderson & Lovrich [39], further support these findings by reporting that women are lagging behind men.

On the other hand, some studies reveal that there is no difference in productivity due to gender [34, 37]. Bentley observes that women academics are placed at a particular disadvantaged position by family responsibilities especially during child-rearing years thus negatively affecting career advancement and hence, earnings of women faculty [40].

Gender difference in scientific productivity is another line of attention of researchers. Several studies have found that female scientists publish at lower rates than male scientists. Bassey *et al*., report a higher level of research productivity by male faculty members [41]. Other researchers have noted that female faculty members are lagging behind their more experienced male faculty members in research productivity [42, 43]; while Ogbogu [43] categorically states that the relationship between gender and research productivity has been addressed in many studies adding that little, if any, and sometimes, contradictory correlations, have been found.

Riahinia and Azimi, also carry out a study which shows that that there is a significant relationship between female academics' use of the Internet and their social ranking [42]. The finding reveals that as users navigate through the Internet, they find more hidden threats and vague contents.

In a related study, Tuner and Mairesse, analyze the impact of research productivity relative to age, gender and education of French physicists [44]. They found out that there is a quadratic relation between the age of the scientists and the number of publications, with researchers productivity increasing before 50 and then declining after 51. The results using citations are not significantly different from those obtained with publications. Finally, the results suggest that graduates from the French Grande Ecoles publish more, and that a woman publishes in average of almost 0.9 papers less than a man per year.

Obibuaku views research productivity from monetary position. According to him, research entails a lot of efforts and it is capital intensive [45]. He argues that if an academic staff member is to carry out a research with the purpose of publishing it in reputable journals outside the country, there is need to have financial resources and laboratory equipment required to accomplish the purpose.

Institutional Support Variables

Studies investigating the variable institutional supplies and resources have found this variable to significantly influence academic research productivity. Bland & Berquist [36], demonstrate that productivity might be enhanced due to administrative support. Johnes [46] notes that the quality of computing facilities and the size of the library were factors that might influence research performance, while Dundar and

Lewis [47], find that institutions with more resources provide better resources in the form of library resources as well as other forms of resources. However, Teodorescu finds no evidence supporting a predictive relationship between institutional support and research productivity [34].

Professional Variables

Vasil [48] and Pfeffer and Langton [49], argue that total years in the profession had a major impact on total research, but an insignificant effect on recent research productivity. Again, Blackburn *et al*., [38], add that the relationship between educational experience and research productivity has been addressed in many studies, insisting that only little, if any, and sometimes contradictory correlations have been found. Teodorescu [34] and Vasil [48], want academic rank to be a significant determinant of research productivity. Ramsden finds seniority of academic ranks to be correlated with research performance [50]. Williams *et al*., however does not find ranks to be a significant decider of research productivity [37].

Measurement of Research Productivity

Majority of the methods for measuring research productivity involve measuring the number of journal articles published. Research productivity has been mentioned in several literatures relating to higher education. The most pervasive issue regarding the measurement of research productivity is the confusion of quantity of publications with quality of publications, either in the publication itself or the publication outlet [51].

Print and Hattie [52] highlight the value of publications as the most direct measures of research performance and these are ranked as follows: Articles in refereed journals, commercially published peer reviewed books, major refereed conference presentations, paper in refereed conference proceedings, articles weighed by journal citation impact, chapters in commercially published peers refereed journals, competitive peer reviewed grants, postgraduate research degrees supervised to completion and editor/editorial board of recognized journals. In concluding their studies, they categorise research productivity into three major groups - research grants, research students and publications over the past three years.

According to McGuire, Richman, Daly and Jorjani [53], the debate over the most appropriate measure of productivity revolves around quantity and quality of research output. The most frequently used measure of the quantity of research productivity is a numerical publication count or the journal article count over a certain time period. Rotten [54], remarks that a common approach to measuring research productivity is to count the number of books, articles, technical reports, bulletins and book reviews published as well as presentations given, and grants received through reviewed curriculum vitae or other print materials.

Armstrong and Hubbard study the publication process on whether a prolific research outcome will be useful to the scientific community [55]. They believe that published papers are not useful unless they are read and applied. Due to numerous barriers to publication, they suggest that citations may be a better measure of scholarly productivity than publication counts. The most common approach is bibliometrics, a research method usingquantitative analysis to measure research output and impact within or between a given subject or discipline [56]. Moed, Glänzel, and Schmoch [57] argue that bibliometrics had been used as far back as 1917, but only gained popularity after the introduction of the Science Citation Index in 1961. The measurements of individual and departmental research accomplishments are often based, at least in part, on the number of publications produced over a specific time period.

Measuring institutional research outcomes with the use of bibliometric indicators is also an activity with a long tradition. The most commonly used measure of individual and departmental research productivity is the number of faculty publications in selected outlets such as academic journals, counts of conference papers, accredited journal publications and books [32, 58, 59].

Weinberg identifies the three external criteria for measuring research output efficacy, viz: technological merit, social merit and scientific merit [60]. He explains that technological merit measures the degree at which research advances technology, while he views social merit as the degree at which the research helps to achieve various social goals such as better health, better schools, better international relations; and scientific merit as the degree at which the research illuminates the neighboring Scientific fields on which the proposed research is embedded.

CONCLUSION

Determinants of research productivity in university or any academic environment is a function of a number of variables or factors embedded in the institutional framework or regulations guiding different institutions. Nigerian scholars are seen to be historically behind other African contemporaries in terms of their input in the international publications and other determinants of research productivity. The paper suggests for governments in Nigeria to dedicate their selves into creating the necessary academic environment that will facilitate increase in productivity among Nigerian scholars.

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