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Review

Constructing Reward Systems for Science and Technology Practitioners in Black Africa

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This paper argues that the state in Africa pays little attention to the reward system of science and technology practitioners. Consequently invention and innovation suffer and trail behind the achievements of other parts of the world. Inventors and technological innovators in Africa carry the heavy burden of transforming their ideas into products and services capable of surviving the use-world. This is obviously a hangover from the colonialism-neocolonialism-imperialism complex which has ingrained into the African political psyche the thought-pattern that technological innovation necessarily diffuses to Africa from the metropolitan centres of the world only and never the other way round. The reward system of science and technology practitioners in Africa is directly associated with the massive brain-drain of Africa's science and technology professionals across several decades. The socio-political structures that form part of the reward system are either dysfunctional or nonexistent and the economic structures are weak. This paper supports the work of historians and sociologists of technology and joins psychologists in exploring the art of invention.

Keywords: science demystification, technological nationalism, social capital, social production of technology, scientistic movement.

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INTRODUCTION

Every developed country in the world is developing character traits of what I like to call the scientific state. The scientific state is the state of the future where science and technology (or technoscience) is the major business of government, and the constitution of the state enshrines libertarian democracy and science and technology as the centerpiece of political governance and the *raison d'être* for the existence of the state. While some countries indeed have developed into this pattern of the Future State, the rest of the developed and emerging countries have the observable *genetic traits* of the scientific state.

Except Africa. Science seems to be shut down in Africa. When their governments talk about it or make plans about it, it looks like where children not more than six years old are talking about matters meant for adults of forty years old or more. So they can only play with and dance around the matter, achieving nothing at the end, wasting and stealing resources, and making a laughing stock of their race. Looking at African governments' technoscience plans and policies through the lens of STS (Science and Technology Studies), one is even more irritated because their governments now appear like babies – that is less than children.

The attitude of African societies is even more frustrating than their governments. The average citizen is totally uninformed about the potentials of his fellow citizens in science and technology. If you get him

informed, he demonstrates great mistrust for their competence, and when you push him further with convincing data that his countrymen are as good as Western or Eastern technoscience men and women, he simply answers, "Well, what can we do? Soon the European or American governments will find him and take him. We don't do anything with them. We raise and nurture them only for those people to come and take them and use them to develop their place." The average citizen in Africa is blind to any role he can play to reverse this destructive trend. Thus, the citizens neither engage with their governments nor with their scientists and inventors to find solutions to the problems surrounding their technoscience. The governments set agricultural targets (so that food can be produced and people can vote for them in the next election) but there are no technoscience targets. Yet agricultural production without technoscience production can only achieve the output of six-year old children. Yet the people will happily vote for the politicians who have achieved even the output of six-year old children. Africans do not demand for much and do not expect much. Standards are extremely low in Africa. Why is this so?

But Africa's scientists and inventors are among the best in the world. With scarcely equipped laboratories, without robots and gadgets, they have used a few thousand dollars to achieve inventions and scientific knowledge that would require billions of dollars to achieve in Europe, Japan, or the United States. Unfortunately for these excellent minds, they were born in Africa and to Africa and it is such a burden. Their frustration can only be imagined. But apart from the political actors, the vast majority of Africans are responsible for this darkness.

African countries don't have any date with destiny on science and technology. Reward systems for science and technology practitioners in Africa at the moment can be described as laughable and feeble structures that may simply be called a joke. Science and technology capital of a state is the real determinant of economic growth. Its human capital component therefore represents the golden goose that lays the golden eggs. Science and technology practitioners of a country are the creators of artefacts of commerce upon which our lives and well-being depend. From pharmacy to agriculture to aeronautics, science and technology practitioners define and refine our economic values. One would naturally think that this group should be any country's greatest assets and greatest pride. But the fact remains that in Africa, science and technology professionals are ignored or at best treated with levity. Great scientists and thinkers emerge from Africa but are not recognized and properly engaged by their governments and people and at the end they emigrate to the United States, Canada, Germany, the United Kingdom, Australia, etc. Africa's best technoscience practitioners are not celebrated; rather footballers and sports men and women get all the attention.

Reward systems can be institutionalized social or political structures for the maintenance of high activity or performance in a specific sector. For science and technology in Africa, this includes political initiatives for building and supporting invention and invention-adoption culture, and the awakening of ethnic technological identity-politics in states characterized by ethnic pluralism.

Reward Systems of Technoscience Practitioners as a Constructionist Approach to Technological Development

Constructionist (or constructivist) approaches to technological development explore the contribution of social forces in the technology innovation process, which covers invention, innovation, and the use-world. Invention or innovation is the first stage which is the birth of the technology. The technology so produced may be a component of an existing technological system which may therein give rise to several technological innovations of the system or it may be the beginning of a large technological system in itself. However the role of social forces that fomented the birth of the technological invention can be traced, through to the shaping of the technology in its developmental history.

Reward system for science and technology practitioners in a country on the surface can be treated under the general domain of human motivation in psychology. SDT (self-determination theory) in psychology conceptualizes certain human needs such as competence, relatedness, and autonomy as drives rather than needs (Deci and Ryan, 2008). Drives are more psychological than physiological. But the collective consideration of human drives renders them as social forces. Our collectivity or social group in this case is technoscience practitioners. The summation of the drives of technoscience practitioners in a political state constitutes a formidable social group, the group of science and technology producers. Therefore the reward system is the human component of a country's technological capital and has social elements that can be tinkered with to shape the country's technological outcomes. The reward system therefore constitutes a huge array of social forces forming and shaping technological outcomes in any political system. The theory clearly debunks the diffusionist theory of technological production which more or less was sponsored by imperialistic thinkers.

To proceed with this analysis of reward systems of technoscience creators as a constructionist approach I pose the following questions about Africa's science personnel:

- Can the reward system for science and technology practitioners in Africa be optimized to achieve a catching-up regime?
- Are African countries, especially sub-Saharan Africa, too poor to hold their best brains in science and technology?
- Should the reward system for science and technology practitioners in Africa be only economic or should it include the social and political dimensions?
- Does the Nobel Prize for Science segregate against Africans? Any evidence?
- Can Africans contradict the known physics?
- Can Black Africa be at the frontiers of science and technology?
- Can Africa produce Nobel Prize winners in science?
- Can African equalize with Europe? Can the 300/400 years' technology gap between Europe and Africa be demolished by Africans?
- Can African countries institute an African Prize for Science monetized to hundreds of millions of dollars in cash value?
- Can African countries institute national honours for excellent work in science and technology monetized to hundreds of thousands of dollars in cash value?

Forms of Reward System

Here we examine the diverse forms of reward system of technoscience practitioners from the viewpoint of social constructionism. We discuss them here as political patterns and sociocultural patterns.

Political Patterns

The political importance of science and technology is not explicitly emphasized in Third World politics, especially in African politics. Science and technology is not at the centre stage of African politics. Rather issues such as security and agriculture assume overwhelming priorities while science and technology come up around number nine.

African governments handle matters upside down. For instance both security and agriculture are issues to be tackled directly by technoscience. African governments rob their science and technology sector of its political importance, and this way their practitioners do not share political power with the political class through their perceived political importance. This political importance is a powerful force in the *reward systems theory* whether as perceived political importance or practical political importance. Sustained acknowledgements of the critical importance of science and technology practitioners by the centres of political power are an open invitation to that sphere. It opens the way for negotiations on power-sharing between the political sphere and those whose stock-in-trade is science and technology.

African politicians, being power-drunk, are not ready to share power, whether by association or negotiation. African politicians driven by their phenomenal primitive accumulation spree cannot be open to negotiation of any kind with the science and technology armies of their respective countries. Beneath this attitude of the political power holders (who are usually not men and women of science) lies their fear of science and technology intellectuals. Men and women all over the world, in postindustrial states and in very poor states, wield political power after their temperaments. African politicians usually have no scientific temperaments, so much so that where they think they are making a mark in scientific and technological progress of their countries, they are only dancing around and wasting money. No, not wasting money. They are actually stealing money for themselves. Their primitive accumulation temperament knows no sacred grounds. Inept and uncertain that they can perform, they fear and hate the men and women of high scientific and technological acumen. Their fear is that one day political power will depart from their hands and rest in the hands of these science and technology leaders of the continent. So African politicians, driven by fear, indulge in politics of exclusion to keep their perceived enemies out of even the corridors of political power. They achieve this through steadfast underfunding of the science and technology sector. The public universities are particularly underfunded with a view to punishing the science and technology departments. The remuneration itself does not attach any special importance to science and technology experts. A professor of chemistry and a professor of sociology earn the same salary. Yet a professor of chemistry needs far more financial capital to function effectively than a sociologist. The chemical industry is a material world and the professor of chemistry deals with this material world all the time and so he needs a lot more financial allowances than the sociologist or even the education professor. The scenario the political power brokers have created in African universities echoes C.P. Snow's (1961) war between the two cultures. But another version of this war is represented by African politicians' politics of exclusion. I now turn to the conspiracy theory.

The Conspiracy Theory of Africa's Technological Backwardness

The control and allocation of resources, whether economic, social, cultural, or political belongs to the political sphere. Technological backwardness of Africa is

a product of a conspiracy between Africa's political elite and their comprador elite from the technological power states who incidentally are Africa's colonizers. The conspiracy theory is about Africa's technological colonization as a replacement of political colonization by the erstwhile colonial masters and their African compradors. Africa's political elite and their business cronies are the home front compradors of their erstwhile colonial powers. The conspiracy theory therefore has two components – the domestic and the foreign. The domestic component of the theory is Africa's political elite and their decision to exclude the science and technology experts from wielding political power because of their fear that it will put an end to their career in politics. Africa's political elite are afraid of the immense popularity the science and technology elite can command once they get hold of political power. Africa's technological colonization therefore is made possible by Africa's political elite in a tacit understanding with foreign political powers represented by their business interests in each African country. From the executive to the legislature, the foreign powers and interests have their agents who monitor African governments to ensure that their mutual understanding remains sacrosanct and unchallenged. Whether the governments are military, whether the governments are corrupt democratic regimes, the foreign powers do not mind. Sovereignty of states is the ideology they invoke to defend their barrenness of morality. Otherwise they would not do business with military democracies and presidential monarchies where one man subverts all the instruments of state power and continually succeeds himself in office for decades in a democratic system of government. Yet the foreign comprador powers sell arms and vehicles and other military armaments to such governments to help perpetually maintain them in power, while the citizens' rights and freedoms are repressed and subverted. The foreign comprador powers are like the dog that eats its own vomit since they are mostly vanguards of modern democracy and the freedom of man and their countries represents archetypes of modern libertarian democracy.

It is extremely difficult to separate the primitive accumulation instincts of Africa's political leaders from the economic interests of their foreign compradors. In the meantime Africa's scientific and technological geniuses whom God sent to Africa to quicken the continent are continually siphoned to European and American countries where they are made to renounce their native citizenship to acquire the foreign one, so that their great technoscientific intellect becomes the property of their new countries. But where the political forces fail to galvanize the resources of African states to achieve the continent's scientific and technological takeoff, the social forces can speedily achieve it. This is where the technoscience practitioners themselves have work to do.

The concept of technological colonization can be properly related to the concept of political colonization. Just as political colonization subjects a country so colonized to the political control, destination, and rule of the colonizing power, technological colonization represses a country's possible mastery and replication of technology, truncates a country's possible pathways to technological self-sufficiency, and relegates the people to mere consumers of the technological artefacts of the technological systems of the colonizer. A country so technologically colonized becomes technologically dependent and inept. So upon political independence the country continues to patronize the science and technology systems of the former colonizers and their friends, mainly in the form of import business. Where the former colonizers have set up manufacturing firms, they are guided by their governments to ensure that they do not transfer their technological know-how to the locals who at best are employed as low manpower or labourers. The scientific component of the manufacturing process (the technology itself) is hidden from the locals through the arcane deployment of expatriates. This adds to the mystification of science and technology to the locals. Even where science is taught in colleges and textbooks are produced, they are not meant to transfer the real technological knowledge to the locals. Much of the knowledge is handed over in theoretical form which is a deliberate mystification process.

Therefore a country that is technologically colonized cannot realize its technological potential. The mystification of technological production by the erstwhile colonial country and the quick substitution of local production with the importation of finished goods works as a psychological attack and control on hitherto colonized African countries. There is no motivation for local engineers and scientists to innovate because there is no need to fill. Everything is imported. And their governments are the chief culprits of this. Everything used by the governmental structures, from the presidency to the local governments to the state and national legislatures, to the judiciary are imported and quickly done with. Everything from cars and buses to rulers and erasers used in the course of running governmental offices are all imported through a contractor-supplier. At least there is no requirement by the government restricting the contractor-supplier to artefacts made by the country. African politicians carry on this way so that scientists and engineers will not be empowered and embourgeoised, so that the people will keep coming to them (the politicians) with empty plates in their hands begging for peanuts instead of going to their scientists. To maintain their political power and relevance, African politicians do not patronize their science and technology sectors so that those practitioners will not be embourgeoised. Their reason is that if the science and technology experts are truly underfunded they will not have enough money resources to influence the people to

follow them. So African societies do not follow their science and technology experts who in the popular perception do not have much to give to the people. The politician who knows nothing about the evolution of national science and technology systems gets the entire attention of the people because as he walks crumbs drop from his pockets and the people who he has converted to beggars quickly pick them up.

Nigeria and other African countries are not part of the international technological competition that drives global technological expansionism. This international technological competition can be driven by the following:

- A country's ideological convictions.
- A country's economic management sense.
- An administration's political targets for national relevance and dominance.
- The right dose of national science fiction that is derogatory to the national stature of another country defined by ethnic homogeneity which ignites technological competition in the so thwarted country.
- The right dose of ethnic science fiction within a country which ignites interethnic technological competition in the country so defined by ethnic pluralism.
- The influence of technological arrival or technological takeoff achieved by a neighbouring country whose citizens are of the same genetic/racial stock (that is technological takeoff attained by another country in the same geographical/climatic zone and of the same racial stock influences domestic affairs in a country radically towards drive for technological takeoff).
- Political aggression and invasion of the territorial integrity of a country by a neighbouring country which can trigger a response of making its own armaments and other gadgets by the country to defend itself.

Political governance in the 21st Century should be about driving science and technology for the well-being of the political state. Unfortunately political governance in Africa up to the second decade of the 21st Century has not come to terms with the times. Any African country can muster enough resources to resist the forces of technological imperialism. There should be a memorandum of understanding among African states for mutual support in delivering this resistance. African ethnic nations and peoples must take technological independence in their own hands. It is not given but taken.

Sociocultural patterns

Poor reward structures for science and technology practitioners in Africa are also traceable to certain other elements that are not purely political. Though with some political undertones, the social and cultural elements of the country's reward system for science and technology practitioners are far more powerful and more reliable and accessible than the political patterns. For example the former Soviet Union produced the most intimidating army of research scientists and engineers, but because the reward systems and structures were purely politically-driven and defined it lost scores of thousands of these experts to Western Europe and North America at the end of the Cold War. The politically-motivated system achieved an overproduction of research scientists and engineers the system could not maintain at the end of the Cold War with the collapse of the Soviet empire. The Soviet system failed to develop (or was forcefully stopped from developing) the sociocultural and socioeconomic patterns of reward system for its science and technology practitioners.

The problem with Africa at the moment is that the science and technology producers are busy running after their politicians who, as I have discussed in the section on political patterns, have other things in mind than the adoption of their domestic inventions and funding for their mass production or the general funding of technological invention activities. In Africa the politician is worshipped by the people because he is able to steal public funds successfully and with this he distributes largesse. The corrupt system developed by the political power holder in Africa must be maintained at all cost to ensure his flow of dirty money with which he services his largesse distribution network through which the people surrender their rights and powers to him without knowing it. Pensions and gratuities that could have been paid are not paid until the beneficiaries die and the funds are signed out into private pockets; one road is built at the cost of five roads and the surplus is expropriated by the power holders. The political power holders in Africa who actually hold this power as a trust on behalf of the people have created a thousand ways of diverting into their pockets funds meant for the people's welfare. Paradoxically the majority of the people hail them for putting their country into their private pockets. Their fellow citizens praise them for stashing away their money in foreign bank accounts and causing the death of thousands of their children and the malnutrition and consequent poor development of several million others. The social acceptability of African political leaders in spite of their unprecedented negative pedigree is shockingly high. The stealing of public funds (in a word, corruption) has eaten deep into the fabric of African societies so much so that it has become a national pastime in many African countries, and so much so that the Igbos of southeast

Nigeria invented a proverb which says, “Anaghi ari elu orji ugboro abuo,” which translated literally means “You don’t climb an iroko tree twice.” This cultural attitude to getting wealth encourages the African politician to steal all he can and enrich himself because he may not get a second opportunity to be in that position. Because it is easy to get wealth through public office (in fact in Africa political office is the easiest route to massive wealth) African politicians have developed crippled imaginations about what to do with public funds and public office. The politics of African political leaders can best be described as primitive accumulation politics. African societies are to be blamed for their own loss of value and their entrenchment of a rotten orientation. Their decadent value system is the very reason their science and technology economy is yet to take off.

Africa’s sociocultural values at the moment are extremely unsupportive of science and technology production and consequently we witness frustrating sociocultural forces that have contributed greatly towards the shaping of the reward system. Sociocultural forces affecting the reward system of science and technology practitioners in Africa are as much contributory to its positive or negative development as they are part of or component of the very reward system itself. The political class in Africa has made sure that the social and cultural and economic structures that would develop the African scientist into a well-rounded personality capable of global competition fail to evolve. Africa’s super-scientists are unknown and unsung. Lack of acknowledgement by the political class as the greatest resource of the country robs the African expert-scientist of possible political capital. While African inventors are unseen and unsung at the moment, they have made great strides the world can reckon with. In spite of the present situation of discouragement surrounding the African research-scientist or the inventor-scientist, the African technoscientific practitioner has proved that he has what it takes to set off and drive the African technological invention system. What happens when the befitting high political attention is given him? Who will initiate this move? Certainly it is not the present crop of African politicians who are not ready to repent of their politics of exclusion. Rather the collective social forces of the society can demand this. And they cannot initiate this until they are debugged of the pernicious and negative perception they have of the African inventor. At present the African inventor is looked upon by members of the society as rather unfortunate. Gifted as he may be, he is looked upon with pity because the governmental system is not ready to assist him and work with him or even to harvest his resources. Inventors in Africa are not seen by the society as lucky people but rather as frustrated and suffering people. For what is more frustrating for science and technology practitioners than their governments seeking technological solutions outside the country, thereby patronizing the practitioners and other interests of foreign countries, while the little or so input the African science practitioner can make is ignored. He is starved of attention and economic resources to give full vent to his technology-creation energies. But his government uses his tax and other tax-payers’ monies to support his contemporaries in the developed world and generally to fuel those countries’ technological systems through massive patronage of their inventions.

African inventors carry the heavy burden of seeing their inventions through the developmental process single-handedly. African inventors carry ten times more burden than European inventors carried before and during the European Scientific Revolution when the state was still fused with the Church and science seemed to challenge the authority of the Church about the true knowledge of the world. The African scientist was born in an era when the science and technology systems of many countries had already reached maturity stage when those countries had already become technological societies. The African scientist was born as a latecomer when the two polar powers of the world were in a stiff technological competition for world dominance and control. With the exception of Biafra (1967-1970), the rest of Black Africa has been in a kind of mental colonization as a necessary consequence of political colonization and decolonization.

In the historical development of science and technology in the West, the social elements – that is the social environment of science and technology – developed simultaneously with science itself and the social status or relevance of science and technology practitioners, though with science and technology and their practitioners a little ahead each time while the social forces followed after a little time. It will take hundreds of pages for instance to exhaust the role of the Royal Society as a social stimulant in the development of science and technology in Great Britain and its spiral effects (including continental replication) across many European countries in the 18th Century. The name alone portrayed its direct connection with the Crown, the seat of political power in Great Britain. The imperial power of Britain lavished social, economic, and political attention on this unique association of men and women at the forefront of technological innovation. The social and political status and perception of the scientist-personality in Europe in the hay days was far above what 21st-Century African societies have been able to attain. This comparison is analogous to the mathematician-personality in the historical periodization known as the European Scientific Revolution and present-day Africa. The comparative analysis in the status differential of science and technology practitioners is what led to the calculation of 300 years’ technology-gap between Europe and Africa.

Social Constructionism as the Demystification of Science and Technology in Africa

In Africa the relevant social forces have failed to develop around science and technology and its practitioners. For Africans several decades after decolonization, it appears there is this societal belief that there is nothing they can add to science or remove from it; science as it were is a finished product – finished by Western scientists and subsequently by scientists of the Far East. This erroneous African thinking has blinded African societies and their collective minds so much so that they fail to realize when technoscientific geniuses are born to them. African societies, apart from their governments, do not believe that as formidable social forces they have the power to take on technology, engage with it, and move it forward relative to their specific environments. Rich and powerful individuals arise in these societies with an extremely low technological aptitude and temper. Such individuals wield so much power that they can twist the arm of their governments, yet look on and watch as their own scientific geniuses perish with frustration. African societies do not seem to like their countrymen who are born with marked technoscientific prowess. Another way to view the scenario is that African societies are at a loss about where to begin to tackle the problem of what to do with powerful men and women of science born to them.

The truth however is that the more African governments and societies ignore great technoscientific minds born among them, the more others are born to them who would join the army of frustrated and uncelebrated technical minds. *When will African societies begin to cash in on their inventors?* Granted that their governments are greatly encumbered by political forces beyond their ability to counter (such as the many complications of the conspiracy theory), can relevant social groups emerge around Africa's great inventors to organize resources and to influence other groups to join forces with them to kick off the continent's technological revolution?

Like other social theories of technological development, *the reward system approach* is a social constructionist approach that has the power to thoroughly demystify science and technology production in Africa. Its deployment therefore should be considered a continental contingency. Its advantages include the broad base of its participants – its large number of actors – who constitute the vast majority of the society. They are formidable and powerful because they are united by a common emotional purpose. They are passionate because they have strong interest in the development of a domestic science and technology regime. Their economic interest is strong and lies in the evolution of a society-technology-industrial complex. Once this demystification of technology production and reproduction is achieved through its reward system and social constructionist approach, the social forces favourable to its survival emerge and expand in size and power until they begin to contain the political forces. They begin this containment by convincing a good portion of the domestic power blocs on the grounds of national economic sense. Once the logic of national economic sense based on local science and technology capability consolidation and expansion is sold to certain members of the domestic power blocs, an infectious virus as it were would have been planted in the domestic political space that will leave few members of that realm immune to its organismic and mental rewiring.

Few African politicians actually understand C.P. Snow (1961) and his notion of the Scientific Revolution. From Science and Technologies Studies perspective, C.P. Snow is seen as a *demystifier*. Hundreds of African politicians have probably never heard of him. Western powers actually worked hard to suppress the true understanding of the Snow model. Snow can be described as the father of social construction of technological takeoff (Nwosu, 2019 and this volume). Snow was rude enough to tell Western powers that the three hundred or four hundred years it took them to build modern technological societies can be compresses and replicated by any Third World latecomer in twenty years. Western powers therefore did much to sponsor and generate conservative scholarship to counter Snow, such that upon decolonization of African states starting from the late 1950s the Snow model could not be sold to them straightaway because tremendous controversy had been generated by counter-Snow scholars who worked as agents of Western imperialism.

Social Formations and Technological Nationalism

African governments pursue *development* and *economic growth* instead of 'technological development' and 'technological growth.' By failing to conceptualize the true framework for economic growth determination, African countries have on their own and by their own efforts relegated themselves to the background. Because technological growth is not the measure of economic growth and development, African governments do not frame up technological capability targets as technological development targets and work towards their achievement. Until targets are conceptualized, growth cannot be imagined, for growth only builds upon achieved targets. Where the targets are missing, shooting can be sporadic and aimless. African governments are yet to become capable of setting technology capability targets. Economic development may proceed without such technology target conceptualizations and is all about output maximization. Processing of primary commodities and light industry manufacturing can proceed with imported manufacturing equipment. Research and

development on the product line can be carried on overseas by the patent-holder firm. Such manufacturing arrangement cannot be called real economic development because it is merely a plug-and-play economy. The definition and redefinition of products and product value and the manufacturing process and manufacturing machines still lie with the inventor-country through the inventor-company.

Technological nationalism is about setting national technology capability targets. The best pathway to technological nationalism is the bottom-to-top pattern wherein the social forces organize and propel this national technological focus. Social formations therefore are the best propellant of technological nationalism. Where the country is heterogeneous and not a nation-state, these forces will be ethnic or ethno-religious. If Africa's national ethnicities will not unite to form nation-states of their countries, then their respective national ethnic divisions must be emphasized and amplified on 21st-Century parameters for ethnic competition, namely ethnic technology-identity competition. Ethnic pride or ethnic technological pride – that is the emphasis on the ethnic background of the inventor or technological innovator or technological entrepreneur – is able to create millions of dollars around the ethnic inventor. Social construction of technological takeoff theory therefore is a technique to overcome conspiracy forces against a country's technological takeoff. It explores how social forces around a technological invention develop into social capital which can readily be converted into economic and political capital to overcome reverse salients that may be economic or political or both on its path to takeoff.

The social relations inherent in a piece of technological innovation determine to a large extent its survival in the use world (that is its mass production and mass consumption or its inability to be so produced and consumed) and therefore the value of that piece of innovation. If the social relations are not understood or muted and therefore fail to develop to become a force acting on the production of that piece of innovation, the value of the technological innovation will be grossly underestimated and therefore the invention will be unable to attract the requisite financial capital for its mass production and mass marketing. This is with particular reference to technological innovations not propelled by political-governmental forces or technological innovations not protected by technological nationalism, which in heterogeneous states can take the form of ethnic technology-identity competition (Nwosu b, this volume). The value of a technological innovation therefore can be affected by the level of development of its social relations. The social relations themselves such as national or ethnic pride around an invention develop to constitute the potential social capital ready to be tapped by the inventor or the technological innovator.

> *Technological innovators must therefore be conscious of communicating their inventions thoroughly to the social groups that are bound to be naturally most attached to their inventions, which transforms their inventions into the realm of the commonwealth.*

Be that as it may, social relations can be either positive or negative to the technological innovation. Negative social relations form part of the invention's reverse salient as much as the invention's inherent systemic weaknesses. While popular conceptions of reverse salient as physical encumbrances in the working of an invention that may impede its full development and mass consumption subsist, I make bold to add cultural and religious and general attitudinal components which constitute the social environment of technological innovation as playing a more dramatic role in its survival or otherwise in the use world. For example an element of the social environment of technological innovations is if the society is passionate about seeing their country produce its own technological artefacts whose processed are homegrown and one hundred percent homemade.

In homogenous political states, positive social relations or social forces are easy to form around indigenous inventions and their inventors or even indigenous technological reproduction or imitation in simpler parlance. Positive social forces around indigenous inventors and their creations constitute a huge component of the reward system for science and technology practitioners. The awakening and development of these social forces is all-important in the politics of Third World Africa whose governments are generally encumbered by neocolonialist forces and as such their development is teleguided from outside. This is because in democratic societies, the social environment of technology is the most powerful resource for indigenous and autogenic technological development. Catch-up paradigms for Africa and the Third World must for this reason begin from the social environment and capture this sphere first before negotiating the political. For the political is rapidly and powerfully influenced by the social into an agreement with it, *depending on the degree of democratization in the so-called democratic political state*.

As indicated elsewhere positive social relations-cum-forces for indigenous science and technology practitioners and their artefacts is the foundation of technological nationalism or its fragmented version of ethnic technological nationalism. We are yet to witness any of these phenomena in any Third World African state. And this is rather unfortunate because Africa is annually blessed with hundreds and hundreds of technoscientific geniuses who, because of negative social environments, end up frustrated and migrate to Western countries to help expand their technological systems. Therefore we

may exclude the governmental and the political causes and reduce the 300 to 400 years' technological gap between Europe and Africa to a phenomenon created by the social environment of technology in Africa.

Social Capital Theory and the Social Production of Technology and Technological Value-chain

Social capital for science and technology practitioners derives from positive social relations-cum-forces around domestic science and technology practitioners and their creations. According to Putnam and Fukuyama, "social capital may be defined as those resources inherent in social relations which facilitate collective action. Social capital resources include trust, norms, and networks of association representing any group which gathers consistently for a common purpose… Such mutual support also is associated with self-reliant economic development without need for government intervention" (Putnam, 1993; Fukuyama, 1995). In their formulation the following hypotheses among others apply:

- The greater the networking, the greater the social capital.
- The greater the social capital, the easier to mobilize support for problem solutions.
- The greater the social capital, the higher the percentage of problem-solving outside the governmental sector.

The social network of science and technology practitioners is made up of patriotic citizens who have fervent and ardent desire for the construction of indigenous technological power. The larger and the more organized this group is, the greater the social capital of science and technology practitioners. Civil societies take the lead in organizing this national or ethnic patriotism through recruiting the vast majority into the army of supporters of indigenous science and technology production.

Subsequently the larger this network the easier it is to mobilize collective support for science and technology practitioners of the political state or the ethnic enclave. This support can then be national (which forms the background for technological nationalism) or ethnic or tribal or religious (which forms the foundation for ethno-religious technological identity-competition) depending on the specific pattern of ethnic formations in the state.

Thus, as the social capital formations grow around domestic science and technology practitioners the easier it is for the stakeholders to undertake science and technology takeoff paradigms without governmental support. For example technology entrepreneurs of Nnewi, Southeast Nigeria, leveraged on the high social capital acquired by science and technology practitioners in this part of the country during the Nigeria-Biafra War of 1967-1970 and started the indigenous manufacturing of auto spare parts which till today remains unparalleled in Africa. The auto spare parts made at Nnewi are sold throughout Nigeria and across Africa. The automobile parts manufacturing power of Nnewi has earned that part of Nigeria to be christened the *Japan of Africa* (BusinessDay, 2014; Onwutalobi, 2014; Omokri, 2017).

Technological innovations in political states defined by ethno-religious homogeneity readily and easily acquire political capital if they are perceived to be strategically important to the regime. The governmental regime simply allocates financial and policy resources for their full development. Political capital cannot readily be accessed by technological innovations in political states characterized by ethno-religious pluralism.

In the developmental process of social capital of science and technology practitioners, the social capital must reach critical mass to move the technological innovation to mass consumption. The number of persons in the social groups supportive of a specific indigenous technological innovation must reach its critical mass. The second stage is that the social capital of science and technological innovation or invention must move from its potential energy form to its kinetic energy form through the introduction of relevant catalysts. This kinetic energy form is the manifestation of mass action towards the mass production of the indigenous technological innovation. At this kinetic energy stage social capital of science and technology practitioners or of science and technological innovation is readily convertible into financial capital. However, social capital can move from its potential energy form to its kinetic energy form without reaching its critical mass first. This is made possible by the emergence of system builders such as companies that popularize the work of the inventor or the emergence of system-builder forces such as politically-driven technological nationalism or ethnic technological identity-competition as a form of ethnic competition in political states polarized along ethnic lines. These institutions constitute catalysts in the developmental process of social capital of science and technology practitioners.

The social capital theory of science and technology practitioners is embedded in the notion of social production of technology. Social production of technology itself embeds economic value-chain, technological value-chain, and sociocultural value-chain of technological production. The economic value-chain inherent in the social production of technology includes the popularization of science business. Indigenous scientific and technological ventures become means of livelihood. Inventor-entrepreneurship becomes an important element in the material production of the people's existence. The situation gradually begins to shift away from the era when the politician got all the attention and the scientist-inventor remained unsung to where the scientist-inventor

becomes the creator of wealth and largesse.

Technological value-chain then develops. Domestic technological capability catalyzed by its fully developed social capital (kinetic social capital or social capital that has become aware of its potential) expands into ancillary technological capabilities as a natural process. Other technological capabilities come alive or on-stream as a necessity and a natural process arising from the full patronage of existing technological capability.

As a concomitant process, sociocultural value-chain becomes inevitable. This is the build-up of technological self-confidence in the people arising from their mastery or invention of a technological system or process. The power of the sociocultural value-chain is unfathomable and incalculable and usually the root cause of scientific and technological revolutions. This self-confidence can quickly swallow up centuries of technological ineptitude. Science and technology practitioners as a social group, politicians as a social group, religious communities as social groups, and the entire society at large are all hit by this tremendous force we call technological self-confidence. The more members of a political state look upon their science and technology sector *with an indigenous eye,* the faster that society can take it on and become masters and makers of science and technology, and the more complete the demystification process of science and technology. Technological self-confidence can also arise as a result of an accidental discovery such as an emergency or a necessity situation involving group survival.

Demystification epistemes produce the grand achievement of igniting technological self-confidence. Demystification epistemes construe technology to the process of learning to drive a car. The challenge before the individual in this symbolism is how to drive by himself all alone. A car then must be made available as well as resources to fuel or power it. Technological challenge is the car to the science and technology experts. Technological challenge must be created, valued, monetized, and sustained essentially by the science and technology professionals. It is important that the professionals themselves do not wait for the governmental administration to set such challenge, because again the notoriety of the governmental forces in backward states lies in their gullibility to being teleguided from abroad, such that they could set such challenge but merely pay lip service to it. Such challenge must be socially created: having been initially articulated by the professionals they are then sold to the diverse social formations in the state who can naturally adapt themselves to become constituent social forces with strong vested interest in the achievement of such technological challenge. A wide network then of allied forces in the sustenance of the requisite impetus for the technological challenge becomes the more reliable partners of technoscience practitioners than the political-governmental regime.

The demystification of science and technology in technologically backward political states must occur in two dimensions essentially simultaneously. The first dimension involves epistemologies and anecdotes for constructing self-confidence in the group of science and technology professionals. The technology professionals albeit their political and structural underdevelopment must understand that technology always works irrespective of the prevailing political and cultural attitude and value themselves as the true key to the wealth and prosperity of the state. Technology professionals in backward states must brace up themselves to at least build the equality-complex which enables them to look upon themselves as equal to their counterparts in the technoscientific states of the world. They must look inward into the politics of their states to accurately calculate, as mathematical minds that they are, the root cause of their present redundant status in the world system of production and reproduction of science and technology. Such calculation locates the politicians, who incidentally are predominantly unscientific non-scientists, as the home enemies of science and technology in the backward states of the world who maintain compradors in the technological metropolises. Africa's politicians are the enemy within working against science. These ignorant leaders carry out policies that continually insult and cripple the development of the society of science and technology practitioners. These inept leaders, such as Africa is reputed for, are directly responsible for the underdeveloped stature of the scientist in these states. Scientists and engineers in Nigeria for instance watch helplessly as their government leaders shamelessly import rudimentary artefacts such as toothpick and pens for use in government departments. All of Nigeria's past political leaders have been incapable of crafting a technological identity for Nigeria, so that the people have no national pride in technology, so that the country's technology professionals live with the image of gross technological ineptitude. As inventive minds that they are, it is expected that they can create a hundred anecdotes for constructing their own self-confidence which transforms their soft, complacent and feeble dealings with the politicians. In Africa for instance where catch-up paradigms ought to be as clamant as the very air for the sustenance of life the science experts have no business negotiating with the continent's backward-mind politicians but should be instructing and directing the politicians on the correct pathways to technological independence. The social group of science and technology practitioners then must constitute the core of the technological self-confidence of the state. They must exude this confidence in their own scientific ability as comparable to the best anywhere. Through this narrative they would have achieved the complete demystification of science and technology to themselves. The second dimension of this

demystification is with regard to the rest of the society. This dimension is about constructing anecdotes for the destruction of the society's fear of the possible failure of local technological artefacts. African and Third World publics live with a pernicious distrust of the technical ability of their science and technology practitioners. This phenomenon is more ingrained in the mentality of Black Africans who see science and technology as a property that belongs to white-skinned people such that Black-skinned scientists are merely borrowing the Whiteman's property and can never be as good at it as the owner of the property. Incidentally African publics do not look up to their science experts as personalities of world acclaim but rather follow the direction and agenda as set by the technologically ignorant politicians who of course drop largesse on the path of their followers to sustain cheap attention on themselves and to increase their followership. The largesse so dispensed however is the commonwealth of the people which the politicians have craftily allocated to themselves in their primitive dispensation of political power. And the scientists? Well, they are scientists and engineers and no more. They do not produce resources. They are mostly in the universities with their science textbooks. What about when they discover and invent? Well, it probably does not work. They are still learning, like children. The African politician looks the other way while the inventor suffers and probably dies with his invention, or the invention is stolen possibly by the machination of the very politician and his foreign compradors.

Mass education and public enlightenment on the progressive nature of technological production becomes an inevitable dispensation in the social technology narratives of backward political states launching catch-up paradigms. More factually the social capital of science and technology practitioners in Africa and the rest of the poor world is directly a function of how much confidence the society has in the technical capability of this group. Such capability may be perceived as low at the moment, but the right quantity of public enlightenment produces a population that understands that technological production is necessarily progressive and that mass patronage of the domestic system of technological production is the only route to technological takeoff, technological growth, and technological independence. Nwosu (2019 and this volume) describes such public enlightenment movements as "science consciousness regimes." Societal fear and distrust of the technical capability of the science and technology professionals in backward political states must be conquered. Their publics must understand that this very fear is exactly the lion which stands at their gate to their kingdom of technological independence. The very notion itself of technological independence must be sold to their populations such that it could become the public mantra. The epistemology of this notion must be constructed to locate its counterforces inside and not outside. Much as the counterforces indeed exist outside beyond the immediate political control of these publics meant for enlightenment, locating and dealing squarely with the domestic counterforces effectively accords political power to the publics to formulate and direct their science and technology paradigms, whether as takeoff or catch-up systems.

The mystification of science and technology as it were freezes the social capital of the science and technology professionals. Mystification then can be seen as cultural and social bias as well as governmental-cum-political attitudes that freeze up the latent social capital of this sector in any political state through the non-formation of confidence in the capabilities of the experts and other actors in the sector. Demystification itself is the process of melting the frozen social capital to make it available for dynamic deployment. Mystification anecdotes therefore achieve the devaluation of the personality of the African or Third World scientist.

When Technoscientific Geniuses are born

Nature blesses every society with technoscientific geniuses. They seem to be sent specifically packaged from an unknown dimension of time and their brain patterns enables them to quickly grasp problems from the most unconventional points. They are *emergenic individuals* which means that their peculiar genetic advantage does not usually run in their bloodlines. Isaac Newton for instance was born to parents of average minds. His father for instance was known to be literate. Their unique brain patterns similarly don't seem to be able to replicate easily in their progenies. This phenomenon then exacerbates their scarceness.

The bottom line however is that they emerge most of the time as children of ordinary people, say once in every 20 million births. Every political state therefore inherits them from Nature, the Unseen Hand. Third World countries, particularly those in Africa, practically do nothing with these emergenic individuals. Technoscientific geniuses have always been born in Africa and to Africa, but the continent has mostly lost them to Europe and North America because there have been no plans to harness the power of their unique brain algorithms. We think it is an evil for societies where these people are not to know what to do with them. That they will always be born is a constant that backward societies can always count on as the backdrop upon which to plan how to become technologically independent. The inexorable truth remains that the principal episteme of every political state in the world system is how to achieve technological independence. It is every state's business, and being so it is every citizen's business. It is a huge misconception by citizens of states to imagine that it is a job for the exclusive preserve of political administrators

who are easily bedeviled in the mire of campaigning and winning elections and undoing the opposition, and in Africa the looting of public resources.

Political states, ethnic collectives and identities which fail to harness and put to work their technological geniuses, their emergenic individuals, for whatever weaknesses of their own must calculate their gullibility as selling their technological independence to other states, identities and races, thereby empowering those people to rule over them and accepting the third-class position of identity subservience. Nature, the Unseen Hand, does not make mistakes by distributing technoscientific geniuses, the unique algorithm emergenic individuals, practically evenly across peoples and groups.

Science and technology practitioners in backward states then can work with this fact and construct themselves around their emergenic ones, their pillars of technological knowledge and knowhow and build up their self-confidence from here. World-class best would always emerge among this all-important sociopolitical group of science and technology practitioners in spite of the backwardness of the political state. Pride and self-confidence in the science and technology practitioners must first crystalize in the scientists and engineers themselves before it can be transmitted to the rest of the society. A lot of this pride can be derived by this group from their association with and elevation of the technoscientific geniuses born to their ethnicities, their race, their political state or whichever identity paradigm appeals to their sensibilities.

Since there is no known algorithm for the occurrence of technoscientific geniuses because it is not a phenomenon peculiar to high-IQ countries, all countries have an even ground to achieve technological independence. Technoscientific geniuses, described in ethnic innovation theory as “technological sparks” (Nwosu c, this volume) are sent by the Unseen Hand to quicken the civilization of their people and the world. These pillars of science and technology must be valued by social formations through networks built around them.

Political rationalization of social capital theory

It is Baron de Montesquieu who invented and brought into vogue the notion of popular sovereignty. Popular sovereignty by convention belongs to the people. This implies that ultimate political power resides with the people, the masses, the electorate, and not with governmental representatives such as the president, the governor, the chancellor, or the prime minister, or even the military. Popular sovereignty can express itself or build itself into institutions directly, therein creating alternative government models. Popular sovereignty then can express itself around scientists as social capital networks. Science and technology professionals in backward states must realize the huge work on their hands, which is how to tap popular sovereignty through huge social capital networks. The implication is that these experts must step out of the laboratory and begin communicating to social forces most relevant to them. To achieve this, science and technology professionals must first form a formidable social group of themselves. This is probably the onerous part of this affair. In the meantime they exist as scores of amorphous independent groups representing their various interests and specialties. In most Third World countries there is no ‘club of scientists’ or ‘scientists for the people’ formed on either national or ethnic sentiments. In Africa the political elite are wary of according any serious attention to the science professionals because of their fear of losing their credibility and the possible loss of political power to the scientistic intellectuals. The doctrine of popular sovereignty remains a mere theory in Africa and the rest of the poor world where the political class has truncated its systemic expression and reduced humanity in these states to slaves. The truth which can no longer be hidden for long remains that the people in all Africa and the rest of the poor world are dreaming of the day when their great scientific minds will rise to political power. These dreaming masses however need to wake up to the truth again that they can get up and stand behind their great scientists and give them this much valued political power directly without unnecessary protocols, thereby breaking free from their chains and saving themselves millennia of darkness, poverty, and death. In today’s very developed world, the scientific state is a philosophy and phenomenon starring Africa and the rest of the poor world in the face and makes the darkness, poverty, and captivity of the vast majority in these corners of the Earth laughable.

The scientists themselves must begin this communication process and must sustain it until it catches on with the entry of the civil society to help the scientists achieve this most important social work. Within the regime of dialogue, recognition, and adoption, the articulation of the financial and political capital requisite for technological takeoff becomes the least difficult aspect as alternative government structures emerge to easily take on this task, albeit as good business. Essentially too this regime of communication with the vast majority ushers in the era of technological nationalists whose actions and demeanor further deepens and expands the power and force of social capital at the disposal of science and technology professionals.

Epistemes for the convertibility of social capital of science and technology practitioners to political and economic capital must then be seen as the political rationalization of their social capital and must be so forged with the intent of effectively replacing the non-scientistic political players. One of the valences of such

epistemes in backward states is the turning of tables such that where outright replacement of non-scientistic political leaders is not immediately feasible, full dependence on the science and technology practitioners by the non-scientistic political leaders would have been achieved. For the non-scientific leaders such as Black Africa is notorious for would have no alternative than to cash in on the high net worth political capital at the disposal of the leaders of the science and technology professionals in order to survive the changing terrain of the political sphere. Herein lies the signature control of the political sphere by the group of science and technology experts – the awakening of the S&T experts to the real nature of their social capital.

Social capital of science and technology practitioners therefore is in the final resolution of its meaning political, and intensely so. An important pillar in this anecdote is the notion that every political state is undergoing a fermentation process which leads to the realization of the scientific state in spite of the present backwardness or otherwise of the state. Indeed political power belongs to the scientist.

Action Plans

The reward system for science and technology practitioners in Africa can be optimized to achieve a catch-up regime

Indeed this is one of the proactive pathways to set and achieve technological catch-up goals if they are articulated in the first instance. The unification of the science and technology experts forms a formidable alliance for collective bargaining with the governments at regional levels. The emphasis should be at national levels in countries that are ethnic-nation states. In countries with deep ethno-religious pluralism however the movement of the scientists should be on ethnic and regional government blocs. Scientists should be politicians too and understand the delicate intricacies of their body politic. In Africa defining catch-up is the business of the scientists themselves and not the politicians. The scientists in each country, in each region, in each federating unit of each country must face their governments with technological catch-up targets and pragmatic methodologies on how such targets could be achieved, situating themselves of course as the captains thereof. Then the technological catch-up regime must be sold to the people, the vast majority, the rest of the society as science democratization movements. Catch-up regimes as framed by the scientists must be planted in the people for their participation and ownership. The more millions of the population understand the catch-up programme of the scientists the higher the likelihood that the scientific experts can propel the government in that direction. The errors of the past by the science professionals is to seek political recognition and acclaim directly from the political sphere when they have an important invention, innovation, or discovery instead of first fraternizing with the public, the social sphere who indeed are the popular sovereign. Of course the scientists are not politicians but it is not late for them to learn the ropes.

Catch-up regime targets must include automobile design and manufacture. The scientists must set this all-important agenda and convince the vast majority of their populations about the foolery in driving other people's cars. In Nigeria for instance automobile importation remains the highest category of imports after the food category. Nigeria spends more money importing automobiles than the national budgets of ten African countries put together.

Having articulated catch-up regimes and recruited the public for participation and ownership, the science experts must commence negotiations with their governments for enhanced pay packages to reflect the nature of their work and greater attention on science. We recommend in this paper that science workers in government agencies should receive enhanced allowances over and above their counterparts in the social sciences. The union of science professionals must necessarily include their counterparts working in the private sector such that whatever negotiations are arrived at with the government must be made to apply to the private sector science and technology experts. Science professionals in private and public sectors must constitute strong unions to push for the implementation of special packages for their professionals. This is important to arrest the high incidence of brain drain from the sector. In Nigeria for instance mechanical engineers work in banks as cashiers and thousands of men and women with Masters Degrees in Physics are unemployed

African countries are not too poor to hold their best brains

No country in Africa and the rest of the poor world is too poor to keep their best brains at home. Brain drain is phenomenon that accompanies the low value a country has for its science and technology practitioners. Countries that take their army of scientists and engineers as their own vast oil reserves or their own gold reserves develop science and technology regimes that make them the target destinations of these experts from other countries. Therefore brain drain is easily reversible if the political and social structures are revamped overnight to value the technology professionals more than say the politicians. Members of the scientistic economy must sit up and imaginatively construct social paradigms for the upturning of the value of the politician, the turning of

tables to put the scientistic regime minds at the centre of their societies. The failure of the politicians in these countries to achieve technological takeoff to say the least is a plus for the scientists as they can seize the opportunity to initiate society-wide scientistic movements. The elimination of mass poverty, hunger, and disease implicit in the scientistic movement is the branding and marketing of the scientistic-culture movement. These anecdotes have the power to overthrow the regime of the politician and produce a rebirth of several thousands of them into the scientistic culture to become scientific politicians. While the politicians are transformed, the personality of the scientist-politician must develop to become strategically salient in the burgeoning scientistic-culture movement. The scientist-politician in Africa and the rest of the poor world is still taking orders from unscientific politicians and so his personality is not adequately developed to the realm of self-realization. The scientist-politician in Africa and the rest of the poor world still looks upon Western models of his personality-type as exemplary of his personage. The truth unfortunately is that the scientist-politician in Africa and the Third Word cannot follow the same pathway of development of their personality-stature as their Western version. The era of the emergence of their Western counterparts is different from their time and so their pathways and targets cannot be the same. In Africa and the Third World, technological independence cannot be achieved with their politicians in charge of sociopolitical affairs. The sociopolitical sphere must be ruled by the scientist-politician through the regime of the scientistic-culture movement. The era of the politician as we know it in these countries is indeed over. Now it is not in anyone's imagination that the end of the conventional politician as we know it will be announced by the selfsame politician-personality. The army of scientists and engineers must build into their branding and marketing methodologies undertones that effectively devalue the politician-personality and tacitly market same as grossly incapable of initiating and sustaining the scientistic-culture regime.

The sociopolitical components of the reward system of science and technology professionals in Africa should be developed in addition to the economic components

African societies should be groomed to understand the truth that the science and technology professionals are the golden goose that lays the golden eggs. They must be seen by the wider society as *oilfields* which every African state has in abundance. The same applies to the rest of the poor and backward states of the world. Mass media channels can work with the science and technology professionals for the dissemination of this doctrine as part of the media's contribution towards its social responsibility to the society. Alternatively, the large social group of science and technology professionals can muster enough resources to own a radio and television station. Indeed the work of marketing the scientistic-culture movement would be much more affordable with a higher guarantee of success if there would be a science and technology television owned by the scientistic movement and run on a profit basis as a private enterprise. The work of every inventor, innovator, explorer, or general science communicator can be reduced to mass market language and effectively marketed on the science and technology radio and television. This mass communication project has the power to build up within a very short time the knowledge and attention of the vast majority of the population, as well as the eye of the intelligentsia. The vast majority so informed about domestic technological readiness for takeoff must nevertheless need the leadership of the intelligentsia. The intelligentsia with the vast majority then proceeds to build up political action in the political sphere through pressure on the political class for the formulation of supportive laws and directives to sustain the domestic exploitation of the technological readiness paradigms invented by the science and technology group. Whether the society is deeply divided along ethno-religious lines or is an ethnic-nation political state, the ensuing events manifest as the general politics of indigenous technological start-ups.

Therefore the sociopolitical components of the reward system of the science and technology professionals determine the size, value, and power of the economic components of their reward system. Mass investments in domestic technological artefacts regime must be preceded by a highly developed sociopolitical awareness and subscription of the technological readiness regime. Takeoff and catch-up regimes then can be negotiated on these terms. The authors and actors then of the ignition of this sociopolitical component are not the political-governmental administration as erroneously assumed by the scientistic group. The responsibility for the ignition of this sociopolitical reward system which may be conceptualized as a turnkey project lies with the group of science and technology professionals. The political class will emasculate the process to their own selfish and primitive ends if allowed to initiate and direct this sociopolitical component formation. The buildup of the sociopolitical reward system forms alternative government regimes as pathways to technological independence.

The Nobel Prize for Science segregates against Africans

There is ample evidence to buttress this assertion (see Morgan, 2018; Wade, 2019; and Uwadiae, 2018). When

it comes to science and technology, the Nobel Prize is a racist academic structure for expanding the sociopolitical capital of the science system of the White race and their relatives. It was formed keeping in mind the assumption that the Black race would never measure up in the realm of science and technology. Even if its founders were open-minded enough to envisage every race or even every major ethnic group producing a Nobel winner in science, the present implementers have adopted the regime of ethno-racial exclusion which renders the Nobel perniciously inadequate as the institution that accords the highest academic recognition to science and technology practitioners in the world system. Western powers who created the Nobel had to accept the Mongoloid East, with Japan being the first winners from this racial enclave. The Japanese as the representatives of their race entered the realm of science and technology at an advantage time and have proved themselves practically superior to Western peoples in their ability to master and expand the frontiers of science. It then became impossible to exclude the Mongoloid race. But the Negroid race is yet to be accepted into the comity of scientistic races of the world.

There is presently no record of the Nobel Prize for Science awarded to any Black scientist in the world. So, who will do for the Black race what the Japanese ethnic identity did for the Mongoloid race? If we may not count Philip Emeagwali as befitting the Nobel, it is impossible to overlook the creation of a new branch of Physics by an Igbo-Nigerian. Dr. Ezekiel Izuogu's invention and patenting of the Izuogu Machine and the subsequent development of Emagnetodynamics as a new branch of Physics cannot be ignored. This new Physics knocks down some fundamental laws of Physics and renders most of school Physics textbooks obsolete. Emagnetodynamics is a radical invention that ushers in a new energy system for the world (Nwosu b, this volume) and reshapes the world's economy by liberating the pockets of billions of world citizens from the predator oligarchies.

Technology therefore is fundamentally ethnic. It is ethnic sentiments and ethnic forces that power and propel technology (Nwosu c, this volume). Ethno-racial identities look after their own technology-identity, their own technology-image, and therefore do not waste their time and resources promoting other ethno-racial identities to achieve technological milestones comparable to theirs. Ethno-racial pride in technology-identity construction guarantees this trend in human behaviour and renders it a most significant component in the theory of social construction of technology.

The segregation against Black people worldwide is the thwarting of the image-identity of the Negroes which in SDT (Deci and Ryan, 2008) the Black peoples of the world must convert into high need for competence manifestation and possibly the construction of a new Negro identity as a response to a thwarted relatedness need (ibid.) which is the equivalent of the constructionist's ascription and adversity (Sarna in Yang, 2000, 44-45). To this end, a Black identity in science and technology must need be constructed through a new Black racial identity built from Black networks of identity. Similarly, Black Americans and Black Africans must collaborate to create an alternative Nobel Prize for Science. Racial consciousness will disarticulate such a framework on continental Africa because the North African bloc cannot key into the project. It is best to deliberately exclude this bloc. The import then is that it is not simple to form this agenda on the supranational structures of the AU and NEPAD, but must be propagated on non-governmental structures and negotiation platforms. Private universities owned by Negroes in every corner of the Earth are good platforms to begin negotiations on the articulation of Black science and technology interests.

The theory of ethnic innovation policy (Nwosu c, this volume) and the theory of ethnic construction of technology (Nwosu b, this volume) explain the ethnic foundations of technology within which the Nobel segregation against the Black world is practically acceptable and understandable. The same ethnic segregation works within multiethnic states to discredit or disinherit through disavowal the technological milestones achieved by ethnic group members by the out-group such that the multiethnic political state cannot aggregate its scientific manpower in a general programme of technological independence. The example given of Dr. Ezekiel Izuogu and his Izuogu Machine or Emagnetodynamics technology applies to Nigeria's segregation against scientists who are considered to be from the ethnic groups which must not be given techno-political acclaim in the general scenario of Nigeria's ethnic politics. Electricity supply in Nigeria is about the poorest in Africa, yet the country has its citizen as the inventor of new energy that can power the whole world.

Africa can equalize with Europe

This assertion answers three of our questions in the affirmative. Yes, African science can contradict the known Physics. Yes, Black Africa therefore can be at the frontiers of science and technology. Yes, Africa has already produced (unrecognized) Nobel Prize winners in Science. There is evidence then that Africa can equalize with Europe. Africa's science narratives must change from that which is anchored on the political to that which is anchored on the social to guarantee an unhindered flow of reward to the continent's scientific personnel.

Compared to Asia which achieved this equalization basically between 1945 and around 2010 (a period of roughly 65 years), Africa is not inferior to Asia, scientist for scientist, inventor for inventor, when one considers the general governmental disadvantage of Africa as

compared to Asia. In China for instance the intelligent governmental administration tacitly bargained with Britain to domicile all its technology within Hong Kong so that the Chinese people will inherit the technological production structure after 99 years, with tremendous industrial capacity spillovers – as expected – into mainland China while the contract lasted. Ethnic innovation theory explains the unusual attention of the Chinese governmental administrations to science and the general adoption of scientism into Chinese culture.

Africa's epistemes to equalize with Europe must become ethno-national movements for valuing the African scientist which produces an exponential growth of his social capital. Ethnic nationalists must rethink themselves as the true forces of technological takeoff of the continent and begin to mill around their scientists, their inventors, their technological entrepreneurs through honour, value, and investment. On demolishing the 300 or 400 years' technology gap between Europe and Africa, C.P. Snow (1961), a British man is convinced that no one should consider it a miracle if achieved in 20 years.

African countries can institute an African Prize for Science monetized to hundreds of millions of dollars in cash value

In view of the proven racial technology politics against Africa and the Black World, Africa should develop an alternative to the Nobel Prize for Science. *The African Nobel Prize* should be invented to honour and value the best of its best scientists and inventors and to institutionalize them for public investment. Such African prize for science can be funded through a certain percentage of the national budgets of participating states. In addition to the scientific invention, the winning scientist should have a large followership on the social media of up to five million and must be physically endorsed and supported by numerous social groups with a total of 100,000 physical members as a fundamental precondition for assessment. The social aspect of getting the people to meet their technology creators is designed to take technology "out of the laboratory and into the culture," thereby instituting the regime of citizens' participation in the evaluation of winning scientists in addition to the purely scientific evaluation by fellow experts. The inclusion of the African publics then should create a participant scientific culture which itself ushers in the regime of public engagement with science and technology which is obviously totally absent in African societies of today.

Upon winning the cash prize, the institution awards popularization contracts to companies specializing in this to transform the inventor into a superstar. Epistemes that market and transform the indigenous African inventor into a superstar are inevitable anecdotes which constitute an indispensable element in the forces of technological takeoff. This implies that companies that popularize the work of the African inventor must emerge as an important component of the African invention space. The African technological invention space must be intimately engaged with the relevant social forces. To move the invention space to the public domain again is not an expectation from Africa's weak governments but the responsibility of the collectivity of those in the forefront of science and technology. The extent of the engagement of Africa's invention space with the social forces determines how much the governments of Africa can be constrained to institute the alternative Nobel or to align with the private sector to achieve it. Alternatively, the governments may be ignored completely to save time and private universities can work with the private sector in an alliance with the relevant social forces. The essence is to market and popularize Africa's inventors to make them into superstars. Africa's cultural epistemologies can be shaped into paying less attention to sports and greater attention to technological invention. The alternative Nobel structure must include patent support for patentable African inventions. Trademark registration support should ensure that all African inventions have registered trademarks.

African countries can institute national honours for excellent work in science and technology monetized to hundreds of thousands of dollars in cash value.

African ethnic-nations such as the Igbos, the Yorubas, the Hausa-Fulanis, the Ashantis, the Ndebeles, the Zulus, and others should work hard to institute the ethnic identity prize for science for their respective identities. For example the Igbos can create and institutionalize the Igbo Prize for Science as the ethnic equivalent of the Nobel to honour their greatest achievers in science and technology from their ethnic enclave within the Nigerian political state. Such frameworks become important milestones in domesticating the reward system of science and technology professionals. And of course the greater the domestication of their reward system the greater the overall impact of their social capital formations. This technique is a way to harness the huge potentials of Africa's science and technology professionals in the diaspora which itself can reverse the huge brain drain to a brain gain harvest. The continent in the meantime is bleeding to death in what looks like an unstoppable brain drain spree.

CONCLUDING REMARKS

Africans should stop concentrating attention on their politicians and start engaging their scientists as their

collective goldmines. The politicians who are barren on technological independence paradigms must be jettisoned by the people in preference for the scientists. In importance, in the determination of the way forward, in deciding which way to go with employment generation and how poverty can be ended, African publics should replace their politicians with their scientists. The scientists of Africa are the messiahs and the architects of her technological independence. The scientists of Africa cannot fail to deliver technological independence. This business of technological independence is what they went to the university to study and so they must replace Africa's politicians. The scientists in every Third World country if galvanized will deliver technological independence to their people in ten years. Their politicians are nothing but saboteurs to this mission of emancipation and the Third World publics must understand this.

When the reward system of Africa's science and technology practitioners attains the critical mass of its development, an explosion of the national science and technology capability of Black African states becomes an inevitability. The sociocultural patterns of the reward system if developed readily translate to social capital in the hands of the science and technology professionals, which itself are easily convertible into political and economic capital.

Mass engagement with the science and technology producers by the society and the society's perception of science and technology practitioners as the true liberators of African societies from hunger, illiteracy, and disease and as the gatekeepers of Africa's rich future is all that is required to devalue political power in Africa to the extent that it ceases to impede technological progress on the continent.

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