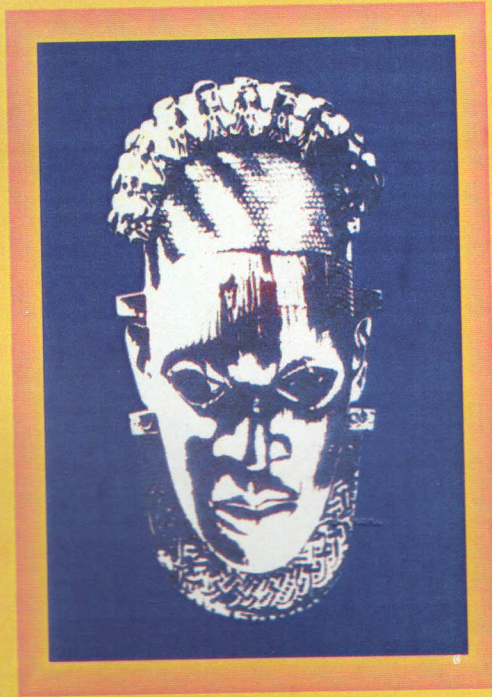




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REFLECTIONS ON TRANSFER OF TECHNOLOGY AND NIGERIA'S INDIGENOUS TECHNOLOGY

Alabi Oladimeji Mohammed*

Abstract

Technology is the application of scientific knowledge for practical purposes. It is sine qua non in transforming human society, because it facilitates man's ability to conquer his environment, thereby promoting social, economic and political development. Every society is endowed with one form of technology or another. The Nigerian region demonstrated a strong capability in technology as orchestrated by the prevalence of indigenous industries in different parts of the region during the pre-colonial period, some of which have survived till the present time. This paper examines how, in an ardent desire to achieve modern know-how, the country has paid much attention to technology transfer through Multi-National Corporations, importation of sophisticated machinery, and over-reliance on foreign expertise. It argues that such channels serve as vehicles for transferring already developed technology into Nigeria. These moves, the paper contends, have largely been unsuccessful, because, rather than stimulating technology development, they have had a negative impact on the country. Some of the adverse effects of technology transfer are: that it has gradually eroded local initiatives, hijacked local market and economy, and promoted economic dependence, thereby turning Nigeria to a consumer economy. The paper concludes that indigenous technology needs to be invigorated as a precondition for achieving technology breakthrough. By using relevant source materials, the study contends that even societies which achieved successful technology transfer, like Japan, China, India and Singapore, first prepared the ground for its reception through their indigenous technologies.

Introduction

Technology has remained the greatest instrument of change in human history. Every human society has demonstrated one form of know-how, or the other in a bid to overcome the challenges presented by the environment. In other words, technology is the product of interaction

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between man and his natural environment, and it is also the instrument for its exploitation. For instance, as *Australopithecus Africanus*, man was thought to be a scavenger, hunter and fruit gatherer. As *Homo erectus*, he had developed into a tool maker and fire user, and lived more in nomadic hunting bands, rather than being individualistic. As *Homo sapiens*, having conquered nature by his tools, which made him a better hunter, he was able to live anywhere, confident of guaranteed security.¹ Man's ability to adapt to his environment for survival, using science and technology, is perhaps the most distinctive feature which makes him a unique entity. He gradually became a technologist, making stone and later, iron tools, as well as building crude shelter for himself. Of course, better tools were a consequence of the interplay between human beings and nature as part of the struggle for survival.²

In the contemporary society, a nation has two possible strategies through which it could achieve modern technology. It has a choice of either going through the technology life cycle, that is, passing through the four stages of pre-introduction, introduction, growth and standardization, or to import already standardised technologies and adopt, modify and change them for its own purposes.³ In any of these strategies however, the local condition of the particular country is a great determining factor of success.

Nigeria, since independence, has adopted different policies aimed at developing her technology since independence over five decades ago. Some of these are the establishment of technical schools, colleges, polytechnics and Universities of Technology. However, technology transfer appears to be accorded greater attention with the spread of Multi-National Corporations in the country. It has often been stressed that transformations which will lead to technological development in any country, must originate from its society, so that it can be nurtured. Thus, the place of indigenous technology in the techno-industrial growth of a nation cannot be over-emphasized. For example the Industrial Revolution was facilitated largely by local condition in Britain, as orchestrated by transformations in the cottage industries in 17th and 18th centuries. This paper thus examines some aspects of Nigeria's indigenous technology; it analyses the concept of technology transfer and its impact on Nigeria's industrial development.

Conceptual Clarifications

Technology as a scientific knowledge aimed at satisfying the basic need and objectives of man, is classified into three broad categories; human

embodied technology such as skill, knowledge and experience; the capital embodied technology such as machines, equipment and tools, and the disembodied technology, which includes blue prints, products and product specifications.⁴ This classification enables us to distinguish between hardware and software technology.

On a broader scale, technology can also be classified as indigenous (endogenous) and foreign (exogenous). While the former refers to the internally generated methods of learning and expressing grassroots' initiative in technology, the latter deals with the transferred (imported) or foreign input in the technology of a nation. Indigenous technology is also referred to as traditional technology, while foreign input is often referred to as modern technology, and somewhere between both concepts, is the term intermediate technology.⁵ This is more of a fusion of the relevant aspects of both indigenous and foreign technology and this gives rise to the concept of appropriate technology. For anything to be indigenous, it must belong to the people in whose environment it exists, rather than being alien to them. In every respect, indigenous technology makes use of the raw materials, the tools and the technology, which are locally available. Therefore, it is the type which is developed by the indigenous community through the harnessing and utilization of local material resources.⁶ The most characteristic feature of this type of technology is that it is self-reliant, one which is capital-saving rather than capital-using, labour-saving rather than labour-using, and one which is easily operated, repaired and maintained locally. This type of technology makes use of simple tools which practitioners invent, modify and replace as situation dictates; as such, the tools and the user are well adopted to one another. Furthermore, because the technology (tools) and skills come as a solution to problems (challenge) identified in the production process, it is always appropriate to the needs of its users, not being too advanced or lower in standard to the problem it seeks to solve.

Technology transfer refers to the diffusion of skills, techniques, ideas and values from the community which possesses them to the community which lacks them for the purpose of development. In a broader sense, the concept refers to the process of transferring skills knowledge, technology, 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, exploit and transform them into new products, processes, applications, materials or services.

Indigenous Technology in Nigeria

The Pre-Colonial history of Nigeria is replete with many indigenous technologies and industries that had made substantial contributions to the country's economy. From time immemorial, various groups in the country had developed their own technologies based on their ecological conditions and ingenuity to satisfy their needs. Over time, traditional arts and crafts, indeed, grew from domestic occupation to very extensive industries, some of which have continued to flourish till the present day.

Iron working represents one of the earliest and most important technologies in Nigeria. The iron technology of Nok culture area of Jos, Bauchi, Daima, Kano and Zaria had been dated to around 500 BC.⁷ Archaeologists have excavated iron spears and axes at Nok, and iron smelting furnaces have been found at Taruga in the same area. At Oyo and its districts, a complex of highly specialized mining villages flourished during the pre-colonial period.⁸ In the same vein, blacksmithing, which is an essential aspect of iron and steel technology, was an important 19th Century Ilorin indigenous craft.⁹ The works of Thurstan Shaw and F. Anozie have also revealed the existence of large quantities of iron in Igbo Ukwu and a slag in the Nsukka area.¹⁰ Indeed, smiting activities in iron, brass, bronze, gold and silver were specialized skills among several indigenous communities in Nigeria: Bida (brass), Kano and Awka (black smiting); Ilorin (gold and blacksmithing), and Agbaja and Ajaokuta (Metal work). Indeed, in the 19th Century, workshops of specific structures, were built for the smiting exercise, which comprised usually, a master blacksmith and a number of apprentices, who assisted in forging metals into desired tools. The impacts of iron in the development of these communities were enormous. It stimulated production in agriculture as farming implements were forged, which had multiplier impact on the communal settlement and enhanced economic power of the people. Iron implements assisted in canoe building in riverine areas, thereby making it possible for areas hitherto inaccessible to be connected. It gave a comparatively better advantage to the people and generally stimulated economic, social and political development. Iron technology provided arrows, bows, spears, swords, daggers and guns with which state formation was accomplished during in the 19th Century.

Traditional weaving is another activity in which indigenous technology found expression in precolonial Nigeria.¹¹ It is particularly striking that in the early centuries of trade, Europeans relied heavily on Indian cloths for resale in Africa, and they also purchased cloths from several parts of the West African coast for resale elsewhere. Morocco, Mauritania, Senegambia, Ivory Coast, Benin, Yorubaland and Loango were all exporters to other parts of Africa through European middlemen.¹² This shows that the volume of production and quality of cloth produced in these societies were great. From ancient times, indigenous textile technology in ginning, carding, spinning, weaving and dyeing had been popular practices among Nigerian people. Two types of looms were particularly in use. These were the horizontal narrow handloom and the vertical broadloom. While males worked the narrow handloom, females worked the broadloom. Weaving was quite popular among Ilorin, Oyo, Okene, Kano, Nupe, Kabba, Abeokuta, Ijebu-ode, Owo and parts of Igboland. These communities turned out quality hand manufactured cloths, not only for the local markets but also for export. Some of the indigenous fabrics produced among the Yoruba include *Sanyan*, *Etu*, *Petuje*, *Alaari* and *Kijipa*, while indigo plants, especially the local species *indigofera erecta*, produced the major dye used. By the mid-19th century, Kano had become in influence, if not in organization, the Manchester of West Africa for the value of her cloth sales. The famous traveler, Barth estimated Kano's cloths sales to at least 300,000,000 cowries a year in the 1850s, which was an equivalence of £40,000.¹³ Although indigenous weaving survived colonialism in Nigeria, its volume of production had reduced drastically especially.

Pottery represents another significant application of indigenous skills and techniques in pre-colonial Nigeria. Archaeological evidence that located pottery at Rop Rock Shelter on the Jos Plateau, dated back to around 300 B.C. The Igbo Ukwu pottery also contained a large quantity of broken pots, while at Benin, pottery made over seven centuries had been excavated. The people of Daima located at the south of Lake Chad were similarly known for their good pottery works in the pre-colonial period.¹⁴ During his visit to Hausaland between 1851 and 1854, Henrich Barth recorded that different crafts including pottery, were carried out at Katsina, Air, Sokoto, Adamawa, Kano and Gwandu. Pot sheds had also been found in Iwo-Eleru near Akure in 1965 and Ukpa Rock Shelter near Afikpo in 1966. In Ilorin, the Dada Pottery Centre has been noted as one of the largest ceramic centres in West Africa. Several other communities like Oga, Isan, Ekiti, Inyi,

Ishigu, Ife, Owo, Patigi, Obeku and Abuja were renowned for their excellent techniques of pot making. Indeed, Michael Cardew, in a preliminary survey of pottery in West Africa, attested to the excellence of native potters' techniques.¹⁵ He believes that the native potters operated a very ancient tradition and that their notorious conservation is grounded in good traditional knowledge of the craft. The product is finely adapted, technically and economically to the needs of village life.¹⁶

Other indigenous technologies, which supported pre-colonial economy, and which were gradually developing, included the leather and skin work, metal and bead industry, carving, brewing etc. Sokoto, Kano, Bida and Maiduguri have long been important centres for leather and skin works.¹⁷ Hausaland was generally noted by a 16th century traveler, Leo Africanus as West Africa's most famous leather working and exporting centre. Most of the leather sandals made in Gobir were exported to Timbuktu, Gao and Asante Kingdom. These leather works attracted patronage in Europe where they were erroneously referred as Moroccan leather. By 1851 it was estimated that Kano exported not less than ten million pairs of leather works northwards to Timbuktu Gao and Tripoli.¹⁸

Indigenous Technology and Colonialism

British colonial venture in Nigeria was largely a means to an end, the primary motive being the economic gain derivable from the local environment:

The imperial government pursued mercantilist policy whose primary purpose was to reconstruct Nigeria into a trading economy, supplying the raw material needs of industrial Britain in exchange for manufactures. Justification for this relationship was sought in the so-called theory of comparative advantage. By this theory, Nigeria was to be condemned perpetually to be a raw material producer while Britain was favoured as producer of industrial and consumer goods.¹⁹

With colonialism, the initial steady progress achieved in Nigeria's indigenous industries, was destabilized. A.A Kudu categorized this policy into direct and indirect attacks as targeted on local initiatives.²⁰ The mining industry specifically suffered from direct attack as the colonial

administration embarked on stringent measures to ensure total elimination of indigenous entrepreneurs from the craft, through direct prohibition of indigenous miners and smelters of tin and iron ore by series of proclamations (Crown Lands).²¹ While the indirect attack on indigenous technology took the form of forced labour, taxation and mass importation of products were made to rival those produced locally. Both forced labour and taxation had the same impact on the local economy; there was the removal of active hands from purposeful and beneficial activities to those activities exclusively beneficial to the colonial administration. C.C Jacobs describes forced labour as "the recruitment of labour by coercion to undertake works which it would not normally have willingly undertaken whether it was paid or unpaid."²²

Therefore, colonialism had dislodged local technology in the productive sector and turned many Nigerians to labourers, and the country, to a mere supplier of raw materials and markets for European manufactured goods.

Nigeria and Technology Transfer

The importation of already developed technology, from advanced economies by the less developed countries, has been a problematic and unrewarding venture for most African countries, including Nigeria. This is largely due, either to lack of adequate favourable conditions for a successful reception of such advanced technology, or the unwillingness of the "owners" to relinquish their know-how, or a combination of the two possibilities. Successive governments in Africa, since independence, have continued to encourage, though inadvertently, the decline of indigenous technology through the uninhibited importation of all forms of foreign technology. There has been the tendency towards the establishment of "Turn-key" or wholesomely imported technology which is intrinsically unviable within the culture and environment of the African society.²³ For a proper diagnosis of the weight of technology transfer on Nigeria, there is the need to examine the concept beyond mere definition. In doing this, three schools of thought on the subject are examined as follows:

The Conventional School examines technology transfer in terms of the product cycle theory of international trade in which technology owning enterprises in the advanced countries exploit their monopoly advantages in the Third World market.²⁴ This is basically done either, directly through the establishment of firms (companies), usually called Multinational

Corporations in less developed countries, or when the developed nations connive with another enterprise already established in less developed countries. These examples are visible in Nigeria. Multinational Corporations are though widespread in the country visibly operating in such areas as construction, petrochemicals, automobile, telecommunication, food technology and beverages. The hope of technological development through such corporations has remained elusive. Rather than assisting the country to achieve technological growth, the nation has been drifting away from technological progress. This school therefore sees technology transfer as a support for the international division of labour by which the less developed countries (including Nigeria) remain a primary producer while the developed countries are secondary producers.

The Dependency School focuses on the relationship between the less developed countries and the advanced capitalist countries. The Marxists within the school, maintain that dependency is the inevitable result of capitalist development.²⁵ The focal point of the dependency school, is the centre-periphery concept, which maintains that the third world is part of the centre. This relationship makes technology to remain a problematic issue in the third world countries. In this case, technology has become a tool used by the advanced countries for checkmating the less developed countries. In Nigeria, the story is not different, as the nation's market has been hijacked by the developed nations. Indeed, economic dependence is strongly tied to technology dependence; a nation which lacks technology is forced to accept the dictates of the developed nation.

The Supremacist School relates to racial superiority highly publicized by the West against the rest of the world, particularly Africa. There is the concept of the supremacy of the Aryan race in which the advanced countries see Africa as a museum of barbarism or "a zone of immemorial stagnation" which needs to be regenerated by an advanced culture.²⁶ This conception is predicated on the belief by the Europeans in the supremacy of their race, variously referred to as euro centrism or hermitic hypothesis, in which Africa and other races are viewed as naturally subordinated to them, and as such, should obey the already ordered precept. This theory has been employed to explain Afro-European relations at various periods in history. Social Darwinists in the 19th century, for instance, argued that nothing was wrong with the exploitative colonial cum imperial enterprise in Africa, through which natives were practically relegated to the position of servitude while the proceeds of the colonial enterprise were

appropriated to the metropolis in Europe. The same argument was offered for apartheid ideology in different parts of Southern Africa.

Meanwhile, technology transfer, however attractive it may appear, portends the following negative impact on Nigeria. It deters local initiatives by shifting attention from indigenous productive efforts to foreign methods, and this takes the form of importation of machineries and implement which Nigerians do not know their origin. The country is, in effect, forced to seek foreign expertise in managing them. Through this, substantial money is paid for consultancy, thereby making the achievement of self-reliance a mirage. Therefore, for foreign technology to work, it has to be adaptable to local condition. The indigenous productive means have to be able to accommodate the foreign technology so that it can be nurtured adequately. However, the degree of transferability seems to be higher within the developed nations wherein exist what could be described as "necessary and sufficient conditions," which has been summarized by Iya Abubakaras follows

.....but if the principle of transfer is to succeed, there is need in the countries of the third world for some form of established organization to cope with the reception of technology, and capable of selecting, assimilating, adapting and innovating the kind of technology needed for economic growth and social development.²⁷

It is such local endowment which enabled countries like Japan, China, Korea, Taiwan, Singapore and India to successfully import (copy) technology from the West. In the case of Japan, it was already a highly developed feudal society, progressing towards its own capitalist form by the 19th century. It was this local progress that ultimately enabled Japan to successfully borrow from Europe.²⁸ It can be argued further that what has been transferred, for the most time, is colossal economic resources from the less developed and developing countries to the already developed ones. This is what J. Ohoirhenuan succinctly observes as:

Technology dependence is not the massive importation of machines and knowledge. More importantly, it refers to the conditions of being without and unable to develop an indigenous technological capacity. In essence, technological dependence means that technology..... has become the medium through which the centers of

world capitalist system extract surplus from and control the major economic (and therefore political) decisions in the underdeveloped countries.²⁹

Furthermore, technology transfer has become a tool of economic conspiracy by the industrialized nations against the industrially backward countries. The transfer syndrome is part of the process of wealth transfer, through which the Third World countries (including Nigeria) sustain the economy of the industrialized nations, since the transfer is not free, but rather highly paid for, in human and material resources. Thus various forms of capital that would have been invested in the indigenous technology are being tapped abroad by the advanced countries. The Multinational Corporations play the roles described above as representatives of capitalist interests. Little wonder that after several decades of operation in Nigeria, the Multinational Corporations are yet to have serious linkages with the indigenous technology, rather they operate like states within the country, declaring huge dividends annually while the local economy worsens continually. The country largely serves as a dormant host, incurring losses in terms of environmental degradation, pollution, health hazards, oil spillage and deadly toxic wastes from foreign companies. This results in constant agitations and endless demands for compensation and rehabilitation of the degraded environment of the host communities, particularly in the oil rich Niger Delta area, mostly prone to these adversities.

Technology transfer has also been used as an instrument of globalization by the developed countries. The rapid integration of national economies worldwide through trade, financial flows, technology spillovers, information networks and cross-cultural current, has further made the less developed countries susceptible to domination. Countries are encouraged to open their economies to foreign capital investment since in globalization, neither distance nor national barriers will impede economic transactions. Nigeria's initial progress in indigenous technology has, therefore, been lost due to the influx of products from the developed world. Thus, the market hitherto enjoyed by indigenous technology and their industries like weaving, iron industry, bronze, brass, glass, beads, pottery, local brewing etc. drastically reduced, while in few cases, production is gradually phasing out. As observed by Rodney, the lines of economic activity attached to foreign trade were either as destructive as slavery was, or at best, primarily extractive. In fact the Europeans deliberately blocked the diffusion of their

technology to Africa. He illustrated how some African leaders sought European technologies without success. Congo, for instance, in the 16th Century, Ethiopia also in the same Century, under Emperor Lebna Dengel, felt the need to introduce European technical knowledge into his society but failed. Again, Agaja Trudo of Dahomey in 1720 and Asantehene Opoku Ware (1720-50), both sought European skills but got no response.³⁰

Away With Technology Transfer

In the contemporary world, wealthy nations are those that are creative and thus, are continually able to offer new products in the global market. Nigeria's creative ability is though not in doubt, the country has largely remained dormant due to her over reliance on foreign technology. It is argued that any culture, developed by any ethnic taxon or race, employs and manipulates two aspects of knowledge; particularistic and universalistic.

³¹ Particularistic knowledge is that aspect which marks out one culture from the other. Such is a body of intellectual wealth, constituting a peoples basic non material culture, which changes at a very slow rate even during and after a revolution. Universalistic knowledge, on the other hand is materialistic in nature and is best typified by technology of which the first and most primitive forms originated in the continent of Africa, and spread to other parts of the world where it underwent complication and elaboration.³² Its rate of change is, however, generally greater than that of particularistic knowledge. The point being stressed here is that no single race can lay claim to the achievement of universalistic knowledge, rather, it is a collective effort of mankind. Indeed, it has been argued that universalistic knowledge (technology) did not start in 1750 with the advent of industrial revolution. In fact, there are other important revolutions in human history. The first pebble industry, which originated in Africa, over a million years ago, is the genesis of a lithic technological development antecedent of Homosapiens. It has since undergone complex stages of development and refinements to which the different races of mankind have contributed their quota at different eras of human history. Technology is therefore the accumulated knowledge of all people of the world, and does not belong to any one pure race as writers like Baker and Oyebola want the world to believe.³³ Indeed, Onwuejeogwu describes this early technology as the great lithic revolution. According to him, this was then equally mystifying and profound to Homo sapiens, and from this humble but important beginning, the most complicated tools of modern world evolved.³⁴

Therefore, if Africa had played such significant roles in the foundation of technology, she can still retrace her steps and forge ahead in technology, in spite of the setbacks already recorded. The developed nations have tried to particularize technology through moves such as patents on proliferation specifically targeted at confining certain aspects of technology to their own domain. The case of Ajaokuta steel project is a glaring example of the reluctance of the advanced countries to transfer technology to Nigeria.

On industrialization, Africa and indeed Nigeria, have a rich record. Two basic types of industrialization have taken place in the history of man. These are domestic and techno-scientific industrialization. Domestic industrialization refers to all systems of production organized basically on small scale, using homes as the main centers of production. This type of industrialization occurred in every continent, in different forms and intensities, at different periods since the advent of the Neolithic Age, through the Metal Age to modern times. For example, in Europe throughout the Middle Ages and up to about the middle of the 19th century, the characteristic industry was domestic. Similarly in Africa throughout the early Metal Age (about 350 BC -1000A.D), the mature metal Age (1300-1600), and the transitional age (1600 - 1900), industry was by and large, domestic.³⁵ The ancient civilizations of Egypt, Nok, Meroe, Axum, Zimbabwe, Ghana, Igbo, Yoruba, Benin and Hausa were sustained on domestic industries characterized by the use of non-machine technology.

All forms of Nigeria's indigenous technology discussed earlier were mostly operated on domestic basis. A most decisive factor in the growth of industry in Europe, was the change over from domestic production to the factory system, in addition to the advent of machinery. Similarly, the guild system was visible among local technologists in Nigeria. Benin and Nupe are shining examples of societies where guild system operated. In Benin the famous brass and bronze industry was controlled by a guild caste type, while each Nupe guild had a common workshop and a master for the control of the glass and beads industry. This shows that Nigeria was already progressing steadily in its industrialization with increasing specialization and division of labour.

Techno-scientific industrialization is the other type and this began with the Industrial Revolution as from 1750. However, this type is yet to be universalized. In fact, this type of industrialization grew out of the domestic industries as typified by Britain's cottage industries in the pre-industrial revolution era. The British only held sway in this aspect for a period, for

within two centuries of its beginning, other countries such as France, Germany, United States of America, Russia, Japan and China joined the race. However one factor of note in this revolution is the radical application of science and technology in solving problems and satisfying the needs of man. Nigeria, however, lags behind in this aspect. As observed by Rodney, one feature associated with technological advance is the spirit of scientific enquiry closely related to the process of production. This will lead to inventiveness and innovation as witnessed in the British weaving industry in the 17th and 18th centuries, which ultimately stimulated the industrial revolution. In the same vein, instead of embarking on technology transfer, Nigeria needs to give priority attention to the pursuance of scientific enquiry and inventiveness as a way of transforming its indigenous technology. The German Democratic Republic, for instance, established a young innovators fair in 1958, calling upon the intellectual creativity of socialist youths, so that within ten years, over 2000 new inventions were presented at that fair.³⁶ Nigeria needs such initiatives and programmes of action in order to make her technology transfer efforts become a realistic and sustainable exercise.

Conclusion

Pre-colonial Nigeria states had multitude of indigenous industries and technologies which contributed to the growth of the economy. Indeed, the widespread nature of technology during the period encouraged specialization, and was gradually stimulating innovation in various productive areas. However, colonialism interrupted this steady progress through policies which subjugated the practitioners to the position of labourers and subservient farmers. Since independence, various options had been employed by government in the pursuance of technology development, with technology transfer given a priority attention. This policy has had negative effects on indigenous technology. These include, continuous discouragement of local initiatives in indigenous technology, hijacking the market of local technologies through competition from imported goods, continuous wealth transfer to the metropolis in the case of Multinational Corporations as instruments of globalization, thereby increasing marginalization and drifting the country farther from self-reliance. Nigeria thus needs to re-assess her tie with the Multinational Corporations, who rather than being vehicles for technology transfer, have catalyzed the inhibition of local initiatives, and served as vendors for evacuating the

country's wealth. The country, therefore, must revitalize and develop her indigenous technology as a means of creating an appropriate technology, which can be nurtured in Nigeria by Nigerians.

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