

THE POLITICAL ECONOMY OF TECHNOLOGY TRANSFER AND THE CHALLENGES OF DEVELOPMENT IN NIGERIA IN THE AGE OF GLOBALIZATION

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Abstract

The basic source of industrial development in developing countries in reality is knowledge and technological change through the process of technology transfer or the application of new technology to a new use or user for economic growth. Economists have long recognized the fact that transfer of technology is at the heart of the process of economic growth (and development), and that the progress of both developed and developing countries depends very strongly on the extent and efficiency of such transfer. Over the years, Nigeria has made efforts to increase and improve local production through the acquisition of foreign technologies. Yet, in the 21st century, Nigeria has not been able to improve its technological base in the different sectors of the society. Thus, the main thrust of this paper is to assess the political economy of technology transfer and the challenges of development in Nigeria in the age of globalization. Materials for this study have been drawn mainly from secondary sources found in libraries and archives in Nigeria; academic and other resources available in the internet, local and international publications (books and learned journals). The strategy of content analysis was used to systematically analyses secondary data in view of the historical cum contemporary nature of the study. The paper concludes that even if funds, skills, expertise and basic infrastructures may be available, the issue of technology transfer is highly political and requires a political solution. It then concludes with suggestions for possible solution.

Keywords: Politics, Development, Globalization, Technology Transfer, Nigeria.

INTRODUCTION

Technology Transfer is the flow of applicable knowledge, skill, capability, expertise, equipment or facilities from one location to another within a specific time frame; it is closely linked to the process of industrialization. In order words, it is a complicated process involving a matrix of cultural, socio-economic, environmental, IPRs, infrastructural, political, diplomatic and other related factors. Technology transfer is a multi-level process of communication involving a variety of senders and receivers of ideas and materials. As a response to market failure, or as an effort to accelerate market-driven social change, technology transfer may combine public and private apparatus or rely solely on public institutional mechanisms to identify, develop, and deliver innovations and information. Technology transfer institutions include universities, government ministries, research institutes, and what may be termed the 'project sector'. The challenges to technology transfer efforts center on developing indigenous capacity to generate and adapt agricultural technology to local conditions. There are two main dimensions of Technology Transfer Process: Vertical: Countries of an unequal technological pedestal, (Nigeria and UK/USA/Germany/Japan); Horizontal: Countries of equal technological pedestal (Nigeria and Ghana, Kenya); Sectoral: From firm to firm within the country).

What is common in Nigeria is vertical pattern of technology transfer process. Technology Transfer differs from Technology Acquisition (TA). In Technology Transfer, the choice and cost of technology is determined by the transfer or major stakeholders in Technology Transfer Process: Primary Stakeholder: The State which provides the enabling environment and the Organized Private Sector (OPS): They control the factors of production. The issue of technology transfer became the policy of the state in Nigeria in 1983 following the promulgation of Decree NO 70 of 1979 which established the National Office for Industrial Property (NOIP) and amended by Decree 83 of 1983 leading the change of name to National Office for Technology Acquisition and Promotion (NOTAP) in line with the international obligations, hence it changes its regulatory roles to developmental and promotional while endangering technology transfer and contributing to national economic development.

In today's knowledge based economy and globalized business environment, absorption of new technology has become a vital component for companies to survive through maintaining their competitive position in the market place and for a nation state, technology capability is used as a tool to measure and equate national competitiveness. Ideas and knowledge are increasingly becoming an important factor in international trade relations as codified in the Trade Related Aspects of Intellectual Property (TRIPS) under the World Trade Organization (WTO) of which more than 60% of the developing countries are members. The rate of technology transfer is a function of many factors which varies from country to country. Nigeria's attempt at developing the national economy in the 1970s, when crude oil was discovered focused on the establishment of infrastructure and industries utilizing assortment of foreign technologies and these technologies many were unsuitable and outdated. Technology Transfer is achieved through the execution of project agreements between Nigerians and their foreign counterparts. These agreements are evaluated in order to achieve equity, airplay and to be in conformity with the national socio-economic objectives. Approvals are based on net sales or lump sum as stipulated in the official Guidelines implemented by NOTAP. Over dependence on foreign technologies for industrial production in Nigeria over many years is throwing a serious challenge to Nigeria's development efforts.

The problem of technology transfer began to attract a serious attention of scholars in the 1970s. Since then, controversies surrounded the concept. On the one hand, there are those who argue that technology cannot be transferred; on the other, there are those who insist that no technological development is possible in the contemporary world without the transfer of appropriate technology. The debate became so keen that in the late 1970s, the Ann Arbor of Michigan, U.S.A., founded a journal called APPROTECH which sought to explore the dimensions of appropriate technology transfer to the developing countries. But it wasn't until the 1980s that the debate began to assume some significance for Nigerians. Several questions begging for answers in this paper naturally come to mind: what is technology transfer? What issues are at stake in technology transfer? What general principles should guide the transfer and growth of technologies in a developing nation like Nigeria? Has Nigeria the basic infrastructures for technology transfer? In this paper, thus, the authors assess the politics of technology transfer and the challenges of development in Nigeria in the age of globalization.

CLARIFICATION OF CONCEPTS

The Concept of Technology Transfer

Defining technology is paramount because it helps to identify phenomena related to technology transfer. Since the 1960s, many scholars have tried to understand the real meaning of technology using different underlying philosophies (DeVore, 1987; Frey, 1987; Galbraith, 1967; Mitcham, 1980; Skolimowski, 1966). The definitions or meanings of technology these authors proposed were unique, according to their context, philosophy, economy, or other variables. This implies that it might not be that simple to define technology because technology is situation and value specific. However, the concept of technology should be outlined in order to understand what is being transferred in a technology transfer process. Two approaches have been used to comprehend technology: one is to define technology in a way of capturing the platonic essence in a few sentences by differentiating technology from science, and the other is to provide characterizations of technology. Scholars, such as Skolimowski (1966), Galbraith (1967), and DeVore (1987) might be the representatives of the former approach. Skolimowski

(1966) defined technology as a form of human knowledge and a process of creating new realities. He argued that science is concerned with what is, but technology is concerned with what is to be.

Later, Galbraith (1967) defined technology as the systematic application of scientific or other organized knowledge to practical tasks. This definition is notable because it emphasizes the systematic and practical aspects of technology. DeVore (1987), a major scholar, made an effort to define technology. He argued that technology should create the human capacity to “do,” and it should be used to create new and useful products, devices, machines, or systems. He also emphasized the relationship between technology and social purpose. He contended that technology has always been situated directly in the social milieu and conditioned by values, attitudes, and economic factors; thus, the goal of technology is the pursuit of knowledge and know-how for specific social ends. In contrast, some scholars criticized defining technology in a few sentences. They argued for providing characterizations of technology. Frey (1987) could be considered the most typical advocator of this approach. In 1987, he characterized technology as four elements: object, process, knowledge, and volition. Technology as object is regarded as the concept of physical embodiments, involving tools, machines, consumer products, instruments, or any objects that have intentionally been created to extend practical human possibilities. Moreover, technology as an object may be tangible and focused on efficiency. Technology as process is concerned with how to use or develop the object effectively. From the systems perspective, technology as process would be a means to improve the system’s performance. Skolimowski (1966) also supported this knowledge viewpoint when he stated that technology is a form of human knowledge. According to Mitcham (1980), volition, which incorporates aims, intentions, desires, and choices, provides links to tie together the three aspects of technology: object, process, and knowledge. All technologies are influenced by human intention. In other words, when, how, and why technology will be used depends on human intention and will. Consequently, technology as volition emphasizes the human element and culture within technology.

According to DeVore (1987), the range of technological activity includes everything from problem identification to the design and implementation of solutions. This involves not only technical or physical elements but also human elements. Savage and Skerry (1990) argued that the ultimate outcome of technological activity is the solution derived from the problem-solving activity undertaken by humans through the use of technological processes and resources. The model of technology activity that Johnson, Gatz, and Hicks (1997) proposed seems to be based on the open-systems model composed of inputs, transformations, outputs, environment, and feedback. Their model consists of inputs, personal problem solving environment, outputs, and impacts of social context. They regarded the ultimate outcome of a technology activity as the extension of human capabilities through the creation of artifact, knowledge, and process. This view is very important because it implies that technology can be used to improve both system and individual performance; thus, it can be a tool for Human Resource Development (HRD) interventions.

Technology Transfer (TT), also called Transfer of Technology (TOT), is the process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services. It is closely related to (and may arguably be considered a subset of) knowledge transfer. Technology transfer is the process by which technology or knowledge developed in one place or for one purpose is applied and exploited in another place for some other purpose. The term “technology transfer” historically has been associated with federal activities; however, the process is not restricted to the government. The most common form of technology transfer occurs between federal laboratories and nonfederal organizations such as private industry, academia, and state and local governments. Markert (1993) definition of technology transfer is the most typical - she defined technology transfer as the development of a technology in one setting that is then transferred for use in another setting. However, this definition does not reflect a deep comprehension of technology transfer, because it is mostly focused on differentiating technology development from utilization. To overcome the disadvantage of this definition, Johnson, Gatz, and Hicks (1997) tried to interpret technology transfer through a holistic perspective that included both the movement of technology from the site of origin to the site of use and issues concerning the ultimate

acceptance and use of the technology by the end user. They argued that recognizing the end user's needs and the context where the technology will be used is essential for the successful transfer of technology.

Technology transfer is not the same process and perception for everybody. Universities, corporations, federal labs, and developing countries have different roles and interests in technology transfer. For example, universities, as a provider of technology, view technology transfer as a means for serving a community through knowledge sharing. On the other hand, technology transfer is regarded as a way to obtain competitive advantages through performance improvements in corporations that are the recipients of this technology. Like this, the perception of technology transfer in each site would be different. According to Frey (1987), technology can be an object, a process, or knowledge that is created by human intention. In most cases, technology tends to be the integration of all three components: object, process, and knowledge. Therefore, a provider of technology should try to transfer the integration of all components that make up that technology, not just one component.

The various forms of technology transfer can be simple or complex depending on the resource (e.g., agency/laboratory), user (e.g., industry), and interface (e.g., mechanism) that connects the two and moves the technology from one organization to another. Examples of processes include:

- a) Technology developed for nongovernment applications
- b) Secondary applications of technology developed specially for government applications
- c) Transfer of mission-related technology between government organizations
- d) Technical assistance
- e) Collaborative R&D between government and nongovernment entities
- f) Commercial transfer of technology for use in government applications

Examples of forms of transfer technology include:

- i. Commercial transfer - transfer of knowledge or technology from government to commercial organizations for potential or new/improved technologies
 - ii. Exporting resources - collaborative agreements or volunteer services that provide expertise to outside organizations
 - iii. Importing resources - a cooperative effort that brings outside technology (pull) into the agency/laboratory to enhance its mission
 - iv. Dual-use - development of technologies that have "dual" or commercial/government applications
 - v. Scientific dissemination - the multidirectional sharing of government, industry, and academic publications (i.e., conference papers, working papers, etc.)
- The long-term goal of technology transfer is to sustain economic growth in the foreseeable future through the development and commercialization of new technologies. In the global economy, the wealth of one nation is directly affected by its relationship with other nations. With the wealth of knowledge and expertise the U.S. has in its scientists and engineers, the U.S. is positioned to compete in the global marketplace. Federal technology transfer programs are intended to make the most of R&D and the expertise found in both government and nongovernment organizations.

The Concept of Development

In general terms, "development" means an "event constituting a new stage in a changing situation" or the process of change per se. If not qualified, "development" is implicitly intended as something positive or desirable. When referring to a society or to a socio-economic system, "development" usually means improvement, either in the general situation of the system, or in some of its constituent elements. Development may occur due to some deliberate action carried out by single agents or by some authority pre-ordered to achieve improvement, to favourable circumstances in both. Development policies and private investment, in all their forms, are examples of such actions. Given this broad definition, "development" is a multi-dimensional concept in its nature, because any improvement of complex systems, as indeed actual socio-economic systems are, can occur in different parts or ways, at different speeds and driven by different forces. Additionally, the development of one part of the system may be detrimental to the development of other parts, giving rise to conflicting objectives (trade-offs) and conflicts. Consequently, measuring development, i.e. determining whether and to what extent a system is developing, is an intrinsically multidimensional exercise.

Dimensions of Development

Even if the development of a socio-economic system can be viewed as a holistic exercise, i.e. as an all-encompassing endeavour; for practical purposes, in particular for policy making and development management, the focus of the agents aiming at development is almost always on selected parts of the system or on specific features. To this end, “development” is qualified and specified in different ways. A summary (non-exhaustive) list of possible qualifications comprises:

- 1) Economic development: i.e., improvement of the way endowments and goods and services are used within (or by) the system to generate new goods and services in order to provide additional consumption and/or investment possibilities to the members of the system.
- 2) Human development: people-centred development, where the focus is put on the improvement of the various dimensions affecting the well-being of individuals and their relationships with the society (health, education, entitlements, capabilities, empowerment etc.)
- 3) Sustainable development: development which considers the long term perspectives of the socio-economic system, to ensure that improvements occurring in the short term will not be detrimental to the future status or development potential of the system, i.e. development will be “sustainable” on environmental, social, financial and other grounds.
- 4) Territorial development: development of a specific region (space) achievable by exploiting the specific socio-economic, environmental and institutional potential of the area, and its relationships with external subjects.

Developing Countries and the Concept of Development

The low standard of living of the mass of the population in developing countries is singled out as the key issue in development. The development of per capita income over time and the factors that influence economic development or stagnation are important issues in this study. However, the interplay between economic and non-economic factors is of great importance for our understanding of the dynamics of socio-economic development. Economic development cannot be explained by economic factors only, and the concept of development includes more than mere changes in economic indicators. In discussions of development issues, two general approaches can be distinguished (see Myint, 1980): 1. The fight against poverty: This approach focuses on the problems of widespread poverty, hunger and misery in developing countries and on the question of what can be done in order to realize improvements of the situation in the short term. 2. The analysis of long-term economic and social development: This approach concentrates on comparing developments in different countries, regions and historical periods in order to gain a better understanding of the factors that have long-term effects on the dynamics of socio-economic development. One of the characteristics of the first approach is a strong involvement with the problems of developing countries and their inhabitants. Most people who study development issues do so because they feel that present levels of poverty, misery and injustice are simply unacceptable. Their aim is to arrive at concrete recommendations for action. This approach is closely linked with development policies and strategies at international, national, regional or local levels. Some people choose a technocratic interpretation, focusing on policies, instruments and projects; others choose a more radical--political interpretation. The latter argue for political action in order to achieve dramatic changes in the existing order of things.

A potential drawback of strong involvement is certain trendiness in thinking about development. To illustrate this, one can point to the endless succession of ideas and slogans that have played a role in post-war discussions of development: the idea that large-scale injections of capital are the key to development (‘big push’); the ‘small is beautiful’ movement; human capital as the missing link in development; the green revolution as a technological fix for agricultural development; community development; appropriate technologies; basic needs; integrated rural development; self-reliance; delinking from the world economy; the New International Economic Order; market orientation and deregulation; promotion of the informal sector; structural adjustment policies; or sustainable development. A common characteristic of these recipes for development is their short-term perspective. Time and again, proposals have been put forward in order to achieve certain goals, preferably within a decade or two (see, for example, Brandt, 1980; 1983; Brundtland, 1987). In the meantime, developments that take place irrespective of the fashion of the day are ignored or disregarded. These

fashions often evoke a brief surge of enthusiasm in the world of politics, policy and the development sciences. But when the immediate results are slow in materializing, disenchantment sets in again. The issue disappears from the public eye, and new and more appealing solutions and catchphrases emerge. The greater the involvement, the harder it is to distinguish between desirability and reality, and the greater the disappointment that follows when the real world proves less manageable than one had hoped. Some of the major mistakes in development policies are a direct consequence of erroneous advice from development advisers and experts. An example is the neglect of the agricultural sector in the drive for industrialization at all costs in the 1950s. The long-term approach to development is more detached. One tries to comprehend why, in the long term, such great differences in development have occurred in the different parts of the world (Szirmai, 1993). One tries to identify the factors that may help to explain different patterns of development, such as the accumulation of production factors, the efficiency with which these factors of production are being used, technological changes, external political and economic influences, historical factors, institutions and cultural differences. Economic and social policies figure among these factors, but considering policy as only one of many relevant factors may help to deflate immoderate pretensions and hopes of policy makers, politicians and scientific advisers.

The long-term approach emphasizes that economic growth in its modern form is intimately associated with the economic development of the Western countries since the mid-eighteenth century (Landes, 1998; Maddison, 2001). Therefore, the history of the economic development of prosperous European and North American countries will often serve as a point of reference in our comparative discussions of the experiences of developing countries. This is not simply to advocate the copying of Western solutions by developing countries. Rather we hope to gain an insight into the similarities and differences in development processes. The history of modern economic growth is also associated with industrialization and a process that Higgins and Higgins (1979: p. 3) have ironically described as 'getting rid of farmers'. Again this historical relationship between industrialization and economic growth cannot be applied indiscriminately to developing countries. It does, however, serve as another point of reference.

Furthermore, comparisons of the historical development of economically advanced countries and developing countries may teach us much about the role of institutions in advancing or impeding economic development. In this context one can think of land tenure relations, intellectual and other property rights, patent institutions, processes of state formation or the emergence of financial institutions. Finally, the historical study of processes of economic growth reveals the importance of processes of saving and investment in the accumulation of factors of production. Such a study leaves us under no illusion with regard to the human costs of economic growth. In the past, economic growth has always been coupled with an enormous increase in the capital-labour ratio. In order to invest in capital goods a considerable portion of the national income has to be saved. In poor countries, saving means that people living at subsistence levels have to postpone present consumption for the sake of investment in future production. This is not easy. In Western countries such savings have been realized through the ruthless workings of the market mechanism of nineteenth-century capitalism, which kept wages low. In the centrally planned economies of the twentieth century exploitation of people by people through the market was replaced by direct coercion by the state. Both mechanisms have resulted in the transfer of income from consumers to social groups (capitalists, entrepreneurs, government officials) that were both able and willing to save and invest. It is unlikely that such tough choices can be avoided in the future.

An objection to the long-term approach is that it seldom offers neat solutions to the kind of practical problems and choices policy makers, politicians, entrepreneurs or aid workers are inevitably faced with on a day-to-day basis. On the other hand, it is exactly this kind of distance to policy that enables one to analyze problems and developments in a more independent and critical manner. The emphasis on long-term trends can help make us more immune to the fashions and fads of the day and may dramatically alter our perceptions of development. The choice between the two approaches is not a matter of all or nothing. Both are important. It is perfectly legitimate for politicians, policy makers, engineers, entrepreneurs or aid workers to ask for support and advice from scientific researchers and development experts. Also, strong involvement with the plight of individuals in developing countries does not preclude independent judgment or critical analysis. On the other hand, a long-term approach offers a

starting point for a realistic assessment of the effects of national and international development strategies and policies. It provides us with greater insight into the significance and scope of socio-economic policies amidst the many factors that impinge on processes of development.

Regulatory Framework for the Transfer of Technology in Nigeria

Many companies, universities and governmental organizations, now have an "Office of Technology Transfer, dedicated to identifying research which has potential commercial interest and strategies for how to exploit it. This applies to the Nigerian experience with the establishment of National Office for Technology Acquisition and Promotion (NOTAP). In this direction the activities of this body have been adequately backed by an Act referred to as National Office for Technology Acquisition and Promotion Act, Cap. N62LFN2004. This regulatory body for the transfer of technology called NOTAP can best be x-rayed under the following headings:-

Establishment of NOTAP

The body was established pursuant to the National Office of Industrial Property (NOIP) by Decree No. 70 of 1979 which was changed to National Office for Technology Acquisition and Promotions (NOTAP) as amended. It was established as a national agency for efficient acquisition (transfer) of technology under more equitable conditions. The name was changed from NOIP to NOTAP in 1992, in order to ensure that new name adequately reflect its entire functions and to avoid any misconception with regard to the activities of NOTAP and those of Registry of patent and trademarks. NOTAP was established with the assistance of the United Nations' Development Programme (UNDP). The United Nations' Industrial Development Organization (UNIDO), became operational in 1983 with a mandate to: "Perfect the interest of the Nigerian economy by assisting indigenous enterprise in their negotiations with foreign partners so that the terms and conditions which they enter into technology agreements are reasonable, fair and equitable and so that obnoxious clauses which refrain their economic gains and innovative capabilities are explained from all technological or collaboration agreements" NOTAP is a body corporate with perpetual succession and a common seal and may sue and be sued in its corporate name.

Functions of NOTAP

The main functions of NOTAP are set out in the Act as follows: a) The encouragement of a more efficient process for the identification and selection of foreign technology. b) The development of the negotiating skills of Nigerians with a view to ensuring the acquisition of the best contractual terms and conditions by Nigerian partners entering into any contract agreement for the transfer of foreign technology. c) The provision of a more efficient process for the adoption of imported technology. d) The registration of all existing and new contracts or agreements having effect in Nigeria on the date of the coming into force of this Act and the all contract and agreements hereafter entered into the transfer of foreign technology to Nigerian partners, and without prejudice to the generality of the foregoing every such contract or agreement shall be so registrable of its purpose or interest is, in the opinion of the National Office wholly or partially for or in connection with any of the following purposes that is to say" i) The use of trademarks ii) The right to use patent inventions iii) The supply of technical expertise in form of the preparation of plans, diagrams, operating manuals, or any other form of technical assistance of any description whatsoever; iv) The supply of basic or detailed engineering, v) The provision of operating staff or managerial assistance and the training of personnel and; vi) The monitoring on a continuous basis, of execution of any contract or agreement or agreement registered pursuant to this Act. From the functions listed above, we can summarize that NOTAP was established with the objective of monitoring on a continuous basis, the transfer of foreign technology to Nigeria. It carries out these functions by examining the quality of imported technology with a view to determining its price and to check fairly obvious abuses (e.g. overpricing of real, fake or obsolete technology, etc) Overtime, the office has acquired considerable capability in fulfilling its functions as the authority in charge of evaluating and regulating the flow of technology into the country. This predominating regulatory role of NOTAP became insufficient vis-à-vis the changing needs of the country particularly at the period when the Federal Government embarks on National Economic Reconstruction.

In response to the new challenges resulting from the dynamics of global technological advancement and in accordance with the government policy of encouraging foreign investment into Nigeria, NOTAP has since 1988 shifted its focus from regulatory and control activity to promotional and development roles. The objective is to attract foreign technology and investment, re-emphasize local manpower development with a view to strengthening local technological capabilities. The office therefore renders the following additional promotional and development functions: Rendering technological advisory services to the public and the private sectors of the economy. Training of Nigerian entrepreneurs in all stages of the development of technological capabilities and providing technology information. Acting as patent attorney or patent agent to assist in patenting indigenous innovations, Creating awareness on the concept of Build-Operate-Transfer (BOT) scheme and strategic alliances as alternative mechanism for the acquisition of foreign technology and investment profiles, Undertaking techno-economic survey on industrial project profiles, and Organizing seminars and workshops on various issues relating to technology acquisition and negotiating for the public and the private sectors.

Globalization, Technology Transfer and Socio-Economic Development in Nigeria

Technology is the key to economic development. One wonders whether the technologically advanced nations are really interested in transferring technology to less advanced nations which, if successful, would make them more competitive and self-reliant. Is it naive on the part of the technologically less advanced to expect genuine transfer of this type of knowledge? At the moment technology transfer into Nigeria continues to be in the form of consumer technology which only allows people to learn what technology to consume and how to consume it. Nigeria's attempt at developing the national economy in the 70's, when crude oil was discovered, focused mainly on the establishment of infrastructures and industries utilizing assortment of technologies. These technologies, many of which were unsuitable, outdated and obsolete were sold at prices determined, in the majority of cases by the whims and caprices of the advanced countries under unfair contractual terms and conditions. Nigerians lack the skill to negotiate technology transfer agreements for rapid development and therefore signed and executed technology agreements, which did not favour national interest. Such agreements contained monopoly pricing and restrictive business practices, ranging from export restrictions, discriminatory royalty rates, coercive packaging, and tie-in-clause, dealing with capital equipment, raw materials and components tied to the strings of the technology suppliers. Contracts were excessively long and sometimes of indefinite duration. In addition, details of technology to be acquired were in most cases not properly stipulated in the agreement, products quantity, quality and standards were not clearly stated. While guarantees, warranties and infringement penalties were not clearly defined in most contracts.

In most contracts, Research and Development were non-existent while little or no attention was paid to the training of Nigerians staff, except statements of general nature, which were never implemented. With time, it emerge that the indiscriminate import of technologies into Nigeria had resulted in high level financial out flow (capital flight), had led to haphazard patterns of development, had accentuated dependence on foreign inputs and had inhibited indigenous skill acquisition and development. That was the imperfect situation which characterizes the import of foreign technology into most African countries particularly, Nigeria.

In developing countries like ours, the basic source of industrial development in reality is knowledge and technological change through the process of technology transfer or as defined by Rodrigues (1985), the application of new technology to a new use or user for economic growth. The emergence of new and advanced material industries has proved that the conventional raw material no longer fit into the production lines of high technology processes. Materials need to be enhanced through advanced technology processes to make them possess specific features that will enable them perform certain functions which they would not perform in their natural form. Certain skills and infrastructure as well as the enabling environment are needed and these are lacking in most developing countries including ours. Effective technology transfer process in any economy depends on the technology receptor mechanisms available or put in place within the system. Technology receptor mechanisms are embodiments of parameters needed to un-package, reverse engineer and adapt to any available knowledge alien to the system. This involves a number of factors including critical mass of skilled

manpower, high level of research and development activities going on in the system, strong linkage between the academia and industries that can guarantee industry oriented research and development results, adequate physical infrastructure as well as dynamic and vibrant academic system of education capable of breeding industry-ready graduates into the system.

Within the thirty (30) years of evaluation, analysis and registration of technology transfer agreements, NOTAP has observed that the initiative to enhance the process of effective technology transfer in the system is very much lacking. This absence of a pragmatic technology transfer enhancement initiative has resulted in the obvious inadaptability of technologies imported into the Nigerian economy which in turn has brought about continued dependence on imported technology to drive the industries in all sectors of the Nigeria economy.

Nigeria and the Plight of Technology Transfer

‘Various laudable attempts have been made in the past to promote technology transfer in all sectors of the Nigerian economy. These efforts were most visible in the adoption of the Import Substitution Industrialization (ISI) strategy and the Green Revolution agricultural programme. The ISI was aimed at fostering a national economy fairly independent of the rest of the world (Aderemi, 2002:8). It was characterized with the establishment of production/assembly plants in the country; to assemble or manufacture product in the country for the domestic market initially and later for export. This was aimed at conserving foreign exchange, diversifying the economy, create employment and acquire the technology in the process. Consequently, Peugeot, Volkswagen, etc established their assembling plants in Nigeria. However, as Ake (1984:146) noted, the ISI strategy failed largely because of policy disarticulation. On the other hand, the Green Revolution Programme was an initiative of the Rockefeller Foundation geared towards developing and promoting high-yield varieties (HYVs) of staple crops so as to ensure global food security (Sachs, 2005:259). Nigeria was among the developing countries that implemented the Green Revolution Programme in the 1980s. While Green Revolution succeeded in India, Mexico and other third world countries it failed woefully in Nigeria.

Considering the importance of technology to growth and development, Emeagwali (2010) argues that for Nigeria to achieve development the one hundred million young Nigerians whose weapon is knowledge must develop their intellectual capital in order to build a stronger Nigeria using technology. At present, efforts at the acquisition of foreign technologies seem not to be working. This is because, the approach the Nigerian government has adopted in its attempt to achieve technology transfer seems to suggest that technologies can only be transferred through patent and licensing agreements with multinational corporations and through foreign direct investments. All the governments’ efforts at technology transfer since the 1960s tow these lines. The end product of these processes is MNCs establishing their organizations in the country, produce their products/commodities for the consumption of the Nigerian people without Nigerians acquiring the technical and managerial skills and know-how. While it is true that the people benefit from these activities, technology cannot be said to have been transferred. In other words, technology cannot be said to have been transferred if the owners of the technology are those utilizing it in a foreign country, as has been the case in Nigeria. Technology can only be said to have been transferred when the local people (in this case Nigerians) acquire, adopt, absorb and utilize it on their own. As Ake (1984:106) has argued, technological capability is defined in terms of the technological innovation as reflected in patents granted. Simply put, for Nigerians to be said to have acquired a particular technology, they must have made an innovation in the production of a commodity/product and have the patent for that product.

Indeed, the acquisition of foreign technologies and development of indigenous technologies have been a great challenge to Nigeria. It is not therefore surprising that after over half a century of oil exploration and production, Nigeria still depends on foreign expertise for oil drilling activities in the country. Similarly, despite the fact that Nigeria is a huge market for cell phone, with 115 million people using GSM in the country, none of the cell phones is produced in the country. The National Office for Technology Acquisition and Promotion (NOTAP) avers that Nigeria has spent over N300 billion on technology transfer agreements in a 10 years period (Business News, 2011). Yet, in our hospitals most medicines are imported, the equipment are imported; in the banking sector most of electronic gadgets, software, etc are imported and almost 100 percent of machinery used in our industries are imported.

Nigerians have not been able to significantly acquire foreign technologies using the technology transfer agreement model, yet the government is still bent on adopting that approach. For example, after the disappearance of Nigeria's Communication Satellite (NIGCOMSAT1), the Nigerian government replaced it with NIGCOMSAT1R. The government then entered into an agreement with the builders of the new satellite to train Nigerian engineers so that they too can become satellite builders (Osugwu, 2011:12). The Executive Commissioner for Engineering and Standards, Nigeria Communication Commission, Bashir Gwandu, observes that the government was in search of satellite companies to build a second satellite, but would only be interested in companies that would transfer technology to Nigerian engineers (Osugwu, 2011:12). What has become clear from the above is that over all these years, the Nigerian government has not understood that owners of technologies do not willingly transfer technology, rather those interested in acquiring technologies "steal" them, as was the case with most Asian economies. A Business News (2011) reporter puts it this way:

If you open your gate as a country for people to bring their technology, money and know-how to come and make money in your country and depart, you are not doing well. What you should do is to use a "magnate" to capture their technology and managerial know-how and be made better. The graduates from our institutions are those magnates, but if the magnates are bad what can we do? So the education system has to push it. By now it should be Nigerians exploring our oil, designing our refineries. By now we should not allow one drop of crude to leave; let us refine them in this country. That is where the jobs are but we are not taking this opportunity. Be that as it may, NOTAP operates in what is still a relatively weak knowledge system and in a country where public institutions are often criticized for excessive bureaucracy, delays, poor expertise and unmotivated workforces. Another challenge is better equipping NOTAP to deliver its mandate. For example, NOTAP needs a large technology exhibition centre where entrepreneurs can come and see global technology, domesticate these technologies and establish businesses. Only a new partnership in a new era of cooperation could make government and its people agree to transfer technological which can make a difference. Only a new breed of Nigeria political leaders could put the welfare of their people first and make it the basis for political and economic policies. With such new partnership and international cooperation local innovations and initiatives would be supported without discrimination. For unless Nigeria creates the environment for creative innovations and supports the same; she will remain technologically backward in a world where technology dominates commerce, politics and even culture. People of good will can help Nigeria, but Nigeria must create the enabling environment for her people to benefit from such support. Political leadership with that vision is currently lacking in Nigeria.

Transfer of technology is a complicated process involving a matrix of cultural, socio-economic, environmental, intellectual, infrastructural, political and other related factors. Nigeria's efforts at technology transfer have to content not only with the widening innovation gap between Nigeria and the developed countries, but also with the nation's poor culture of innovation, as well as the rapid changes in innovation and the shortening life span of innovation cycles; Review of 1956-1981 era, which saw massive importation of capital goods and establishment of very critical industries shows that although technology inflow was appreciable, the internalization of technology was inappreciable. The trajectory of Nigeria's technological development so far appears to resemble that of the movement of an individual staggering about in the manner of a Brownian motion, or more correctly a sleepwalker on a platform that is moving rapidly in the opposite direction, so that the net motion of the sleepwalker is really backwards.

One of the key issues often neglected with transfer of technology is how to construct a receptor to capture the transferred technology and ensure that it is fully internalized to enable it blossom and grow to create similar new technologies on its own within a given time frame without external support. It is only then that technology can be said to be transferred. (But is the innovator willing to kill his/her market and creative power?). Without a deliberate receptor programme, technology transfer will be a chance thing indeed.

Nigeria's national R&D intensity under the S&T Ministry is about 0.06% compared to South Africa 0.70%, China 1.40%, and India 1.2%. There must be massive increase in R&D expenditure to yield a national R&D intensity of at least 1.0% within the next six years i.e. by 2014, and to exceed 2% by 2018. Consideration of all factor costs shows that the required increase in R&D intensity cannot be sourced solely from Federal Government annual budgets. Consequently we need to locate extra sources of funding R&D. And these actually exist. Know-How Licenses account for nearly 50% of all

technology collaborations involved in technology transfer agreements between Nigerian enterprises and foreign transferors. The predominance of Know-How/Technical Assistance and dearth of patent license agreements reflect the very weak indigenous technological capability in the economy. Between 1983 and 1992 while the UK and Western Europe accounted for some 70% of all technology inflow into Nigeria, Asia accounted for about 17%. However, between 2001 and 2006 while the UK and Western Europe accounted for 59%, inflow from Asia accounted for 31%. The indications are that throughout this decade and the next, the upsurge from Asia (mainly China and India) will continue, and the inflow from Europe will gradually diminish to secondary importance. Foreign technology inflow has been at more favorable terms and conditions during 1981 - 2006 when technology transfer became a policy of state compared to the preceding 1956 - 1981 laissez - faire technology transfer of pre-NOIP era.

Intervention by NOTAP has led to savings to the economy of over N90billion between 1990 and 2006, representing an average overpricing of 23% in technology fee; cases of 100% overpricing are quite common. Notwithstanding the attainment of substantial levels of LVA and engagement in global competitive export market by a good number of Nigerian manufacturers, as well as some evidence of horizontal transfer of technology, there have been massive technology transfer failures. Indeed it turns out that Nigeria's energy crisis of "scarcity of energy in the midst of energy abundance", a good example of "paradox of plenty", is an epitome of Nigeria's technology transfer problem. A culture that encourages spirit of enquiry, freedom of thought, sound work ethics, discipline, high regard for truth and integrity, reward for hard work/accomplishment, public spiritedness, justice, and the like, would be a "technology-promoting" culture. In such an open virile, just and active society, innovation will sprout and abound technology will develop and blossom entrepreneurialism will flourish and there would be rapid development. For a vibrant technology transfer, it is imperative to elevate Nigeria to the rank of innovation-oriented nations. Consequently, as a prescription, technology transfer strategy capable of making Nigeria a global "hot spot" and "global power house" must embody the following seven operational objectives: Upgrading technological governance; enthroning a culture of innovation and strengthening intellectual property system; development of human capital with strong entrepreneurial base; establishment of strong technology support structures; creation of technology transfer receptor programs; increased R&D intensity; and infusion of a technological culture and a new mindset.

Nigeria (Africa) must take her destiny into her hands, create confidence in her peoples, develop a culture of innovation, hard work and public spiritedness, acquire adapt, acquire, adapt, internalize technologies from any corner of the globe for the good of the continent, and innovate aggressively to create new opportunities in order to reconfigure the rapidly evolving global economic landscape to her favor. Nigeria needs to keep a date with destiny this century. The financial cost of doing this is not too high. The funds can be available but have indeed remained un-marshaled all along.

Conclusion and Recommendations

Over the years, Nigeria has made frantic efforts to acquire foreign technologies so as to bring development to its citizenry. These attempts should not stop at establishing various research institutes but also in putting in place infrastructures to support them. The fact that up till now, local companies depend heavily on imported technology is evident that the technology transfer initiatives need to be enhanced to ensure technological capability acquisition. This therefore calls for a re-orientation on the process of acquisition and adaptation of imported technology. The existing model of process of technology transfer in Nigeria lacks a strong initiative that encourages learning and continuous deliberate efforts to domesticate technology. The absence of research orientation of local firms occasioned by absence of qualified highly skilled personnel to carry out research and development required in the industry for development of new products and processes leave the local companies continually dependent on technology importation. Hence, the problem is not lack of resources, but the lack of productive investment, ability and clear imaginative orientation which has hindered the gap between reality and aspiration. This study therefore, maintains that it takes more than mere declaration to make any plan work, but the steadiness, drive and moral discipline that will not compromise principle which require certain strength of will, because a plan is just an empty and inactive collection of ideas, hopes and aspirations, without adequate will and discipline needed for implementation. Ultimately, it would be more rewarding if Nigerian policy makers realize the need to look inward, recognize the technological need of the nation, and use same to develop a high competitive manufacturing and industrial sector toward a higher productivity so as to relieve Nigeria the burden of underdevelopment.

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