ACCESS AND RETRIEVAL OF INFORMATION AS COORDINATES OF SCIENTIFIC DEVELOPMENT AND ACHIEVEMENT IN NIGERIA

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ABSTRACT

In a pioneering study on the first generation Nigerian Universities between 1975-79, using the science indicator of publication count of the scientists derived from the ISI database, the data showed a real growth in scientific output. The growth correlated well with Federal Government funding of the Universities and the nation's Gross Domestic Product (GDP). The decline and often erratic funding stemmed the rate of growth in most of the Universities. The fastest growing science, Biochemistry, recorded a modest growth; nutrition was identified as the major front of research, but high infant mortality rate (an index of underdevelopment) was unabated. Retrieval of information to aid prosecution of relevant research and lack of access to scientific information have resulted in intellectual isolation of Nigerian scientists and inapplicability of research findings. The pathetic state of scientific growth and relevance in Nigeria is typical of the Developing Countries (DC). The situation calls for the importance of the science indicators in strengthening the coverage of Third World science and supporting the scientific development in the DC. Refining the science indicators for suitability in measuring science in these countries is also advocated.

RESUME

La première étude réalisée sur la quantification de la science dans les Universités Nigérianes de la première génération (1975-1979), à partir de l'indicateur du nombre de chercheurs dérivé de la base de données de l'ISI, a mis en évidence une croissance réelle de la production scientifique. On a également observé une corrélation étroite entre les dépenses du Gouvernement Fédéral pour les Universités et le Produit Intérieur brut (PIB). La diminution des budgets et leurs irrégularités ont été à l'origine d'un déclin de la production scientifique dans la plupart des Universités. Le domaine de plus forte croissance, la biochimie, n'a connu qu'une croissance modeste; de plus dans le domaine de la nutrition considéré comme un des fronts de recherche les plus importants, le taux de mortalité infantile (un indicateur de sous-développement) n'a pas diminué. Le manque d'accès à l'information scientifique a eu comme conséquence l'isolement des chercheurs Nigérians et l'inapplicabilité de leurs résultats de recherche. La croissance de la science au Nigeria et son manque de pertinence sont caractéristiques des pays en Développement (PED). Cette situation nous fait prendre conscience de l'importance des indicateurs de science qui doivent permettre de renforcer le soutien de la science du tiers monde.

L'auteur se fait également l'avocat de la mise au point d'indicateurs de science plus adaptés à la mesure de la science de ces pays.

INTRODUCTION

The neglect of science in the Developing Countries (DC) can only be at a great peril. It is quite evident that the sheer quantum of scientific output in the Industrialized Countries is significant in advancing human knowledge and enhancing life on Earth. However, recent advances in communication science have shrunk the World into an indivisible whole. There are no more regional but global problems. The contribution of DC scientists and the pace and output of their work will ultimately determine the growth of science in the World. The global concern for the environment, the destruction of the Amazon and other Tropical forests, earthquakes and desert encroachment; nuclear, volcanic and oceanic eruptions and the AIDS epidemic, to mention but a few, are no respecters of National boundaries or socio-economic demarcations. The realization of one world science has prompted the need to support science in the DC (Moravcsik, 1964 and 1966).

Science indicators are potent tools in measuring the size of science (Solla Price, 1969). It has been used in quantitative and qualitative assessment of science in some cities and countries (Inhaber, 1974; Garfield, 1978). One of the problems of the administration of science in Nigeria is the lack of precise knowledge of its size. When the fifty most active countries in terms of absolute number of publishing scientists was computed, Nigeria ranked 38th after correcting for the size of the scientific productivity, which was above average over the years (Kovach, 1978). Similar analysis using only developing countries showed Nigeria to be a close second to Egypt (Garfield, 1978). In a developing country like Nigeria with a strong economic base due to oil revenue, funds must be properly channelled to research that ought to lay the foundation for future prosperity. Although research policy is mostly a political decision, it is important to identify the appropriate centres of research in the country so that these centres may be the beneficiaries of research funds when political considerations are less weighty. In this regard, the measure of the size of science in six Nigerian old Universities was computed over a period of ten years from 1970 to 1979 (Adamson, 1981a). Although some research work is carried out in the several specialized Research Institutes, it has been shown that in Nigeria, as in developed or developing countries, the bulk of research is carried out in the Universities.

It is, therefore, the objective of this paper to recapture the size of science in the first generation Nigerian Universities as an illustration of the role of Nigerian scientists in data gathering and dissemination, their training, motivation and

working conditions as factors that may mediate refining of science indicators for the DC.

NIGERIAN SCIENTISTS

The researcher is the generator of scientific information. His ability to contribute to world information databases, access and retrieve same are dependent on his competence and the social milieu in which he operates.

Training :

Virtually all first generation Nigerian scientists during the colonial period had their training in Britain or at the University College, Ibadan, which was affiliated to University of London. The British system of education was imposed generally during the colonial rule and any other Scientists produced from other systems, particularly the few that went through the American system, were regarded as academically inferior and are often denied employment in the country. In terms of contribution to the world databases, the average British scientist is wont not to publish, compared to his American counterpart. The legacy of this attitude is still reminiscent in some older British-trained Nigerian scientists who would only publish at the completion of their research work. Such publications are often sent in a series to an International journal. Older Nigerian scientists often took great pride in having 3-4 papers in an issue of such a journal. The fewer counts of publication of these first generation scientists is, in the main, due to this attitudinal effect. The citation analysis of these scientists i.e., those at University of Ibadan between 1948 and 1962, will be interesting and may reflect many of the social factors influencing science indicators in the country as well as the DC.

Training of Nigerian scientists became more diversified after independence with acceptance of significant number of scientists trained in the USA. A University fostered by University of Michigan, USA, was also tolerated in the year of Independence in 1960. Trickles of some scientists who received their training in the USSR and other East European countries also came into the milieu. The British tradition of education was actively encouraged at Ibadan and there was conscious attempt to surpass it. Scientists at Ibadan argued over the need to achieve International standards which was, in fact, "British standard" (Ukoli, 1985). The more pragmatic American-trained scientists, on the other hand, were advocating science relevant to solving the immediate problems of underdevelopment. For these American-trained scientists, there was a lot to do and, consequently, a lot was published.

Publishing Scientists:

The American-trained scientists published most of their works in American journals which were, at the time, regarded as less reputable International journals. The publication count of publishing scientists consequently reflected a significant increase for Nigeria largely contributed by these American-trained

scientists. Thirty years after independence, over 80% of the first generation scientists have retired and the divide between the attitudes of Nigerians trained under the British and the American systems had virtually been obliterated. On the International scene, the attitude of the British scientists itself towards rapid publication became similar to the Americans and Nigerians trained in Britain perceived this shift and now publish like the American-trained scientists.

A third generation of Nigerian scientists trained by the second generation of scientists in Nigeria came into the scene. This generation was beset with problems of material resources which affected their perceptions and activities. The Nigerian scientists on the whole, especially the second generation, are as good as their counterparts all over the world in perception and publication attitudes. The International slogan of "Publish or Perish" even hold in the country to varying extent. It is therefore difficult to advocate a different science indicator for these Nigerian scientists. It would be resisted, albeit, ignorantly. When the high rejection rate of articles from the DC was decried (Gordon, 1979), and a proposal that a new Journal for the Encouragement of Research in Life Science (JERLS) in the developing countries be created (Campbell, 1977), it was rejected on the grounds that it would not be recognized either in the developing or developed countries. This line of thought was a gleam from the debate on International relevance of science by the first generation of Nigerian scientists. It is, however, clear that the second and third generations scientists could not perform as well as their counterparts overseas because of prevailing socio-economic factors. The lack of a culture of science in the country and shortage of materials and infrastructural support were clearly staked against them. Since the practice of science itself is about competition and publication and recognition are only accorded to those who first achieved breakthroughs, Nigerian scientists would not settle to be second best. A factor could be worked out to multiply publication counts and citation analysis of DC scientists to reflect the precarious state in which scientific results publishable in "reputable International Journals" are rated.

Background of Scientists and their motivations:

The first choice of the brightest science students is for the professions of Engineering or Medicine. The others who are not less qualified but could not get into the professions are admitted into Science degree programmes in the Universities. Most of such science graduates eventually end up as teachers or as Administrators in the Civil Service of the country. Outstanding science graduates are usually given scholarships by the Government to pursue higher degrees overseas (UK and USA), but lately, locally. It would, therefore, appear that due to lack of a science culture and with only a handful of scientists as role models, Nigerians do not primarily opt for science. Those that, however, become scientists receive adequate training which can enable them to carry out independent research. Most Nigerian scientists are imbued with the desire to achieve excellence in research or at least maintain the standard of their post-

graduate training. They are also motivated to solve the problems of the country in the areas where indices or under-development are high. Usually, the responsibilities imposed on themselves are disproportionate to their level of experience. It is remarkable that with the spirit fired by independence of the Nation, Nigerian scientists have responded to the exeptations by carrying out research and recording excellent publications.

Working Conditions of Scientists:
The research facilities bestowed by the colonial administrators of the country and early post-independence acquisitions were up-to-date for prosecution of scientific research. Funding and remuneration of scientists at the time were also satisfactory. With independence and gradual harmonization of the University with the Civil Service, the culture of science that was being built in the Universities gradually became eroded by bureaucracy. Being a scientist was no more a way of life but a means of employment. Erratic and decline in Government funding of the Universities bred scientists with inimical motivations to scientific endeavour. Lack of water, unreliable electricity supply, ill-maintained and obsolete equipment, inadequate research grants and funds to attend conferences were the working conditions of the scientists. All these affected publication counts of scientists and science indicator of publication counts dropped in the most prolific Universities. These are some of the factors that must be put into consideration in determining science indicators for developing countries.

New Breed Scientists:
Three types of research scientists evolved in Nigeria as a result of the precarious conditions under which they work. While the annotated sketch (Fig. 1) appropriately describes the three types of scientists, their prospects and publication patterns, the compartmentalization and mode of operation are flexible. One can thus find scientists in the Universities that function as Government Research workers and vice-versa.

The Information Gap:
In measurement of Biochemical Research in Nigeria, it was shown that a real growth was obtained over a period of 1975-79 (Adamson, 1981b). It was also shown that research in nutrition was also one of the major fronts yet the real growth in nutrition research did not reflect any remarkable improvement in infant mortality rate. Information access and retrieval are problematic to achieving appropriate application of research findings. It is not uncommon for Government to award contracts to foreigners to carry out feasibility studies on local problems only for the contractors to come to Nigeria to initially carry out manual information retrieval of available data related to the contract by visiting local libraries, Universities and through personal contact for unpublished data. These local scientists are later recruited for prosecuting the job.

The inability of most Nigerian scientists to use the present day information systems hampers their productivity. The beauty of the modern information system is that it is current, and technically obtained at the speed of an electronic flash, but it is expensive. Hardware computers) and software (programmes) are required to use the modern day information system. The hardware is not only prohibitively expensive in the DC but requires low temperatures for optimal functioning. The cost of providing low temperature where the ambient temperature is tropical is enormous and against the backdrop of irregular electricity supply, high down time and frequent breakdowns are common features of the few computers. Highly trained computer engineers are also hard to come by. Training of computer scientists, systems analysts and other middle level personnel of the computer industry is in its infancy. The country itself is yet to be computer literate. Some of the new breed scientists who constantly visit laboratories abroad are, however, adept at the use of computers. Some even have PCs of their own and fully appreciate the importance of power of the computer in their work but they are few and far in-between. These "International" scientists also appreciate the importance of science indicators and insist on listing their departmental addresses in joint publications of work done abroad. As for general awareness of science indicators in the country, the author was shocked when a decade ago he presented a paper on the measurement of science in Nigeria at a science conference. The view of the audience was that the exercise was futile and non-academic in nature. It was argued that further pursuit of this "non science" could put the country in a bad light as being underdeveloped. To the credit of the participants, however, pertinent questions relating to the slant of science indicators in favour of USA and UK were raised. Strikingly were issues of english language as medium of communication and rejection of science dealing with local problems by international journals.

CONCLUSION AND RECOMMENDATIONS

There is a tremendous resistance to the use of science indicators to measuring productivity or evaluating the state of scientific research in Nigeria. Awareness strategies of the importance of science indicators would seem to be the first step to developing suitable science indicators for the DC. Information science has to be appreciated, for presently, it is regarded as an aspect of library studies based in the Arts and Humanities and a wide gulf exists between the arts and the sciences in Nigeria. Unfortunately, scientists interested in scientometrics are regarded as those that could not cope with the rigours of their science discipline.

The selection of journals for building the information databases and inherent deficiencies have been stated (King, 1987; Garfield, 1990; Gaillard, 1991) of which irregularity of publication (partial death) is a major consideration. Outright mortality rate of Nigerian journals is high and this is vexing. It is, however, an economic issue. Fortunately, Governments, Non Governmental Organisations,

Foundations and societies are concerned about the low scientific output of the DC. Financial support, grant and seminars on journal production will be welcomed to ensure regularity and quality assurance of the DC journals. The Indian example in journal publication may be a model for the DC. The emphasis is not on glossy perfect finish of the West but on quality articles in regular journals even if on a newsprint. It is for this reason that India is the super-star in scientific output among the DC. Scientific information gap is minimal in India compared to other DC and science, whether basic or applied, relate to the problems of the country. Another strategy for strengthening the information resource base is to encourage scientists in the DC that have computers, for example, those in the Universities, to form PC clubs which may develop to networking, exchange of diskettes, trouble shooting of hardware problems etc. Such clubs may be supported and used to reach the larger scientific community of the Universities and may lead to building local databases which could be net-worked internationally. The catalyst to facilitating the use of science indicators and modification thereof for the DC lies in scientometricians of the Developed countries visiting the DC and organizing workshops, at least, in the Universities. The importance of information databases, access and retrieval as important tools for development and recognition of scientists would then become evident. The potential for CD-ROM technology in less developed countries (Nichols and Majid, 1989) and other information technology adapted for the third World (Moravcsik, 1985) can then become a reality.

Note
The author regrets his inability to cite all relevant articles, especially those of Dr. Eugene Garfield of ISI, Philadelphia, Prof. Abdus Salaam of the Third World Academy of Sciences, Professor T. Braun, Editor, Scientometrics, who through his review of the author's paper in Scientometrics fired his interest and many more who, along with Professor M. J. Moravcsik are the heros of Third World science. Justice could not be done to their contributions by citation because of inability to access and retrieve information from any database or the local libraries.

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Nigerian Scientists Ph.D (UK, USA, Nigeria)

Job

Government grants

Location: Research Institutes   Location: Universities

Government Approved   Free Choice of
Research   Research Topics

Mode of   Technical Papers/
Publication   Monthly/Annual Reports
                          Direct Retrieval   Research for Inter-   Locally relevant
                          through Institute   national recognition   short-term
                          bureaucratic delays   basic or applied   research

             Automatic promotion   Personal link/visits   Local journal
             low incentive for   with Universities or   newspapers
             achieving break-   Research Institutes   publications. Not
             throughs   abroad ensures fami-   indexed.
                                                     liarity with state-of-
                                                     the-art informations
                                                     systems

                                                     Few high impact   Increased local
                                                     publications   publications
                                                     International Award

                                                     Promotion   Promotion

                                                     National recognition   National Recog-
                                                     for boosting the   nition for
                                                     name of the   solving local
                                                     country   problems

                                                     State sponsored   State sponsored
                                                     research   research

                                                     High impact   Local publication
                                                     publication   unrecognized
                                                                               internationally
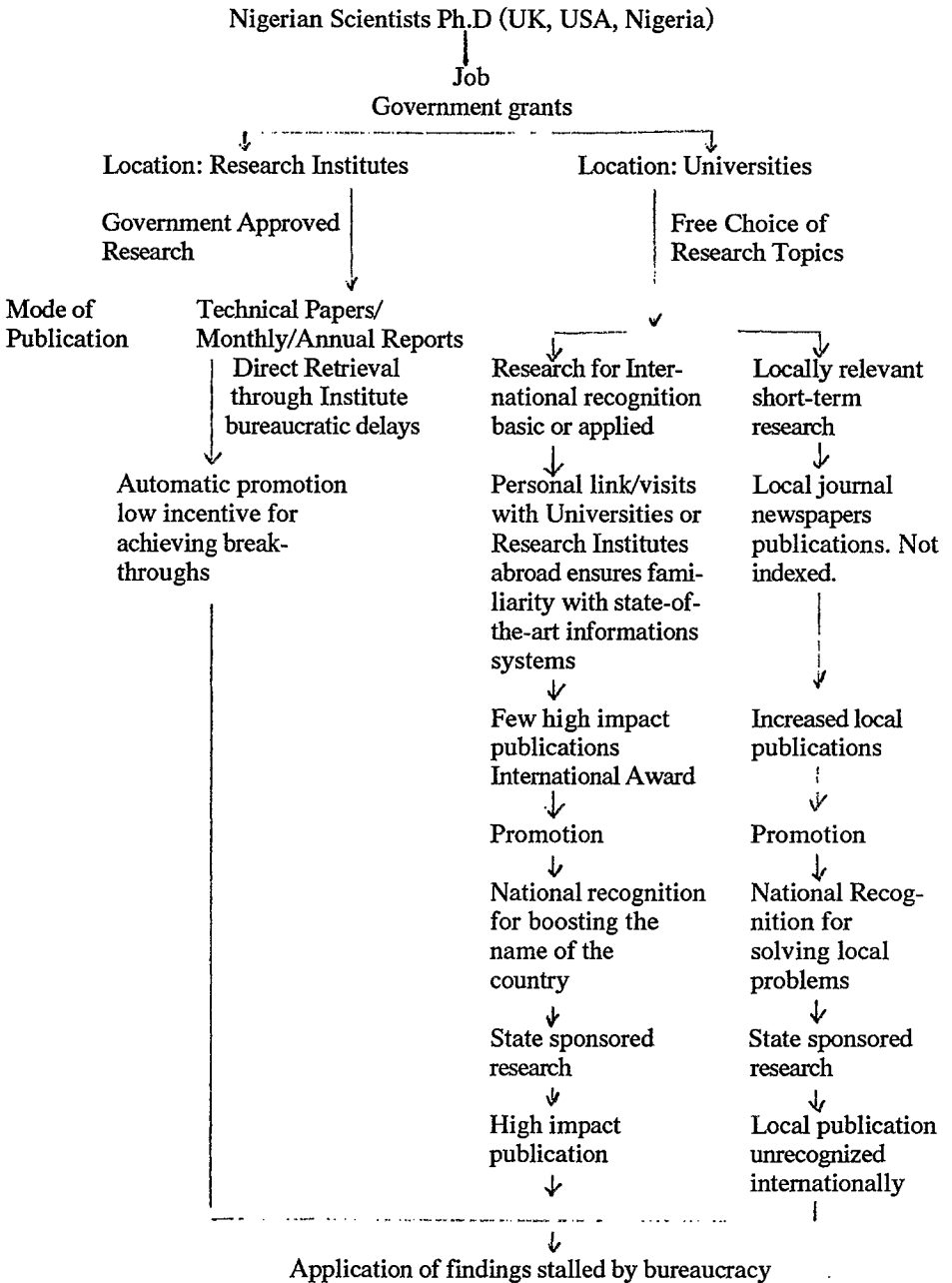
Application of findings stalled by bureaucracy

Fig 1: Nigerian Scientists, Location and Publication Pattern.