Indigenous Technology (I-Tech) and National Development in Nigeria: The Civil War Experience

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Abstract

Indigenous Technology (I-Tech) remains the core development strategy of most industrialized nations of the world. In Nigeria however, there is deep crisis of development. Since independence, the major challenge of various administrations has been how to overhaul national development through innovations in I-Techs. The civil war experience demonstrated the innovations on indigenous technology by the Biafran soldier in building weapons of war. Irrespective of being used in war, the abundant human resources in Nigeria can enhance national development if properly harnessed. This study therefore focused on examining the potentials for innovations in I-Techs towards national development, drawing lessons from the civil war.

Keywords: Biafra, Civil war, I-Tech, National development

Introduction

In today's globalized world, economic development of nations in international community, depend largely on the level, degree and applications of the knowledge of science and technology. Accordingly, Titanyi (1985), observed that science and technology represent power instruments of change which can assist in the economic, social and cultural development of people, such that the superiority of the rich countries in terms of their living standards, better health services and educational facilities is generally attributed to the breathtaking advances in science and technology. As a result of this, scholars like Adetola et al (2011) and Anaeto et al (2016), opined that, poor developing economies like African state, may be better positioned in the game of global competition if, rather than exclusively focusing on catching-up at the frontiers, they look inwards to deploy science, technology and innovation (STI) in specific areas where they have comparative advantage. Thus, the relevance of developing Indigenous Technology (I-Tech) becomes imperative for national development. May it be known at this juncture that innovations in indigenous technology (I-Tech) is not new to African countries. This is because in pre-colonial and colonial era, some Africans developed resistance to the penetration of colonial administration into their territories as a result of innovative ideas in strategy and defense. Though crude, but it depicts inward sought for innovation. Therefore, development of I-Techs is a gradual process from crude technological attempts to an advanced and sophisticated stage of development in relation to the understanding of the environment.

For adequate comprehension of this study, such concepts like I-Tech and National Development (ND) have over the years garnered several usages from the government, academia, media, civil society groups and even the general public owing to their quite inseparable relation to sustainable development. However, there is no universal definition of the concepts (I-Tech and ND). For instance, Siyanbola et al (2012) observed that I-Tech arises when indigenous

knowledge finds applications in tools, techniques, processes and methods that help in solving problems. For Umoh & Jacob (2020), "I-Tech is an outgrowth of the utilization of many local skills and resources to satisfy basic needs of a people and taking a cognizance their yearnings, aspiration as well as their socio-cultural background" (p. 370). In similar vein, The General Multilingual Environmental Thesaurus (GEMET) defined I-Tech as those technologies employed by the native inhabitants of a country and which constitute an important part of its cultural heritage and should therefore be protected against exploitation by industrialized countries. Therefore, for the purpose of this study, we defined I-Tech as those processes involved in harnessing and re-modification of local resources, artefacts and tools to solve problems of the public, the country and even the international community. Also, we conceived the development of I-Tech in Nigeria to mean the combination of human capital efforts and strategies in interaction with the immediate environment in other to meet the basic and distant needs of the citizens.

For adequate understanding of the concept National development (ND), there is need to explain the meaning of development. According to Gran (1983), development is the social and practical means which aims at the freedom of human potentials in other to acquire the maximum feasible and practical control over all the available resources needed for the actualization of basic human needs and security. Korten (1990) stated that "development is conceptualized from the peoples centered approach, that is as a process by which the members of a society increase their personal and institutional capacities to mobilize and manage resources to produce sustainably and justly distribute improvements in their quality of life in consistence with their own aspirations" (p. 57). The utility of human capacities is at the center of this definition. In furtherance, Burkey (1993) puts development as "a process by which an individual develops self-respect, and becomes more self-confident, self- reliant, cooperative and tolerant of others through becoming aware of his/her shortcomings as well as his/her

potential for positive changes" (p. 35). This means that development is the empowerment of human capacity to enhance positive outcomes.

Having established the meaning of development, National development on the other hand includes improvement in living standard of the people, increase in per capita income and provision of social amenities like education, medical care, social services, etc. to the citizens of the country (Studyrankersonline, 2017). In addition to this, Bawa (2021) observed that ND is a process of reconstruction and development in various dimensions of a nation and developments of individuals. Consequently, it includes full-growth and expansion of industries, agriculture, education, social, religious and cultural institutions. It also implies development of a nation as a whole, the all-round and balanced development of different aspects and facets of the nation viz- political, economic, social, cultural, scientific and material. From the foregoing definitions on national development, it encompasses overall upliftment, improvement and advancement of both the citizens, institutions and industries of the state in such a way that the citizens are able to live out their full potentials and the state is able to function optimally.

In reference to the Nigerian civil war experience, the Biafran side was observed to have indigenously developed war strategies and weapons like shelling (ogbunigwe), gun powder, underground bunkers, grenades, radio transmission networks for effective communication amongst others. The innovative ideas of the Biafran Army attest the inevitable need of understanding one's environment and developing technologies irrespective of its crude nature to solve societal problems. Irrespective of the war, the chance of developing indigenous technology was significantly nipped in the sense that while the other side made use of her indigenous knowledge in developing warfare technologies, the other side resorted to military assistance which indicated a sign of dependency for military hardware and logistics that brought a leverage in their favor during the war. Not minding the end of the war and the dependency of the

latter on military assistance, it partly subdued the desire and zeal of the development of I-Techs as the wounds of the war daunt on the unity of Nigeria. Again, lack of vision, and the menace of ethnicity and ethnic politics undermined such move.

Although, the task of Nigeria's developmental plan has over the years been to build a sustainable I-Tech yet, there are underlying mitigating factors of both local and global constraints that hinder these attempts on development of I-Techs in Nigeria which are dependency related. It is this backdrop that this paper examined the development of local I-Techs in the defunct Biafran state during the Nigerian civil war era and analyze how a perfect refocusing and replication of these scientific progress of the past can serve as catalyst to overhaul scientific and technological development of the Nigerian State.

Theoretical Framework

This study is anchored on the dependency theory. Though dependency has more economic underpinnings than the issues of indigenous technology and National development. However, the holistic definition of ND has made dependency theory a broadened approach to the understanding of development discourses. Hans Singer and Raul Prebisch (1949) related the idea of dependency theory to the economic relations of developed and underdeveloped countries which has significant effect in their socio-economic and political development. The Singer-Prebisch thesis of 1968 suggests that economic activities in the richer countries often lead to serious economic problems in the poorer countries. Prebisch went on to conclude that the underdeveloped nations must employ some degree of protectionism in trade if they were to enter a self-sustaining development path. He argued that Import Substitution Industrialization (ISI), not a trade-and-export orientation, was the best strategy for underdeveloped countries. Consequently, dependency theory attempts to explain the present underdeveloped state of many nations in the world by examining the patterns of interactions among nations. Therefore, for poorer countries to escape from this international

malady, they should embark on import substitution so that they need not purchase the manufactured products from the richer countries. The theory is viewed as a possible way of explaining the persistent poverty of the poorer countries.

In applying this theory to our study, it is pertinent to note that in times of war there are beneficials of war and losers of war irrespective of the victims. The purchase and tests of new weapons of war depicts the economic undertone of arms which has implications on socio-economic development of the supplier and the buyer. From the economic point of view of I-Tech in the civil war experience in Nigeria, Ake, (1982) observed that an economy is dependent to the extent that its position and relations to other economies in the international system and the articulation of its internal structure make it incapable of auto-centric development. This is in no different to the long-established relationship of the Nigerian state to the British government even before the war. By implication, Nigeria since independence has been heavily dependent on the capitalist and industrialized countries, making it practically impossible for the country to look inwards and utilize her enormous resources in enhancing the development and advancement of indigenous technology as was done by the Biafran nation during the 30 months civil war. Nigeria's relations to other economies in the international system till this moment does not enhance auto-centric development of the nation's economy. In terms of method, this study made use of documentary method of data collection, relying on data collected from secondary sources like journal articles, monographs, textbooks, internet sources, newspaper, etc. The analysis was done through content description.

Development Diagnosis and Biafra Civil War Innovations: A Recap

Necessity is the mother of invention and creativity. This axiom was exemplified in the innovations and technological advancement of Igbo tribe all through the span of the Nigeria-Biafra civil war. It was not just a three-year warfare fought with bare hands and cutlass, it was a war where the creation,

exploitation and advancement of I-Tech was at its peak. The war saw the height of scientific and technological creativity born out of shear display of talents and unflinching quest not only to quell the forces of Nigerian army, but also to provide for the basic needs of the people with every ingenuity that could be conceived, exploited and utilized. The Biafran state had harnessed her local resources beyond the global expectation of a small tribe in a young country of Africa, which was completely shut out of every help and intervention from the outside world. Sophisticated local products and weapons of various proportion, propensity and capability were manufactured by young talented and resilient Biafran youths which for more than two years sustained the citizens of the region and quelled the Nigerian Federal troops from invading the Biafran land, even with all heavy support from big super powers of the world, notably the United Kingdom and the Soviet Union.

Some University of Nigeria Nsukka (UNN) lecturers collaborated with young vibrant students in establishing skills acquisition centers and the local industries, tools and war artefacts produced during the war were technically utilized and managed throughout the war (Emefiena, 2012). At the inception of the Nigeria-Biafra civil war, the new Republic of Biafra established Science and Technology (S&T) groups, later renamed Research and Production Agency (RAP) and vested the vested the constituting structures with various responsibilities. The structures of RAP and their respective tasks included:

- Scientists and Technologists: They were mainly members of the academic staff of the university in Nsukka. Their major task was to provide technical means for self-defense tasks.
- Biafran Chemistry Laboratory and Government Ministry: This was located in Enugu and the ministry prepared and organized materials needed in production of war-hardware.

- Group of Engineers: They worked closely with Shell-British Petroleum Company (Ukaegbu, 2005).

The following were the major Biafran innovations during the civil war that have the capacity to overhaul development in the contemporary Nigerian state.

Building of War-Hardware

Modified Dane guns were constructed by lecturers and students of Chemical Engineering of University of Nigeria, Nsukka. The construction site was located in Enugu, the capital of the old Eastern Region, precisely in Nsukka, the university town. This location served as testing ground for these dangerous weapons. These scientists manufactured local gun powder for local guns and the ingenuity of this group of scientists eventually led to the establishment of RAP. They also created some dangerous explosives with the use of crude oil and gun powder. The most sophisticated and surprising technological warfare weapon made by this group is the series of weapons system including command detonation mines, improvised explosives devices, and rocket propelled missiles that was popularly called *Ogbunigwe* or *Ojukwu Bucket*. It was mass-produced by the Republic of Biafra and used against Nigeria between 1967 and 1979 in the Biafran War (Nkwocha, 2010). The weapon killed many federal troops from the Nigerian side.

Establishment of Edible Salt Factory

Before the inception of the civil war, there was no presence of salt refinery factory in Nigeria. Salt used for cooking and preserving of foods were imported into Nigeria while salt was and is still a basic daily need of the people. There was no scientific research conducted in Nigeria to this effect before the civil war. At the heat of the war in late 1967, the stocked salt in Biafra land got finished and the situation was compounded when the Nigerian federal troops blocked the importation of refined salt into Biafra land (Nnadozie, 2008). The predicament caused by unavailability of edible salt became worsened in Biafra

land as hunger and starvation increased. This prompted RAP to build salt factory refinery in Uzuakoli in Umuahia (Ukaegbu, 2005). RAP managed the factory throughout the duration of the war. The factory provided job opportunities for primary and secondary school graduates of Biafra at the time. The factory was later destroyed by the Nigerian federal troops.

Construction of Petroleum Refinery Plants

The civil war saw the running up of petrol in Biafra. This caused untold difficulties in fueling armored vehicles, cars and motorcycles for transportation during the war. As a result, RAP was mandated by the Biafran government to produce petrol and innovate a local plant that would be used in refining the petrol. RAP eventually made a breakthrough by converting palm oil and palm kernel to crude petroleum with the aid of distillation plant. They as well set up a petroleum refinery plant in Owere, Umuahia. RAP employed the principle of fractional distillation, which enabled them set up the refinery plant industry. The plant refinery worked with the process of assembling special equipment such as; steam boilers, distillation columns, storage vessels, heat exchangers, pressure vessels, pumps, air compressors, pipe network of valves of different sizes, etc. Though there was fatal bio-chemical accident during its production process because of the electrical fuse used in palm-oil mills, it was later perfected when palm-oil mill conversion was used as alternative source of refining and supply of petrol.

Construction of Airports

Before the Nigeria-Biafra war started, the people of Biafra had only two major Airports; one at Enugu and the other at Port-Harcourt. It was blocked from operation during the war. The blockage therefore shot off Biafran nation from the outside world. It was taken by the Nigerian federal military troops. Through RAP and its engineers, new airports were built. They did this by harnessing the Bitumen within Biafra land in the construction of trunk A & B**.** They also built runways for aircrafts. These Airports were located at Ulli in Onitsha-Ihila Road and Uga in Awka-Ekwulobia-Uga Road respectively. At the intense period of the

war, the Ulli Airport was used while that of Uga Airport was on standby. These twin Airports were constructed with indigenous and local labour force, utilizing local raw materials harnessed, without the help of any multinational companies. The two-brand new Airports offered Biafra land not only a lifeline but more so, communication with the outside world.

Table 1: Biafran Technological Innovations during the Nigeria-Biafra Civil War

Technological Advancement & Innovations.	**Location During the War**	**Utilities**
1. Building of War-Hardware	Located at Nsukka, in Enugu.	Provided Biafra with the additional ammunitions they needed.
2. Establishment of Edible Salt Factory	Constructed at Methodist High School, Uzuakoli near Umuahia and kept under the management and supervision of RAP.	It solved the problem of non-availability of iodine chloride in Biafra land. The factory provided job opportunity for primary and secondary school graduates of the defunct Biafran population at that time.
3. Construction of Petroleum Refinery Plants	The oil refinery was situated at Owere-Umuahia for convenience purposes.	Used as alternative source for refining and supply of petrol (PMS).

4. Construction of Airports	Located at Ulli on Onitsha-Ihila road and Uga on Awka-Ekwulobia-Uga road.	At the intense period of the war, the Ulli Airport was used as a runway for aircrafts while that of Uga Airport was on standby.

Source: Authors' compilations from (Ukaegbu, 2005; Nnadozie, 2008; Emefiena, 2012).

The above illustrations have shown that Nigeria has both the capacity and capability to leverage on the abundant resources inherent in all parts of the country in replicating national development induced from I-Techs. It as well shows that Nigeria can champion and sustain scientific and technological developments without external aid or influence.

Challenges of I-Tech in Nigeria

An assessment of the post-independent Nigeria polity is not exhaustively comprehensive without exploring the protests and agitations of different groups towards an inclusive government of which the 30 months Nigeria-Biafra war experience was part of. However, inherent in the course of the war was the ingenuity and creativity in strategy and defense that was developed during the war. Such I-Techs as earlier enumerated and explored in this study waned after the war as they were not harnessed for long-term purposes and sustainable development.

Inferring from the above, one of the inherent challenges facing development and sustenance of I-Techs in developing countries is the extension of the imperialist tendencies posed by the local bourgeoise who are frontiers of the metropoles. These comprador bourgeoise guard and represent their selfish interest as well as the interests of the metropoles. These tendencies manifest

themselves through importation of goods and services which when highly depended on become highly competitive for indigenous industries and stifle the efforts of the I-Tech growth in Nigeria. Scholars like (Marx and Engels 1948, Alavi 1972, Ake 1982) observed that these imperialistic tendencies will in long run decrease the quest for indigenous research to societal problems, hence disarticulate the orientation of the mind to "standard vs substandard goods" without acknowledging that standard foods can also be home made. In addition, this orientation goes a long way to the idea of not acknowledging the home grown made products and artefacts. The issues of inferior products and not up to standard comes into place, hence killing the Small and Medium Enterprises (SMEs) and home grown I-TECHs attempts.

The problem of funding is highly hampering the growth of I-TECH in Nigeria. It is generally known that Nigerian government measures progress and achievements in terms of funds allotment, which of course is important, but the problem of implementation and utilization affects such allocation. The 2020 Nigeria fiscal budget allocated 6% to educational sector which shows inadequate budget allocation to Education/Research and Development (R&D). This shortage is linked with the imperial educational system that gave little or no consideration to the technological needs of a rapidly changing industrial economy, that Nigeria today has to rely heavily on foreign assistance and expertise at the expense of local industrial research and developmental institutions. As a result, Afolabi observed that the cumulative effect is the graduation of half-baked graduate engineers and technicians that know little or nothing as regards the practical application of knowledge (Afolabi, 2009).

Another challenge to I-Tech in Nigeria is lack of support. This has resulted in the slow/sluggish growth of I-Tech in Nigeria. For instance, some of the researches conducted in our universities like the newly constructed electric car/Zero Emission Vehicle ZEV in the university of Lagos (Premium Times, 2021) which has just generated attention momentarily quickly fizzled. This

implies that because these I-Techs are neglected perhaps because of its local and crude nature. On the contrary, some countries like Japan, Taiwan, India amongst orders, increasingly made innovations in their I-Techs, developing materials and instruments from available crude and local resources, which has helped them to this level of their national developments.

In addition, studies like (Appleton and Teal, 1998; Kern, 2009; Omojimite, 2011; Asaju, Kajang and Anyio, 2013; and World Bank, 2010) fault the government and policymakers as they identified that inadequate investment in education and health are the reason for the relapse of human capital performance in Africa. These studies observed that in addition to inadequate investment in education and health, the poor state of existing infrastructure in the sectors has further dampened the prospects for sustained human development.

Shortage of manpower has remained one setback to Nigeria's technological breakthrough. Non-acknowledgement and support for I-TECH in Nigeria led to brain drain. The Nigerian system does not promote skills in science and technology as is the case with China, South Korea, Singapore and other such countries which place great importance in scientific and technological skills acquisition. Graduates of Nigerian university lack requisite and competent skills to innovate in I-Techs. Hence, the problem is not basically lack of resources, but the lack of productive investment, ability and clear imaginative orientation which has hindered the gap between reality and aspiration.

Prospects of I-Tech in Nigeria

It is paramount to begin this section by emphatically and categorically stating that Nigeria is enormously blessed with abundant and uniquely diversified human and natural resources which have the capacity of making the nation the most developed in Africa and one of the most developed in the world in terms of innovations in I-Techs. Looking at some explanations of development on the aspect of individuals as increased skill and capacity, greater freedom, creativity, self-discipline, responsibility and material wellbeing (Rodney 1972:1) as was

seen with the Biafran secessionists, one will infer that development is inside-out and has to do with innovations and ingenuity, having understood nature (science) and the environment in which it dwells. In addition, Rodney (1972) stated that "a society develops economically as its members increase jointly their capacity for dealing with environment and dependent on the extent to which they understand the laws of nature (science), on the extent to which they put that understanding into practice by devising tools (technology), and on the manner in which work is organized" (p.3). This approach to development was the cases of Japan, Singapore, India, China etc that resorted to inward harnessing of human and natural resources in relation to science and environment. On the contrary, the Nigeria society hinges on the axiom of "necessity as the mother of invention" which is not sustained in the long run, of which the phenomenon that necessitated such ingenuity phases off. Consequently, these I-Techs are seen as temporary support and complements in solving the problems of an era or phase, instead of as an arsenal that should be sustained and advanced.

In addition to the prospects of I-Techs in Nigeria is the presence of SMEs and local entrepreneurs. For instance, local palm oil producers, garri processers and some restaurants now make use of locally manufactured pounding machines and processing industries which are currently facilitating ideas and innovations in welding and constructions of these machines irrespective of their crude nature, thereby solving societal problems to a significant extent, instead of the prior aggressive dependence on foreign instruments and machines. In a similar vein, the prospects of I-Tech to national development in Nigeria is closely related to the issues of Human capital development. Accordingly (Akogwu& Ezeh, 2021; SACEMA, 2020; Uwiringiyimana, 2020) noted the various innovations in I-Techs during the peak of COVID-19 in Africa show the great potentials the nation and other African countries have towards I-Tech, especially if resource, support and enabling environment are provided by the governments. These innovations in I-Tech were in local robots and drones for delivery of

health materials and support, PPEs, ventilators, pedaled washing hand facilities in public places, face shield and masks, data modeling, amongst others. These demonstrate and depict the prospects I-TECH has in Africa. By implication, I-Tech can be successfully developed, sustained and exported to even the developed countries of the world if the Nigerian government and other relevant bodies and authorities invest in the building, sustenance and development of I-Techs. For instance, young citizens should be encouraged, motivated and provided with skills and resources to pursue ventures that border on I-Techs. To collaborate this, findings by World Bank (2010) and Asaju, et al (2013) suggest that human capital plays positive and significant role in national development and that large education gaps portend negative consequences.

CONCLUSION

The above study examined the emergence of I-Tech during the Nigerian civil war which manifested in the development of military hardware like shelling (ogbunigwe or Ojukwu Bucket), gunpowder, grenades, etc which were used in strategy and defense by the Biafran army. Irrespective of the war, the study projected a leap from this civil war experience, the need to harness these ideas for sustainable development and building indigenous technology. According to Umoh & Jacob (2020), developing nation like Nigeria may either embrace unwarily imported technology (transfer of technology) from advanced nations or become technologically self-reliance though the seemingly dreary, tortuous route of developing their own indigenous technology. While the former seems unattainable because the issues of technology transfer is implicated on one country's I-Tech, the latter seems feasible when investment of research and Development is focused on. According to Shuaibu & Oladayo (2016), as the world economy shifts toward more advanced knowledge-based sectors, I-Tech becomes a central issue for policymakers in Africa both at the national and regional level. Again, De Muro & Tridico (2008) considered the role of

institutions in determining the essence of I-Tech and productivity progress in relation to the function of good governance.

Indigenous knowledge and practices are increasingly a consideration for world growth and sustainable development agendas. The world is tilting towards embracing Indigenous values and domestication of affairs to meet up with the needs of the local people and the recognition of cultural values and orientations. Arguably, Nigeria will not be a completely independent and economically stable nation until it is capable of developing its own independent technological based systems that combine both Indigenous and scientific values. Nnoli (1986) observed this when he pointed that "the relationship between the State and public policies for economic development is the most fundamental in any society and however, depends on the relationship between the character of the State and policies relating to societal progress and development" (p. 183). Based on the findings of this paper on the existence of Indigenous technology in Nigeria culling from the Biafra war experience, the study recommends the following:

1. There is the need for government, to acknowledge and support I-Tech development at the grass root through the facilitation of capacity development; creation of specialized markets for exhibitions of these I-Techs and creation of room for prospective investors.
2. Research institutes like NASENI, NARICT and CHELTECH amongst others on the other hand need to be funded and equipped to conduct value added R&D for the development of the I-Techs.
3. Tertiary educational institutions that are located around I-Tech clusters like computer village in Lagos, amongst others have a significant role to play. Researchers from such institutions could help in the codification of knowledge and standardizing procedures needed to advance such I-TECHs, Students of such institutions, particularly those undertaking related studies (and science-inclined undergraduate or postgraduate researchers) could be made to work with the I-Tech practitioners for stipulated periods.

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