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## ADAPTIVE INDEGENOUS TECHNOLOGY FOR ENVIRONMENTAL SUSTAINABILITY: A CASE FOR THE VISUAL ARTS

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**Abstract:** The aim of this paper is to advance the position that technology is a very vital component of any nation or civilization. Technology is human resourcefulness in trying to solve the daily unfolding problems of his material environment and, to some extent, assess the concept of adaptive indigenous technology for environmental sustainability, its relationship with visual arts (particularly in the casting technique, sculpture and ceramics) and how it can be adapted to enhance technological advancement in sustaining our environment

**Keywords:** Technology, Visual arts, Casting

### INTRODUCTION

The concept of Technology has been viewed by various scholars, authors and organizations in a variety of ways. According to Mbahi (1997), it is those activities which produce alteration in the material world in order to satisfy human needs easily and the concept of technology may imply many different types of human inventions, Which is a general term ranging from different types of human inventions, the author further identified material and non-material as the two aspects of technology often known as hardware and software, the hardware comprises of machines, tools, products, apparatus, workshop, etc. while the software consists of organizational know-how, information networks, policies, institutions, management structures, marketing and distribution infrastructures. In another interesting paper by Steward (1977), cited in Okujor (1996), referred to technology as an organized body of knowledge, of commercial and useful skills and the systematic procedures (techniques) and processes for making, performing and applying useful things, similarly, Thewitt and Bateman (1989), see technology as a “study of skills (practical arts) and has grown to include the study of practical materials, skills and knowledge”. Technology is more than just a study of theory, it is practical oriented. It involves the application of technical and scientific knowledge and skills, it also solves real problems. Okufor (1996), observe that “Technology solves real problems”. It starts with scientific research and experimentation, production and ends with the consumer. This implies that

Technology must be functional, as it may also be seen as a product of human resourcefulness in solving the problem emanating from his material environment. Manabete and Umar(2014), states that “there is a great confusion about what technology stands for” they further cited Bijker, Hughes and Pinch (2014), who collectively argued that it is pointless wasting valuable time trying to reach a consensus definition as term that does not carry a single meaning which Lawson (2008), cited in Manabete and Umar(2014), pointed out that attempts at trying and embracing definition over the years have only led to failure. Consequently, Foucault (1988), cited in Manabete and Umar (2014), identified four types of technology namely; technologies of production, technologies of sign system, technologies of the self and technologies of power which all functions together but are not irreducible to one. Technology of production allows us to produce, transform or manipulate things; technologies of sign system permit the use of symbols, signs or meaning and technology of power determining individual behavior. In the words of Peters (2013), technology of the self is an approach to study the ethics of the individual. This paper dwells with the technologies of production which deals with product manipulation of things without causing harm to the environment and our self.

It is worthy to note that developing nations are dire need of technology as a catalyst for growth and development to enhance human capacity building and environmental sustainability in the 21<sup>st</sup> century, this technology can either be embrace uninhabited, transfer technology from industrialized nations or better still, become self-reliant through the thorny parts of promoting their indigenous technology whichever it opts for, the fact remains that it most support it and must look inwards for both human and material resources in order to take-off into the much desired yet illusive terrain of technology. It will also need the support and assistance of industrialized nations although to a varying degree. The quest to catch up with the global moving trend of advancement developing nations unreasonably invests in projects, usually associated with iron and steel industry, oil and petro- chemical industry, building and road construction, transportation and agriculture, this according to Enuokoro (1990), cited in Okufor (1996), is carried out without regard to the culture and Technology evident in developing countries without consideration of the obvious inappropriateness of such technologies to the socio- cultural and material problems of the people. As a matter of fact such developing countries most over- look the existence of a viable alternative which could have yielded a better result with limited investment. In order to achieve desirable social objective such as creation of employment opportunities and the much desired eco-friendly industrialization and national development. For instance this huge investment into imploring foreign technology in the area of mining, petro-chemical, communication and agriculture has resulted to serious cases of environmental degradation and putting public health

in danger in developing nations. Adapting indigenous technology and policies for ensuring the sustainability of our cultural and environmental practices and ecosystem services will be crucial if we are to meet the demands of improving yields without compromising environmental integrity or public health. In the light of the above, this paper stresses the need to adopt or modify the technologies that are within the framework of our geographical arrangement for environmental sustainability and the role visual Arts particularly sculpture and ceramics played in the building of car, plastic, casting of utensils, industrial ceramics and spare parts fabrication.

### **The Concept of Adaptive Indigenous Technology for Environmental Sustainability and the Need to Look Inward**

This paper places high premium on adaptive indigenous technology for sustainable development in the case of visual arts as the spring board for developing the nation's indigenous technology has been seen in various ways as "labour intensive, relevant, progressive, socially appropriate, self-reliant and environmentally sound" the Indigenous technology so-called emanating from visual arts is highly sustainable for solving immediate or local problems of the environment where such technologies are developed. There are also amenable to indigenous management, maintenance and replication. It promotes economic buoyancy of developing nations because it emanated and has nourished out of peculiar needs of the people and it is therefore long-lasting, self-preserving and appropriate. At this juncture, the concept of an adaptive indigenous technology becomes relevant because Enuokoro (1990) observed that it will "induce the product of labour intensive machinery and attitude commensurate with national needs and priorities". Once these are realized, the developing countries craving for modernization will be ready and ripe to take the technological decision and undertake the relevant transfer, transformation and change as its needs arises. As a matter of fact, it will be of best interest of national objectives, if the ultimate decision is influenced by the existing technological base, adapted and innovated to solve existing problems. This writer chooses to look at the visual arts and its inherent technological qualities, particularly the casting technique in production of sculpture and ceramic for environmental sustainability.

### **Visual Arts and Technology**

The visual Arts according to Kufor (1996) have a strong link with science and technology. Drawing, as an aspect of the visual arts is useful as an ancillary means about phenomenon in nature, and man-made objects. Some practical skills in drawing form a valuable adjunct to the study of visions subject including technology. In view of the above, Mbahi (1997), posit that the material aspect of technology undergoes process of industrial design. Products are modeled in clay, plasticine, sketched or drawn or painted on two dimensional surfaces prior to the

mechanical mass production. Ozoagba (1982), states that “Drawing is a language so important in this era of science and technology that is called the language of industry” This assertion was supported by Ogbuleka (1996), cited in Okujor (1996), who opined that scientist and technologist have to solemnly depends on the preliminary design or models for their work produced by an artist who seems to have a tripartite attribute among the scientist and the technologist and of course this attribute of an artist account for the clamoring for the compulsory inculcation of visual Arts in education curriculum in primary and secondary schools which will serve as a vehicle for sustainable development in science and technology. Concepts intuitively felt by the artist in advance through research by the scientist and technologist thereby reposition the artist as the philosopher who thinks out the possibilities through his drawings, painting and graphics. For instance the idea of flying machine was first represented by a 13<sup>th</sup> century artist. It took science 450 years to catch up with the feat of this artist with the invention of Aero-plane by Orville and Wilbur Wright. Similarly Talabi (1979), observed that concept of a rocket to the moon was first thought of by an artist in about A.D 3. It was only in 1961 that the first Rocket was launched into the orbit by the Russians. Therefore, the Visual Arts can be used as a means of recording what the technologist perceives or intends to create. In this respect the Visual Arts serves to strengthen the creators, the technologist or inventors power of accurate observation of details. Though the visual arts have many areas of specializations, for the purpose of this paper, only the specialized area of sculpture and ceramic particularly the technique of casting used in its production will be looked into.

### **Casting as Model for an Adaptive Indigenous Technology for Sustainable Development (Brief History)**

Casting is an indigenous sculpture and ceramics (especially metal) making technique. It dates back to the first millennium and is said to have come from the north of Africa through Trans-Sahara Route. Creating a casting is one of the oldest manufacturing methods known to mankind and a very direct method by producing metal parts. The first casting can be dated back to ancient China in the 4<sup>th</sup> century B.C. Though the casting process, molten metal is poured into a mold that matches the final dimensions of the finished product. While all metals can be cast, the most predominant are iron, aluminum, steel, bronze and copper base alloys. In the words of Ikpakronyi (2014), casting involves melting of steel and it is done in interesting stages. The process of melting steel materials for casting actually starts with evolution of raw materials such as used and abandoned brass, silver, copper and aluminum. For instance the art of bronze (metal) casting especially as practiced by the ancient Benin people employs the cire- perdue technique, otherwise called the lost- wax process. The art survived to the present and is still being practiced. According to Newman (1974) cited in Okujor (1996),

that bronze casting “Symbolized a highly developed technology, high on the scale of human accomplishment”.

### **Bronze Casting in (South- South) Nigeria**

The raw materials for bronze casting are largely metal scraps obtained both from within and outside the locality. The major equipment comprises pit furnaces and crucibles. Furnaces and clay crucibles are built by the practitioners themselves usually in an open space. Siyanbola e’tal (2012), observe that some low graphite crucibles are sometimes imported and the production technique is lost wax method. The authors further claimed that prominence of these products is connected to a certain extent with the capabilities of the practitioners and the demands that have existed over the years, depending on the sizes of the products, the time spent on the production varies; Bronze casting in Benin is a male dominated trade like many other trades requiring working with very high temperature and high level of physical exertion. The bronze casting trade has been sustained over many centuries largely by being rooted strongly in the culture and tradition of the people and to a large extent, have a great economic potential that need to renew and sustain the interest of the present practitioners.

### **Aluminum Casting in Saki (South- western Nigeria)**

In the view of Siyanbola, e’tal (2012), Aluminum casting is a well-established trade in South-western part of Nigeria and it is predominant in Oyo and Osun state. The first set of practitioners that were repatriated from Ghana faced with the problem of unemployment and the attendant welfare problems decided to establish the technique and methodology of the practice in 1969, which within a short time became widely embraced in the Saki zone that the home based people became interested and enrolled as apprentices. The major raw- material for indigenous Aluminum casting is processed aluminum metal obtained in form of scraps from household utensils and other disused aluminum products. These scraps are melted in earthen furnaces and locally fabricated crucibles using fire wood or palm kernel shells for fuel. Molten aluminum is poured into mud or clay moulds to form desired products. These products comprise cooking pots of various sizes.

### **Process of Casting**

It involves the forming or modeling an object from wild Bee wax into object to soften in the sun. After achieving a form spurs shaped like rods, with solid funnel shaped ends, are attached (to permit melted wax and air to flow out of one spur, while molten metal enters another spur). Then the wax is encased in clay and charcoal for fine work. Clay and donkey dung for coarser work are mixed together in equal parts and hole is covered leaving small openings where the wax spurs reach the surface.

Then an assortment of metal scraps is placed in a crucible that melts the metal into a molten mass due to very high temperature. At this point the molten mass is poured into cavity left by wax that has vaporized out of the mould. After this the mould is immersed in water. The clay- Dung falls apart revealing the new bronze form that has taken the place of the wax. The metal at this stage needs refinement while file is used to clean away particles. In the area of ceramics the technique of casting is also used. But unlike using Bee wax to model ceramic employs clay to models. The model is taken with the kaolin and POP. Several wares, pots, cups, sinks, tiles are mass produced in accordance with the mould taken.

### **The Relevance of Casting**

Casting as an indigenous technology can be used in our modern building construction industry. With the knowledge of metallurgy and the casting techniques building could be built in parts and transferred or erected at a location different from its casting place. Okujor (1996), cited example with the status of liberty presented as a gift to America by France, the female gigantic legendry statue symbolizing liberty and freedom was built in parts in France and assembled in the United States of America. The knowledge of the casting process can also be employed in the car spare parts fabrication industry. The various parts by the car body can be fabricated locally and assembled as this is capable of resulting to the production of an indigenous automobile from recycled materials within our environment. Most of the tiles, toilet seats and sinks and other household wares and accessories that are foreign imported products are now produced locally with the adoption of casting as an indigenous technique by the ceramic industries thereby serving and meeting the needs of the people.

### **CONCLUSION**

The relevance of Technology for environmental sustainability in the case of Visual Arts for national development of any nation is evidenced by the magnanimous funds invested in the teaching, learning research and development of technology through visual Arts. In the view of Okujor (1996), advanced countries like USA, France, Germany and Russia gradually improved their indigenous technology over the years by incorporating indigenous technology from visual arts into their school system at the same time funding the indigenous technology sufficiently through teaching research and development. For instance artists, cultural practitioners, scientists and sociologists from Asia and Europe were brought together during Asia European dialogue in Arts, Culture and Climate change conference held in October, 2008 in Beijing, China to exchange cross- disciplinary perspectives in climate change on majors to be taken for environmental sustainability.

## REFERENCES

- Bateman, R and Hewitt, (1989): *Steps in Technology*. London, Century Hutchinson publishers Ltd
- Ikparonyi, O.S. (2014). *Nupe Art/ Conference exhibition*, A Publication of National Gallery of Arts, Nigeria
- Manabete, S.S and Umar, B. (2004): Indigenous Technology for Sustainable Development in Africa, a *Journal of Education and Practice* Vol.5 No 37
- Mbahi, A.A. (1997). *The Art of Education in Nigeria*, Faculty of Arts Occasion Publications Maiduguri, Nigeria University of Maiduguri
- Okujor, O. (1996). *Adaptive Indigenous Technology for National Development: Case of the Visual Arts*, A Paper Presented at the 9<sup>th</sup> Annual National Conference of Nigeria Association of Teachers of Technology (NATT) Oto-Ijanikin, Lagos state
- Ozoagba, I.N. (1978): *Understanding Art in General Education*. Nigeria A.F.P Publishers' Ltd
- Peters, M.A. (2003). *Truth-telling as an educational practice of self: Foucault, Parrhesia and the Ethics of Subjectivity*. Oxford Review of Education, 29 (2), Pp.207-223
- Talabi, G. (1979). *Art teaching in African schools*, HEB Nigeria Ltd  
[http:// www.SciRP.org/journal/ajibm](http://www.SciRP.org/journal/ajibm). Retrieved 5<sup>th</sup>, October, 2016.
- Siyanbola, O.N. et al (2012), Indigenous Technologies and Innovation in Nigeria: Opportunities for SMEs, *American Journal of Industrial Management* [www.waupacafoundry.com/en/foundry\\_101/metal\\_casting\\_History](http://www.waupacafoundry.com/en/foundry_101/metal_casting_History), Retrieved 5<sup>th</sup> October, 2016.