
ENHANCING INDUSTRIALIZATION IN AFRICA THROUGH INDIGENOUS TECHNOLOGY

Otuu J.B.

Department of Mechanical Engineering
Akanu Ibiam Federal Polytechnic, Unwana Afikpo, Ebonyi State
Email: johnotuu@gmail.com

Abstract: One fundamental problem responsible for the technological backwardness of West Africa and indeed the whole of Africa is the inability of governments, stakeholders and peoples of the region to explore indigenous viable opportunities. A key answer to this problem lies in according indigenous technology the attention and pride of place it deserves. The feeling of a people in respect of their culture and tradition which define their identity and station in global events propels their desire for development. When a people's indigenous knowledge, experiences, precepts, traditions and history are thrown off in favour of foreign ones, it beclouds and endangers the people's corporate survival and identity. Indigenous technology, viewed against the backdrop of technology, is not a new concept. The paper therefore, looks at the concepts of indigenous knowledge and indigenous technology. The characteristics of indigenous knowledge and technology are considered. The paper also looks at the threats to indigenous technology and knowledge. It outlines the developmental opportunities offered by indigenous technology for West Africa in particular and Africa as a whole. Finally, the paper discusses ways of enhancing indigenous knowledge and technology.

Keywords: Indigenous Language, Indigenous Knowledge, Indigenous Technology, Industrialization, Technology

INTRODUCTION

Technology is the scientific application of knowledge, skills and resources for the purpose of meeting the needs and aspirations of a people. It refers to a device, tool or piece of equipment. Technology designed and fabricated based on the culture, tradition and needs of a people and which is adopted for use in the environment of those people is called indigenous technology (IT). One vital characteristic peculiar to IT is that through meaningful interactions, it seeks to engage and evoke significant knowledge and experiences reflective of the indigenous world. West Africa and indeed the whole of Africa possess a vast amount of indigenous technologies (ITs) and knowledge which are embodied in the continent's cultural and ecological diversities. For instance, several communities in Nigeria, just like the Aboriginal people of Australia, have IT items such as tools and implements, weapons, boomerangs, nets, baskets and

bags, as well as watercraft and canoes. In Africa, these items can be harnessed to meet international standards. If they are properly harnessed, they stimulate industrial development and domestic capacity building, impose checks on imports so that local industries can grow, and propel a nation to attain technological self-reliance. Indigenous technology and knowledge are relevant to such sectors and strategies as agriculture, preventive medicine, community development and poverty alleviation. African peoples seem to have a penchant for foreign technologies.

However, because of the fact that such technologies were not designed peculiar to the African environment, they are often confronted with the problem of spare parts, knowledge of the design principles and maintenance and repairs. Indigenous knowledge which forms the bedrock of effective IT development is facing extinction, occasioned largely by the absence of strong mechanism for ensuring that such knowledge is passed on from generation to generation. More so, IT fabricators and developers lack effective mechanism for market promotion and for guaranteeing their protection. In order to enhance indigenous technologies and knowledge, governments of African countries, just like India, need to form strategic alliances between them and the indigenous technology developers. Governments can purchase the indigenously developed products and can as well promote them in such a way that they make in-roads into the global market.

Technology

There is a great confusion about what technology means and stands for. As a result of this, Bijker, Hughes and Pinch (1987) argued that it is pointless wasting valuable time trying to reach a consensus definition as the term does not carry a single meaning. In fact, Lawson (2008) pointed out that attempts at trying to reach an all-sharp and embracing definition over the years has only led to failure. *Journal of Education and Practice* www.iiste.org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.5, No.37, 2014 55 Technology can be better understood and defined if we see the concept from Foucault's (1988) perspective of four types of technology which always function together.. These four types of technologies are technologies of production, technologies of sign systems, technologies of power and technologies of the self. According to Foucault, technologies of production allow us to produce, transform or manipulate things; technologies of sign systems permit us to use symbols, signs or meaning and technologies of power determine individual behavior. In the words of Peters (2003), technologies of the self are an approach to study the ethics of the individual. This paper dwells on the technologies of production which deals with production, transformation and manipulation of things.

Otuu J.B.

However, against the backdrop of the porous nature of the African environment in respect of peace and tranquility, which can impede production practices, a brief discussion on the technologies of the self needs to be offered. Technologies of the self can better be articulated by considering the human factor (HF) theory advocated by Adjibolosoo (1995), who opined that the human factor refers to the “spectrum of personality characteristics and other dimensions of human performance that enable social, economic and political institutions to function and remain functional over time” (p.33). In the words of Muranda (2003), the HF characteristics involve commitment, responsibility, honesty, integrity, accountability in the conduct of activities in the work place. Integrity means an exhibition of a high degree of adherence and commitment to sound moral principles (Adjibolosoo, 2003). Perhaps what West Africa and indeed the whole of Africa would require now is the technology of the self in the light of growing tensions and corruption and bribery in the African region. It is obvious that ethnic and regional tensions and corruption impede progress. Many African States have not been able to achieve technological independence because of growing unrests and corruption. It becomes absolutely difficult for any nation to develop and harness her indigenous technologies when the atmosphere to do so is threatened by fighting and other forms of dissension. Therefore, Africa desperately needs the technologies of the self at this critical period in her history.

At the beginning of the 20th century, the public meaning of technology was associated with achievement, progress and purpose (Adams, 1991; Pacey, 2001). Abdulkareem (1992) saw technology as the art and science of applying man’s knowledge in human endeavours so as to satisfy man’s needs. Burkitt (2002:224) defined technology to mean “a form of practical action accompanied by practical reason which aims to in still in the body certain habitual actions - either moral virtues or technical skills.” The International Technology Education Association (2002:2) defined technology as the way “people modify the natural world to suit their own purposes...it refers to the diverse collection of processes and knowledge that people use to extend human abilities to satisfy human needs and wants.” The South African Department of Education (2002:4) defined technology as the “use of knowledge, skills and resources to meet people’s needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration.” From the Renaissance period into the present era, technology has been seen as a body of knowledge about the useful arts and its contemporary understanding is associated with modernity. From the foregoing, technology can be defined as the application of knowledge towards the design and fabrication of devices, tools and appliances to better the condition of man. Technology is the art of using knowledge appropriately to create something that alters the condition of living of a people. It refers to the application of knowledge,

skills and resources to meet people's needs and wants. It can be accepted that technology is the tool that keeps going the socio-economic life of a people. It can as well be accepted that technology refers to the science and art of putting to use man's knowledge, skills and experiences in human endeavours so as to meet the needs and wants of people.

Indigenous Knowledge (IK) and Indigenous Technology (IT)

As with technology and other related terminologies, indigenous knowledge (IK) does not have an all-embracing and sharp definition. This is because the concept is highly structured on the identity and culture of a people. In other words, the concept is sometimes referred to as local or traditional knowledge. Explaining IK, Warren (1991) said it refers to the local knowledge which is unique to a given culture or society, stressing that IK here is contrasted with the international knowledge system generated by universities, research institutions and private firms. Warren added that IK is the basis for local-level decision making in agriculture, health care, food preservation, education, natural resource management and other activities in rural communities. Consequently, Siyanbola et al. (2012) identified the following as the characteristics of Indigenous knowledge:

- 1) It is centred on local or indigenous peoples and their beliefs and practices;
- 2) It is generally bound by geography in that the knowledge, most often, does not transcend the locality it originates from;
- 3) It is generally tacit in nature, being most times orally passed from person to person, for generations, through stories, folklore, legends, songs, rituals and laws; and
- 4) It is not dated in the sense that the knowledge or practices do not necessarily have to be primordial. The fact that IK deals with the beliefs and practices of a people demonstrates the uniqueness of the people and their culture and traditions. Most traditional practices and beliefs are not necessarily written down. Through the process of oral transmission, they are known and understood and adhered to. Of utmost importance to this discussion on IK is the presence of the sage in most communities of Africa.

These people, who can be regarded as the ancient people, hold, protect and preserve the traditions of the people. Though their vast amount of knowledge is not written down, they constitute a very valuable source of research endeavours, especially on indigenous technologies of African peoples both in Africa and in the Diaspora. There is no effective discussion on indigenous technology (IT) without a discussion on indigenous knowledge. It needs to be stated unequivocally that it is difficult to comprehend IT without adequate indigenous knowledge. In fact, IT operations are predicated on essential indigenous knowledge systems. In view of this, indigenous technology has been perceived

Otuu J.B.

from several perspectives. The concept refers to the study, mastery, adoption and adaptation of existing technologies to suit the needs of an environment (Adelaga, 1997). Aliyu (2003) saw IT as a coordinated system of technologies developed by indigenes for their use based on available raw materials and tailored to meet local needs and conditions. IT is therefore, viewed as any technology designed, fabricated, adopted and used in an environment for the advancement of people of that environment. As has already been pointed out, IT and IK cannot be divorced from each other. In fact, IT acquisition is predicated on useful indigenous knowledge. Consequently, in the words of Siyanbola et al. (2012), when IK finds application in tools, technologies, processes and methods that help in solving problems of society, indigenous technology has sprung up. According to the Native American Academy Silver Buffalo (N.D.), there are certain characteristics that are peculiar and distinct to indigenous technology. Some of the characteristics are as follows:

1. ITs emerge from the implicit order to reflect the art of skilful living. It is pragmatic, responsive and responsible to the ecology in which it lives.
2. IT attracts the learning spirit; it provides a learning ecology that supports the revitalization and transformation of awareness and knowledge.
3. Through meaningful interactions, IT seeks to engage and evoke significant knowledge and experiences reflective of the indigenous world.
4. ITs have the obligation to come into existence, to be used and to transform within an ethical space that is responsible to life in all its forms.
5. IT is coherent with the natural order. In other words, the ability or capacity to make something does not constitute a valid reason for its existence.
6. ITs have intrinsic value because we know their ancestry where they came from, what their place is in our world. We know they will transform and pass from this place to return to the realms of energies.

Some of Indigenous Technologies Found in Africa

Africa is blessed with a vast amount of indigenous technologies (ITs). First, there is a great commonality between the Aboriginal people of Australia and many African tribes in respect of indigenous technologies. The commonality is conspicuous in areas of tools and implements, weapons, boomerangs, nets, baskets and bags, watercraft and canoes, bush food implements and shelters. The work of Amuda and Waziri (2012) showed that very many years ago, indigenous technologies and science practices were common among women in Borno State, North-Eastern Nigeria. The practices included using glass mirrors, washing plates and clothes, splitting of firewood using the axe-head, treating fever, diarrhoea and cough by steaming leaves and other herbs, and applying natural products like ash, ground pepper and animal dung to protect crops against pests and diseases.

There have been in existence indigenous industries in Nigeria and in several parts of West Africa. These IT industries include the production of pots from clay, and especially the wonder clay pot and stove from Sierra Leone (shown on Gotel TV in Adamawa State, Nigeria). Others are textile making, cloth weaving, production of aluminum metal scraps and pots, leather tanning and bronze casting.

Threats to Indigenous Knowledge and Technologies

Over-reliance on foreign technologies constitutes a serious threat to the development of indigenous technologies (John, Manabete, Zambwa, Abba & Abdullahi, 2009). Consequently, most of the technologies in markets of developing countries of Africa are of foreign origin (Adelaga, 1997; Manabete, Zambwa & Mallum, 2006). In other words, many Nigerians and people of Africa, just like the people of India, have a penchant for foreign technologies. For the Indian people, the reasons for this development are lack of a benchmarking exercise either by the developmental agency or by government and the ignorance of the buying agencies about the potentially developed indigenous products. This has led to shelving or neglect of indigenous developmental programmes in spite of huge sums of money being pumped in that sector (Innomantra Consulting Private Limited, 2011). The imported technologies did not take into cognizance the indigenous knowledge systems of African peoples. Consequently, four fundamental problems present themselves, namely, problem of adequately articulating the foreign language of the technologies; problem of adequately articulating the design principles of the technologies, lack of adequate knowledge of repair fundamentals, and the problem of spare parts availability. The work of Manabete et al (2006) lends credence to this position. The work essentially examined the dual tube four-in-one rechargeable lantern which from 2001, saturated markets in major cities in Nigeria.

A fundamental finding of the study was that repair personnel faced difficulties relating to training, service manual, appropriate service tools and spare parts. A follow-up study by Zambwa et al (2009) on the availability of electrical and electronic spare parts for repair work found that the parts were not available and repair personnel were in a deplorable and undesirable state. Language plays a vital role in the articulation of concepts, theories and principles. For most African peoples, language in technological development is an issue that needs to be addressed. The question is, Can't Africa teach her peoples to develop and harness her indigenous technologies, since the technologies are of their very local environments? Must an old man in an African village who is a master craftsman and who possesses indigenous knowledge necessarily articulate a foreign language before his product can be considered viable? It is a known fact that countries in Europe which spearheaded the industrial revolution up to the present

Otuu J.B.

developments in science and technology employed their indigenous languages in communication and instruction. Britain, Germany, Russia, France and countries in the Balkans in South-east Europe, among others, all used their indigenous languages for communication and instructional purposes to develop their technologies to a world class status. The Asian Tigers, notably North and South Korea, Japan, China and to a certain extent, Malaysia, used a great deal of their indigenous languages in instruction to enhance their technologies. Indigenous knowledge and technologies are facing the threat of exploitation by foreign technologies.

Developmental Opportunities Offered by IT Fort Africa

In spite of the low patronage IT has received from indigenous peoples and governments, it has several prospects for development of Africa. According to the Innomantra Consulting Private Limited (2011), IT, when pursued vigorously offers the following opportunities for development:

1. It catalyses the economic growth of a nation along with providing employment opportunities to citizens.
2. IT helps a nation attain self-reliance in the technological arena.
3. It provides ample opportunity for innovation, modernization and technological competitiveness.
4. IT stimulates industrial development and domestic capacity building
5. It creates awareness and demand for it in the global market. In Nigeria, for instance, there are demands in the global market of indigenous methods of processing cassava, cocoa, and yam and in shelling crops like maize and ground nuts.
6. IT has the tendency to impose checks on the imports from overseas and to provide opportunities for exportation of technology.
7. Increased opportunities in the field of agriculture.

According to Corpor (2013), indigenous technologies are helpful for farmers, for good production of crops, increased fertility of soil, rise in quantity and quality of food. The African Ministerial Conference on Science and Technology, AMCST, publication (N.D.) stressed that the continent has a relatively rich body of indigenous knowledge and related technologies which is embodied in the continent's cultural and ecological diversities.

The AMCS document held that indigenous knowledge and technologies play vital roles in biodiversity, conservation and sustainable development, contributing to increased food production, fighting against the dreaded disease HIV/AIDS and related diseases, as well as considerably stemming environmental degradation. What this means is that indigenous knowledge and technology offers

a wide spectrum of opportunities for development. In fact, all these opportunities are indicative of the developmental needs of various African communities. Therefore, if governments of West Africa are able to use what was handed down to them from time immemorial (indigenous knowledge and technology), their peoples will have initiated development for themselves without foreign intervention. All that is required is the political willpower to do so.

Enhancing Indigenous Technologies (ITs)

According to Folayan (1998:1), "Every culture has her technology for achieving desired goals. However, knowledge of other existing technologies/methods and materials often lead to better choices and therefore, better results. Consequently, in the last three decades, Nigeria has made giant strides in the design, fabrication, refining and development of ITs, especially in the agricultural sector. Ademosun (2002) provided a catalogue of those agricultural ITs to include cassava planter, cassava harvester, melon sheller, grain separator, rice thresher, maize sheller, cassava peeling machine, cow pea thresher, crop transplanter, manually operated electrostatic planter, cocoa plantation weeding machine, groundnut harvester, maize Husker-Shellier, water hyacinth harvester, donkey driven cultivator cum-seeder and thresher for locust bean. Often, the indigenous knowledge of those technologies is refined by a more scientific knowledge and methods so as to not only improve its quality but to raise its reputation in the global market.

Buttressing this point, Siyanbola et al (2012) held that in order for any nation to withstand competition in this era of globalization, there is need for that nation to detect its niche areas and then build on it by applying scientific methods towards improving and enhancing its indigenous technologies. In Nigeria and indeed in many African countries, it is most unfortunate that research and development (R & D) efforts are left with the academia, perceived as a mere academic exercise. Successive governments and people who should be considered rightful stakeholders in tertiary education, more often than not, do not think that it is a worthwhile venture to commit time and resources to R and D. This is not the case with India, however. In India, there is a strategic alliance between government and technology developers. In other words, R and D activities receive tremendous government funding (Innomantra Consulting Private Limited, 2011). This mutual partnership between government and technology developers has yielded the following benefits:

1. Mutual technological, managerial and financial strengths
2. Setting up realistic specifications, reducing and optimization of trial cycles and elimination of moving goal post strategy.
3. Reduction in time for development, production and induction of products that meet the service requirements.
4. A mediated and reasonable sharing of costs by the allies

Otuu J.B.

5. Encouragement for the development of spin-off technologies which can be applied in civil sectors.
6. Encouragement for exportation of indigenous products which would create a pull for those products in the domestic market.
7. Government can implement effective price control on products developed in alliance with private technology providers. This creates a dual advantage.

First, by entering into cooperative alliance with private technology providers, a private firm could turn around an unhealthy project/establishment into a profitable one. Second, government could enable a healthy government R and D firm to run on more effective and efficient lines by collaborating with private partners.

CONCLUSION

It needs be pointed out that modern technologies evolved, through time, study, exploration and innovation, from primitive cultures and traditions. This must be accepted as a fact because no nation in the world ever came into being as a fully developed technological nation, though today the protagonists of modernism have frequently viewed technologies used in traditional societies as non-innovative, primitive, unscientific, backward and of low cost (Boyne & Rattani, 1990; McGoven, 1990), though Siyanbola and associates (2012) conceded that one basic problem with ITs is standardization and codification which makes knowledge transfer easier and preserves the integrity of indigenous technologies. One important way to enhance ITs towards standardization and codification methods is to explore the option of transfer of technology (T of T). T of T is viewed here not from the perspective of the cargo cult (Achebe, 2000) but fundamentally from the acquisition of functional scientific skills, knowledge and experience for incorporation into indigenous knowledge systems. This is necessary because West Africa and indeed Africa as a whole needs to compete favorably with countries from across the globe.

Another way to enhance ITs is to combine Western and indigenous training especially in the field of medical practice. Long before the advent of western civilization, African peoples possessed vast knowledge on various aspects of medicine. Treatments were offered in areas of snakebites, dog bites, bone disorders and several other ailments. Indigenous pharmaceutical and medical treatments were common, including treatment of psychiatric disorders. Therefore, it would not pay to simply dismiss indigenous traditional practice as being primitive, non-innovative, unscientific and backward. Many times, western medicine and traditional medicine stay very far apart. In fact, western medicine in particular, looks with suspicion at traditional medicine and its practices. The

question is, Can a synergy be created between traditional medical practice and western (modern) medical practice? Can traditional medicine, rid of superstition and fairy tales, be examined, refined and adopted in modern medical practice? The Chinese got the secret and they are forging ahead in technological innovations. It is only when this is done that West Africa and indeed Africa as a whole will be confident enough to talk about its invaluable contribution to the global quest for technological development and industrialization.

RECOMMENDATIONS

Following the numerous threats to the survival of indigenous technologies in Africa, the following recommendations are made:

1. West Africa and indeed Africa as a whole need to recognize, value, uphold and propagate indigenous knowledge and indigenous technology for the benefit of various communities by making it relevant to people, especially in the present era.
2. Countries in West African sub -region, especially Nigeria, should support and fund research and development efforts.
3. Government could enable a healthy government research and development firm to run on more effective and efficient lines by collaborating with private partners.
4. Successive governments and rightful stakeholders in tertiary education should, as a matter of fact, consider R and D worthwhile venture and commit time and resources to it.
5. There should be mutual partnership between government and technology developers.
6. Government can implement effective price control on product developed in alliance with private technology providers.
7. There is need to combine Western and indigenous training especially in the field of medical practices.
8. The governments of various countries in Africa should initiate steps for brand enrichment and product marketing.
9. We should be committed to purchasing the indigenously developed products which are at par with the overseas products. The indigenously developed products are however, losing grounds due to lack of patronage.
10. The trade and industries and allied agencies should be able to go through the trade practices, especially the buying trends of common wealth nations and promote the indigenously developed products in such a way that they make in-roads into the markets in common wealth nations.
11. Traditional medicine should be rid of superstition and fairy tales, be examined, refined and adopted in modern medical practice.

Otuu J.B.

REFERENCES

- Acharya, D. & Shrivastava, A. (2008). Indigenous herbal medicines: Tribal formulations and traditional herbal practices. Jaipur: Aavishkar Publishers and Distributors.
- Ademosun, O.C. (2002). Challenges of development of agricultural engineering practice within a democratic system in Nigeria. Proceedings of COREN 11th Engineering Assembly. Abuja: Ministry of Federal Capital Territory.
- Adjibolosoo, S. (1995). The human factor in developing Africa. Westport, CT: Praeger.
- Aliyu, G. (2003). Application of indigenous technology for national development. Proceedings of the 3rd ASUP Conference, 1 (1), 134-137.
- Australia Government (N.D.) Australian indigenous tools and technology. Retrieved on March 31, 2013, from <http://australia.gov.au/about-australia/australia-story/austn-indigenous>.
- Burkitt, I. (2002). Technologies of the self: Habitus and capacities. *Journal for the Theory of Social Behaviour*, 32 (2), 219-237.
- Eionet Gemet Thesaurus (2012). Indigenous technology. Retrieved on March 31, 2013, from <http://www.eionet.europa.eu/gemet/concept?ns=1&cR=4205>.
- Folayan, C.O. (1998). Indigenous technological growth: The CADD experience. Proceedings of the 5th National Engineering Conference of Kaduna Polytechnic, 5 (1), 1-12.
- Foucault, M. (1988). Technologies of the self. In L/H/ Martin, H. Gutman & P.H, Hutton (Eds.). *Technologies of the self: A seminar with Michael Foucault*. Cambridge: MIT Press.
- Gakuru, C.C. (2006). Remodelling traditional and indigenous knowledge. Retrieved from <http://knowledge.cta.int/en/content/view/full/3006>.
- International Technology Education Association (2002). Standards for technological literacy: Content for the study of technology. Reston: ITEA

Reference to this paper should be made as follows: Otuu J.B. (2017), Enhancing Industrialization in Africa through Indigenous Technology. *J. of Sciences and Multidisciplinary Research*, Vol. 9, No. 3, Pp. 80-90
