Application of Intellectual Property Right and Ethos in the Commercialization of Research and Development Activities

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Abstract: The aim of this paper is to promote respect for intellectual property ownership and encourage adherence to ethical standards in Nigeria. The effect on Research and Developmental efforts within the Nigerian Economy has reached surprising proportions. It is now considered to be the norm, in some quarters to be socially deviant or promote socially unhealthy relationships. Most of which have financial and other negative influences on the society’s ability to progress. The case study here is on the efforts in Zeolite production in Nigerian Research Institutes. Some of the issues raised as problems affecting research and development efforts are: - Duplication of efforts in similar line of research, inadequate regard for the envisaged contributions of related disciplinary experts and poor regard for post graduate students' contributions to R and D activities. The approach to this research is accidental and yet historical in nature. So much has occurred in the past that is related to these issues raised in this paper. The experience of the author of this paper with core research teams in zeolite production attached to Ahmadu Bello University, Zaria, is what prompted an inquest into the problems affecting research and development efforts in Nigeria. The results of the inquest showed that efforts were geared by the University to protect the staff involved in social misconduct over that of Students' welfare in the University. (Perkmann et al 2012) highlighted the importance of collaborative research, contract research, consulting and informal relationships in the successful transfer of University knowledge to the industries and vice versa. The recommendations in this paper are associated with their postulations on this issue. The choice of extension workers and the need to follow up industrial factories acting as respondents to science based research (or any research) institutes is also, paramount to the fine-tuning' of innovations for proper commercialization efforts to occur.

Keywords: Intellectual Property Ownership, Research and Developmental & Commercialization.
1. INTRODUCTION

The need to protect intellectual property has become an issue of heated discussions in various Universities and research centers of repute. This is due to the adverse effects of plagiarism, piracy and other related offences on developmental achievements in many economies of the world. Some of the negative effects include delayed attention to cases of extreme emergencies, loss of lives and property, poor grading of affected staff and institutes of learning and out daterness of innovation before recognition.

Quite a number of students at various levels of tertiary education, have lost their respect for time honored research benefits. This is partly due to their inability to protect their innovational findings from individuals within and without the lecturing cadre in universities, who openly associate themselves with theft of intellectual property. This trend has strangled the drive for extra efforts in creative developmental output from the Nigerian Society and promoted the urge to claim ownership of other peoples works, blatantly. This has also resulted in avoidable financial wastages.

Another instance includes what currently occurs in the process of zeolite production. The processing mode and disposal of waste output is supposed to be environmentally friendly. The ideal production process must include funding of clean-up efforts, enforce the use of proper protective apparels, insist on sanitary conditions around waste and industrial sites to mention a few. Nonetheless, the repercussions of neglecting these duties could cause serious financial challenges that are equally health-related, that are less surmountable via corrective efforts instead of preventive ones. Sometimes the issue of wastages is clearly associated with the need to cover up stolen funds or and other forms of corrupt practices.

This paper seeks to address the need for intellectual property rights to be respected in Nigeria. The idea that is stolen, is usually forced to waste away. This causes the new found knowledge to have less value in the wrong hands, especially where the vision for the innovation is not available. This has always been the case with potential intellectual property owners who are unable to take full advantage of their innovative rights. The only issue that most promoters of piracy and plagiarism are concerned about are short term benefits, while it lasts. These include but are not limited to: - Coveting a highly valued title such as Nobel prize winner, earn a graduate/post graduate degree with research option quicker, make quick innovative cash via marketing the stolen dream, the list is endless. However, the main ideas discovered by the original researcher, could lead to economic development in an environment when the support from stakeholders begin from source, justifiably. Another objective of this paper is to provide suggestions to reduce the incidence of intellectual property theft and all other attendant deviant behaviors among the Nigerian populace. This is due to the harmful effects these non-conformity issues have on National development.

1.1 PROBLEM STATEMENT

There are a lot of documented data on the level of delinquency among members of the Nigerian populace. These classes of inappropriate conducts include all forms of illegal confiscation of property belonging to others (such as outright theft, plagiarism, piracy) and exam malpractice in notable examinations of repute. (Adesulu 2017) noted that, students now indulge in dangerous examination malpractice by drugging invigilators, arriving at centers in Africa, particularly Nigeria, with firepower and ammunition just to have their way during WAEC examinations. Also (Saturday Sun 2017) released the outcome of an interview with the current Registrar of National Examinations Council (NECO), Professor Uwakwe. He mentioned that influential people (who are not committed to academic and moral excellence) aid exam malpractice in schools and exam malpractice has a devastating effect on the educational system.

Also (Daily trust 2017) documented three rape cases that occurred in Funtua, Damaturu and Lokoja. These cases have been forwarded to the Nigerian Police and the appropriate magistrate courts, respectively. The same newspaper commented on the activities of car-snatching syndicates whose operations were cut short by Yobe Police Command. Some of the items recovered from two suspected car thieves associated with these syndicates (located in Borno, Yobe and Bauchi states) include, locally produced master car keys and a stolen Honda Accord from Maiduguri. (Zikka 2017) noted that smugglers have improvised new methods of beating security operatives at the Seme border. This is as a result of the ban on importation of new and used vehicles through land borders by the Federal Government since 1st of January 2017. A Lexus
SUV was intercepted while on transit to a burial ceremony, was with posters of a deceased person. In addition, a truck was intercepted with five hundred and thirty-four used tires.

(Odalou 2016) reported on, the number of oil theft arrests between 2009 and 2014 from media sources. For arrests made over suspected theft of automated gas oil (AGO), also known as diesel, between 2013 and 2014, 1,659, 782 liters and 850, 112 tons of (AGO) were impounded with the vessels used to convey the illegal consignments. Altogether, 105 persons were arrested in connection with the above amount of AGO within the high seas and the Niger Delta region. The amount of diesel involved is worth trillions of naira. These examples and other social problems have eaten deep into the fabric of our nation and has caused her a lot of losses in terms of development. (Odalou 2016) also recorded that between 2013 and 2014, various bribes in form of cash were offered to the Joint Task Force (JTF) amounting to $66,500 and 14 million naira on two separate occasions so as to facilitate illegal oil deals.

Other examples of social deviance in the Nigerian Economy include, (Saturday Sun 2017) the arrest of forty gay young men in Lagos state who were also Human Immunodeficiency Virus (HIV) positive and they have been granted bail. The spread of the HIV via homosexuality was the fear, since the prison service could not prevent the spread of the virus within their jurisdiction among inmates at Kirikiri maximum prison where, they all tested positive after undergoing a mandatory HIV test. In the same volume and number of Saturday Sun, an article on the arrest of a pick-pocket syndicate that specialized in defrauding dignitaries at social gatherings such as weddings, political conventions and the like. They were all in their fifties as at the time of arrest. (Igbokwe 2017a) reported on the activities of a Kuje prison inmate that parades Abuja with armed escorts as he unleashes mayhem to members of the society. (Igbokwe 2017b) also commented on the activities of Kirikiri prison inmates and their involvement with robbery syndicates, operating within Lagos State.

2. LITERATURE REVIEW
2.1 Problems negating research and developmental efforts

There are issues besetting the research sub-sector in Nigeria that need to be mentioned in this paper. They are as follows:

a. (Daramola, Aransiola and Ojumu 2012) noted that stepping up the research innovations to meet industrial standards have been a real challenge. This is mainly due to low finance. The amount of recurrent allocation dedicated to zeolite related investigative research is below minimum. To be able to incorporate zeolite in commercial output, its thermal quality needs to be enhanced to cope with the heat associated with industrial applications.

b. Acknowledgement of contributions from research teams are not noted as an essential need to productive cooperation in research and development. It is apparent that ‘academic theft’ could occur in various formats and in large proportions in departments attached to Institutes of scientific research. (Okongwu 1986) noted that when appraising the amount of funding to be allocated to science research institutes, the productivity of graduate students’ participation in faculty research tends to be unrecognized in Nigeria. This makes the promotion of innovative ideas, more difficult than it should be because, according to (Okongwu 1986) ‘...its (Graduates Students’ participation in faculty research) utility both for faculty and for graduate training remains unimpaired.’

c. The third problem affecting research in Nigeria as outlined by (Olayide 1981) is the inability for research institutes to involve Interdisciplinary, Multidisciplinary and Supradisciplinary efforts in science based researches despite the advantages involved. This is also referred to as inter and intra sectoral linkages. Related disciplines in any research area must include the efforts of all those properly schooled in that area so as to avoid wastages of scarce research resources, provide holistic solution(s) to all facets of a problem and facilitate the application of several relevant skills at the same time (Olayide 1981). A clear example of this recounted below.

In relation to the issue on the synthetic variant of zeolite proposed by the Chemical research team from Ahmadu Bello University (A.B.U), Zaria, the first abstract of this paper was titled, Enhancing Forward and Back Ward Linkages Between Science Research Institutes and Related Industries for Proper Commercialization of Innovations in Zeolite Catalyst and Membrane Research’. It was sent in to the ‘1st
Nigeria International Conference on Zeolite’ co-sponsored by Petroleum Technology Development Fund, A.B.U Zaria and other international bodies in the last quarter of the year 2014. (The abstract and the soft copy of the particular conference leaflet are part of the appendices). The abstract was rejected for conference proceedings, only for the author of this paper to move to A.B.U Zaria for a postgraduate course that she had gained admission for and discovered that the department of engineering sciences was quietly canvassing for another researcher without the speciality that is best for the task at hand, to be part of the contributors to the marketing plan for the zeolite production. Fortunately, no one was ready to carry it out alone, it still fell back to the responsibility of the original author of the said abstract (that is, I, the author of this paper). The ‘catch’ was that I will not be allowed to include my name as the researcher-in-charge or even as a co-researcher. I was categorically told that the name allowed will be that of the current Head of Economics, Ahmadu Bello University, Zaria only, and that was part of what I will do for her, as a postgraduate (PhD in-view) student till I graduate. I chose to abandon the course at Ahmadu Bello university, Zaria.

d. Lack of coordinated effort in many areas of national research, has led to the duplication of responsibilities and unchecked waste. (Olayide 1981) had pointed out that a near-complete absence of inter sectoral research linkage is responsible for wasteful duplication of programmes and projects’. The research is ongoing in different parts of the country on zeolite alone. The South-East on localized zeolite production using naturally occurring Clay (Nwosu et al 2013) and the one going on in the North-Central of Nigeria (on synthetic zeolite variant). The application of Elefun Nigerian Kaolin (ENK) from naturally occurring clay in Ogun State as precursor material for the development of zeolite Y is yet another similar research completed and adjudged best by the research team in charge. ‘The synthesis of zeolite Y was successful following a sequence: collection of raw kaolin clay from Elefun area of Ogun state, Nigeria; subjecting it to, calcination, partial dealumination and final hydrothermal synthesis’ (Babalola 2015).

One would have expected more collaborative efforts geared at producing innovation(s) that commands more industrial weight within the shortest possible time and with less resources, instead of scattered efforts here and there, in a bid to outsmart national internal efforts from other geo-political zones within Nigeria. Geo-political location of researchers and the interest of sponsors could also be responsible for the independence in research on similar issues. The academic struggle and manipulations to dominate a research by a particular ethnic group, has contributed to the delay in developmental achievements at the national level.

e. The activities of personalities bent on committing plagiarism and other forms of organized crime, have added to the distraction of research institutions from achieving their goals in what-ever aspect of innovation they choose to lay emphasis in. (Odalolu 2016) documented the huge amounts of petroleum, refined petroleum theft and other related issues discovered by security forces in the high seas and Niger Delta region between 1999 and 2014.

2.2 National Development - Brief Explanation

(Todaro and Smith 2009) noted that the concept development means various things to different schools of thought. Todays development experts explained that after the first world, the next level of countries are considered to be emerging economies. These group of countries are beyond the developing stage but are yet to be considered as developed. The countries in this category as at 2016 include Nigeria, countries within the South American sub-continent and some parts of Asia. All major credit rating reported that, as at 2017 Nigeria has lost the place of an emerging economy and now occupies a space with the poorest economies of the world with non-investment negative outlook, B+ according to Fitch as at January 25th 2017. That of Moody’s is more recent with a B2 which still refers to a non-investing, speculative outlook. However, with some measure of stability - November 7th 2017.

Development involves the ability to maintain certain levels of unemployment, poverty, social unrests, diseases and the like over a long period of time, for instance ten years. United Nations Development Programme (UNDP) Human Development report 2016, claimed that Nigeria ranked 152nd on the Human Development Index scale. The economy was also able to realize a stable growth of 13% in ten
years. However, if after such periods the levels of these negative factors escalate, the little development achieved before becomes obsolete. Development is a continual process that is progressive in nature. The issue of development does not occupy its pride of place in the Nigerian society, despite all the internal and external efforts towards it’s promotion among the Nigerian populace. A lot has been planned and organized for development in Nigeria through the various development plans and associations with various organizations. Notable among them are World Bank, IMF- International Monetary Fund, AfDB - African Development Bank, UNICEF - United Nations Children’s Fund, IFAD - International Fund for Agricultural Development, UNDP - United Nations Development Programme, FAO - Food and Agriculture Organization and etcetera.

2.3 THEORETICAL LITERATURE ON TRADE

The proponents of the Alien conspiracy theory ascribe blame on outsiders and outside influences for the prevalence of organized crime in the American society. They stated that, organized crime gained recognition in the 1860s in Sicily. The indigenes of Sicily are responsible for the foundations of organized crime in the United states of America (Lyman and Potter 2007). This was due to the influx of immigrants into the United states and the need to identify with the norms and values as deemed fit for proper integration and earnings so as to maintain a decent life style. In Nigeria, what is more apparent is the dissolution of oneness within various tribes caged within the same geo-political, international, state and even local government boundaries.

Some major theories on trade that were clear improvements on the traditional theories of international trade such as Neoclassical model of factor endowment are Structuralism, North-South models of unequal trade and the Vent-for-Surplus theory of international trade. The Prebisch-Singer thesis explained that there will always be a continuous decline in the terms of trade of primary-commodity exporting countries due to the combination of low income and price elasticity of demand. Prebisch noted that the only way for Latin American Countries to maintain relevance in global trade was to restructure their economies. This theory has been one of the motivating factors for developing countries, especially those of Latin America to venture into the export of indigenously manufactured goods, (Todaro and Smith 2009). (Kay and Gwynne 2000) strongly asserted that the Structuralist perspective to growth and trade is quite important to other developing nations as well. The main theme of the Structuralist idea is that, deliberate policies need to be put in place to power notable structural change for developing economies to remain significant to global development, growth and trade. Their emphasis was on the relevance of Structuralist ideas to the economies of Latin America in the 1960s to 1970s due to technological dependence. According to (Prebisch in O’Toole 2014), the way forward must be to include internal, productive restructuring, towards technologically exhaustive goods, instead of specializing in providing commodities to the extent that reveal weak technological capabilities and be accompanied by effective demand through exports.

The Vent-for-surplus theory of international trade emphasizes that there is no need to reallocate resources from current production but rather engage resources that were earlier unemployed or underemployed, to expand production so as to meet the demands of foreign markets. However, the proponents of this theory noted that in the short-run the beneficiaries of the expanded production are often foreign investors. This is because the developing countries do not always have the wherewithal to begin these type of entrepreneurial activity without vast foreign support, (Todaro and Smith 2009). Thus, the ability of Developing Countries to enter agreements for long term benefits of their economy is essential.

A lot of variations of the North-South model have emerged, debunking the postulation of the neoclassical international trade theory of identical production functions for different commodities in various economies. In this model the North Countries are the developed economies with more productive advantages while the South Countries are the developing Nations with less comparative advantage in terms of productive capability. The main thrust of this model is that the existence of trade between North and South Countries further worsens the divide between the two in-terms of technology, income and other developmental factors, going by the specialization in productive capacity supported by the factor endowment and comparative cost theories. However, (Porter 1990 in Todaro and Smith 2009) noted that
this issue can be reversed if Developing nations will avoid the easier way out of promoting short-run exporting abilities based on insubstantial natural advantages, such as the export of natural resources and delve deep into the more promising options of creating advanced factors of production to meet the increasing complexity in international demand.

3. METHODOLOGY AND DISCUSSION OF FINDINGS

The Structuralist approach to growth and trade is most applicable to the Nigerian situation, among all the theories explained above. This is because of the need to meet some norms of society that permit illegitimate means of wealth acquisition and contributions to humanitarian causes. The approach to this research is accidental and yet historical in nature. So much has occurred in the past that is related to these issues raised in this paper. The experience of the author of this paper with core research teams in zeolite production attached to Ahmadu Bello University, Zaria, is what prompted an inquest into the problems affecting research and development efforts in Nigeria. The respondents that were interviewed over the possibility of creating a marketing plan for the synthetic variant of zeolite for commercial consumption, as part of my Doctor of Philosophy thesis were mainly from Chemical Engineering Department. They were chosen via accidental sampling mode. The abstract for a paper in a zeolite conference was related to the marketing aspect. A copy of this abstract is in appendix I.

What warranted the need to follow up and identify the status of my paper for this particular conference was because of absence of communication from the local organizing committee. The status was confirmed to be ‘rejected’ after a number of phone-calls and visits to the department of Chemical Engineering, A.B.U Zaria. The issue of writing a marketing plan for synthetic zeolite as a paper for the Head of Economics department, Ahmadu Bello University, Zaria as recounted earlier, is what confirmed my fears of suspected, attempted outright plagiarism. I was even given a document to reference or guide my write-up. This discovery led to my verbal complaints to the Officer that informed me about the expectations from me as a post graduate student in the department of Economics, Ahmadu Bello University, Zaria. I informed him, that I originally sent in an abstract on this issue to a very relevant conference and the status was rejected with the support of the same Chemical Engineering Department of A.B.U, Zaria. I was no longer favored for any course in the department because I demanded that I should be paid for this, as a consultant. Till now I am yet to receive my transcripts to another University since 2015.

Efforts to see the Head in person, warranted death threats from her. I am with guidance and counselling unit of the University till now on the issue. I am even advised by other lecturers of high repute in the University not to return to the University for any course or dealing. As an alumnus I don’t know how they want it done. The department of Economics, A.B.U Zaria, has even chosen to sell my transcripts to another and they are not quiet about it, the seller and the buyers. They are even lobbying for my transcripts in another department in the University where I underwent another course to be given to them for sale also. There is no need to even look for respondents on the matter.

This explanation is to quantify the effects of social deviance on only one research team (that is those with me on my consultancy {X-VONE Ltd, Zaria}). I must confess there is a real waging war in R and D activities. I am also mentioning this in passing. I have been without salary for nine months as a Staff of Economics department, Federal College of Education, Zaria because I refused to indulge in exam malpractice. To be precise I am being asked till now to pass a group of part-time students that do not see the need to attend lectures, write continuous assessment and exams. These students are about ninety-nine percent of the whole group under me. They were supposed to be taught an introduction to accounting course. I am expected to ‘manufacture’ scores for them. We are still on this issue with the Dean of Arts and Social science school, F.C.E Zaria. He has informed me the last time I met him that, he prevented salary payments to my account due to the issue of malpractice. I have since advised the students to transfer to another school or differ the course if truly the cause of all these is lack of adequate time to prepare for the demands of this course. Such schools include other Colleges of Education around and Professional Accounting institutes such as Institute of Chartered Accountants of Nigeria (ICAN). That is how bad social deviance have eaten deep into the Nigerian Society.
Altogether, ten respondents were successfully interviewed, unofficially over the problem and asked to please advise on the way forward. They had direct and first-hand information about the zeolite catalysts case in the department of Chemical Engineering, A.B.U, Zaria. In fact, other key graduates/lecturers in the department are deceased. Their wealth of knowledge on this issue could not be ascertained as at the time allotted for the investigation. The synthetic variant of zeolite proclaimed to be founded by department of Chemical engineering, Ahmadu Bello University, Zaria is a sensitive issue since many individuals in that line of academics have also claimed to be part of the innovation as students of the department but were not accorded appropriate recognition. This in line with the claims of (Okonjwu 1986) as earlier mentioned.

Efforts by this researcher to identify the cause of chaos over the ownership of this innovation was fruitful. Socio-economic problems such as localized racism was noted as, part of the issue why plagiarism and or piracy was unofficially promoted. However, efforts to gather more information on this innovation was not as successful as expected. This has slowed down the extent of progress that should have been made since the discovery over a decade ago. The following are some solutions to the selection of innovations for preservation and onward commercialization of any research innovation, knowledge and etcetera for national development to occur smoothly.

4. RECOMMENDATIONS

(Perkmann et al 2012) highlighted the importance of collaborative research, contract research, consulting and informal relationships in the successful transfer of University knowledge to the industries and vice versa. The recommendations below are associated their postulations on this issue. The choice of extension workers and the need to follow up industrial factories acting as respondents to science based research (or any research) institutes is paramount to the ‘fine-tuning’ of innovations for proper commercialization efforts to occur.

This type of monitoring of innovations in test factory sites and etcetera, may seem trivial but is a key factor that is delicate. It is what makes the difference between a successfully accepted idea, that is now a reality, that people in the society are ready to pay a price for and total failure. It is most times overlooked because, at this stage, high level scientific/engineering knowledge is no longer the only necessary knowledge needed and the time factor earmarked for monitoring and fine-tuning of innovations could be quite vague. Thus, some research teams loose the patience needed to bring forth a quality product.

The majority of the effort lies with social extension workers, who must use their ability to convince the industries to ‘test’ out a new system of production and be ready to stand by the ‘new idea’ until it meets the promises that were envisaged at the beginning. The issue of correcting, improving errors on the innovation lies in the ability of an extension team to clearly define the challenges that respondents are facing amidst, the ‘clause’ of safety rules clearly defined, back to the research institute. Such styles of extension services, to be precise, should have a background in social science studies. There are many issues that make them the number one choice in extension service delivery issues.

1) **Societal differences** across the whole nation in terms of norms, values and traditions and among workers within a facility warrants that cultural differences are taken into consideration when extension service responsibilities evident.

2) **Ability to remain in rural areas**/industrial estates and sites for an extensive period of time and cope above average in every area including one’s personal grooming and health status is paramount to being a successful extension staff.

3) **The personality and makeup of the individual** to be drafted into socio-economic extension service placements. Not all individuals with social science background knowledge are 'out-door' persons. This also refers to the ability to travel at short notice, organize health care service delivery, assist with security checks, among other things.

4) **The ability to listen and learn** from representatives from different societies that have offered their time and resources to test out new products and other forms of innovations. This is quite necessary. They have been in the industry and involved in the commercial production for periods in time and can give a lot of information based on experience, issues on fabrication and customization of some machinery to meet with what consumers prefer, etcetera.
5) **The ability to secure support** for areas of serious challenges due to breach in safety standards and over-all security guidelines in time, to prevent any setback that could prevent continuous retesting of the innovation until appropriate standards are met. For instance, securing funds that could cushion the financial setback of an innovation gone awry during testing procedures.

6) **Trustworthiness:** - The ability for respondents to feel-at-home with the research extension team and give sincere response is earned not necessarily bought all the time. The follow-up process is all about the perseverance of extension workers to continue to come, encourage, listen, advice, learn from what respondent industrial centers are going through with the testing process. industrial centers will definitely contribute to the improvement from their wealth of experience in the production processes that are relevant. The act of 'forcing' is not the option that will bring the desired collaborative effort from the industrial sector. They know the challenges in the Nigerian business climate.

That is why some prefer production plants to be located in another economy while the marketing section are in our economy- just to cope with the current challenges. To have a win-win situation, all efforts towards the innovation, has to be recognized and it must start from the research centers and universities. Other efforts that can be employed to encourage proper commercialization of innovations from research findings include the following: -

- **Proper Costing of Research and Development Efforts:**

  (Lewis and Pendrill 2000) noted that many enterprises spend large sums of money on research and development in the hope that, by incurring such expenditures, future profits will be higher than they otherwise would be...Any expenditure on such projects must certainly be written off against profits of the year in which it is incurred. Research institutes are exempted from paying taxes in Nigeria (legal back up please). They are considered to be a charity organization. They are mandated to receive grants and all other kinds if support, free of charge. There is no need for plagiarism to thrive. However, with this clear case of poor recognition of post graduate students' efforts in research, all these 'waivers' may have to be forgone so as to capture the 'true' cost of including post graduate students' efforts in research activities. (Okongwu 1986) noted that efforts by this class of students in universities nationwide have been regarded as non-recognizable. This has made it difficult to convince such individuals affected to give further support to innovations after graduation or abandoning their post graduate programme.

- **Other Cost Reduction Strategies**

  A known cost reduction strategy is that proposed by (Sheldon 1997) on the need to minimize waste by catalyst recovery and recycling using cleaner alternatives to conventional technologies for the manufacture of products. For example, the use of zeolite-encapsulated metal complexes, metal catalysts attached to smart polymers that are soluble or insoluble in the reaction medium depending on the temperature, and catalytic membranes” (Sheldon 1997).

  Also, in the oil-rich south region of Nigeria, there is a tendency going on, that promotes degradation of the environment (soil, foods and waters) with attendant deaths and illnesses among the populace in the major trafficking communities (Galadima, Okoronkwo, Mustapha and Leke 2012). Many news agencies such as (Reuters 2017 and The Authority 2017) have also reported that the Nigerian government has seized great amount of petroleum products in the southern part of Nigeria in a bid to check illegal oil bunkering.

  The oil spills as a result of oil bunkering and the mode of destruction of illegal refineries has contributed to severe air pollution that is inhaled thousands of kilometers away. These illegal petroleum products that are recovered cannot continue to be burnt or poured out in a bid to frustrate the unregistered oil businesses due to the immense, negative environmental effects. (Odalonu 2016) stated that, the fight against oil theft and illegal bunkering requires a multi-faceted approach that takes on broad stakeholders and governments at all levels.

  Other options to be visited include: - promoting public private partnerships in the refining and marketing of oil petroleum products on a scale that is more affordable to the private sector players; enforcing compliance with licensing guidelines and refining standards in the sub-industry is paramount to checking wastes also in government remittances that could support Research and Development (R and D)
efforts in the oil industry; seizures of oil products and local refining equipment, that were at illegal refining sites are better than burning, pouring out of petroleum products and other inappropriate means of disposing crude petroleum; What should be done with the seized products needs to be decided carefully especially if the refining is incomplete or below consumption standards, thus a better option is to redirect such cases to the dialogue table where Nigerian National Petroleum Corporation (NNPC) and other stake holders take decisions relating to the avoidance of environmental degradation.

Local equipment seized from illegal bunkering sites could be improved upon with the collaboration and attention of the appropriate research institutes, consultants and indigenous fabricators to improve their viability for the Nigerian market. With time the heavy reliance on imported maintenance for foreign equipment is reduced. This will help to free foreign exchange earnings for other important uses as deemed fit.

- Intellectual Property Rights on Innovations:

The moment it is noticed that an innovation is created, efforts should be made to secure a patent, copyright for the original individuals involved. This patent could be 'rented' out or sold to willing individuals, private, public departments, including the research institutes, at a price to cover some costs associated with post graduate education/ research and development. Even those who win grants and scholarships may have to begin the course of study with funds from another source.

All efforts that could promote ingenuity, should be encouraged. This could vary from promotion of the individual at workplace or a simple spoken sentence of appreciation. (Perkmann et al 2012) also differentiated between pure academic engagements and commercialization of academic findings - also called intellectual property creation (in Legal studies) and academic entrepreneurship. According to them, academic engagement could spur creativity in academics and academic creativity could induce academic employment. Whichever way it occurs there is need to give incentives outside the basics associated with the academic engagement.

- Further Recognition of Innovative Efforts:

For instance, due to a firms inclination for investments in research and development (R&D) within their corporation laboratories, their innovative products could secure the head scientist an academic engagement with a government research facility of a University. Isn’t there need to reward the extra effort? Productive research is expensive there is need to reward firms, individuals and other bodies in the public and private sectors in conjunction with the immerse contributions they were able to provide. This is the essence of a democratic society. This type of collaboration will help to absorb graduate trainees before the year of graduation so as to replace loss of manpower.

- Promotion of Inter-Disciplinary Efforts in R and D:

In addition, there is need for scientists to liaise with experts in applied art and allied art specialties to promote responsible packaging and presentation of commercialized scientific findings. This is a way of promoting marketing and advertisement, among other gains. For instance, some types of cement are patronized by the estate sub-sector because of the packaging’ that the cement comes in. Even after the cement is used up, the bags are still very applicable to other uses due to the durability and presentation. Importation is not always the key besides (Lathan 1973) has traced the roots of modern efficiency in international commerce to the Old Calabar region of Nigeria and (Rau 1991) also lauded the extensive experimental ability of local farmers in Africa. Their local silos preserved grains better than large grain depots in the cities. There are still lots of untapped information within our environment if we choose to look closer still at our traditional roots. Science graduates at all levels should be encouraged to undergo courses in Art, Management, Social Sciences and the Humanities. The wealth of knowledge gained will definitely be quite useful when one least expects it to be.

Finally, it must be noted that the marketing plan issue, could not be solved in relation to zeolite production. Thus a good economic plan could not be envisaged since key respondents could not, for one reason or the other, cooperate with the researcher. The author thought it wise to handle it as an ongoing
doctoral research due to the time frame that could be involved in settling disagreements over the zeolite marketing plan.

5. REFERENCES


Empirical observation and experience of the researcher within the same period (2014 to date)


6. APPENDIX I
COPY OF THE ABSTRACT SENT TO THE 1ST NIGERIAN INTERNATIONAL CONFERENCE ON ZEOLITE SCHEDULED TO HOLD IN 2014, ABUJA

ENHANCING FORWARD AND BACKWARD LINKAGES BETWEEN SCIENCE RESEARCH INSTITUTES AND RELATED INDUSTRIES FOR PROPER COMMERCIALIZATION OF INNOVATIONS IN ZEOLITE CATALYST AND MEMBRANE RESEARCH.

INTRODUCTION
Zeolite catalysts have been in use from time immemorial till date for various purposes such as water purification, health benefits and for the separation of ions from chemicals for instance, in the hydroisomerisation of leaded gasoline. In Nigeria, the main challenge in the development and application of zeolite has been to cut cost of production while enhancing the energy efficiency of production process of / involving zeolite catalyst and membranes and at the same time keeping the whole chemical process environmentally friendly. A lot of efforts have been done in the field, to find feasible alternatives to imported zeolite catalyst within Nigeria. Nwosu et al (2013) emphasized the efficacy of Ngwo White clay from Udi in Enugu State of Nigeria as a suitable drilling mud for use in the oil industry. Their analysis of this clay type (mineralogically and physic–chemically) showed that the presence of Sodium montmorillonite in the clay type can equally be used in the synthesis of zeolite which is a catalyst in cracking of petroleum. Daramola et al (2012) in their research on the Potential Applications of Zeolite Membranes in Reaction Coupling Separation Processes, prompted the need for the acceptance of membrane-based reactive separation processes which, according to them are more potentially compact, less capital intensive, and have lower processing costs than traditional processes… especially for industrial purposes. However, Daramola et al (2012) noted that some critical issues dampen the efforts of spirited research output centers in this regard, due to some problems besetting the industry.
Despite the laudability of the membrane-based reactive separation processes there is still need to step up research in this area to make it acceptable for industrial use. This is because most industrial applications need high thermally stable membranes and zeolite membranes need significant improvement to attract industrial acceptance. Thus researchers / research institutes ladened with the responsibility of zeolite research and development need adequate finance for this area not only for the scientific analytical process but also for the whole follow –up process usually involved in trying out a new innovation in make-shift or /and real–life simulation industrial application until appropriate fine tuning of the innovation has been achieved for the appropriate use. The need for an ongoing socio-economic relationship between the appropriate research centers on zeolite development and the industrial concerns involved with the production and use of zeolites in whatever form is paramount. Whatever the goal to be achieved - whether promotion/marketing of a new innovational product and/or fine-tuning a new innovation, the developmental relationship should be such that both parties assist each other to achieve each other’s goals or aims for existence. This is the essence of the forward and backward linkage idea.

THE PROBLEM

Ahmed (2014) noted that a blend of synthesized zeolites from indigenous kaolin was better at cracking heavy gas oil (HGO) and hexadecane than the best commercial catalysts in the market. This breakthrough in zeolite production is regarded as important since all the synthetic zeolites used in Nigeria are imported and millions are spent in the acquisition of these imported catalysts annually. Currently, zeolite Y is the most popular zeolite used in the refineries in Nigeria. Its ability to crack HGO and hexadecane is limited compared to the blend of synthesized zeolite used in Professor Ahmed’s research. According to Ahmed (2014), clay, a major input for the production of synthetic zeolite is in abundance across the nation. Thus, the cost incurred on the purchase of zeolites from foreign zeolite producers is quite enormous and can be significantly reduced. His research and findings were based on the quality of clay found around Katsina State. The research questions this paper seeks to proffer answers to are as follows:-

a. What are the Major challenges hampering the indigenous production of synthesized zeolites from locally abundant kaolin?

b. How important are social science research workers to the advancement of indigenous production of synthesized zeolites from locally abundant kaolin?

c. In what ways can the indigenous production of synthesized zeolites from locally abundant kaolin be promoted so that importation of catalysts especially for the refining of petroleum is drastically reduced to 2% in the next ten years?

OBJECTIVES OF THE STUDY

a. To identify the major challenges hampering the indigenous production of synthesized zeolites from locally abundant kaolin.

b. Identify the importance of social science research workers to the advancement of indigenous production of synthesized zeolites from locally abundant kaolin.

c. To proffer ways in which the indigenous production of synthesized zeolites from locally abundant kaolin can be promoted so that importation of catalysts especially for the refining of petroleum is drastically reduced to 2% in the next ten years.

METHODOLOGY

Since a pilot study on the production of the special blend of synthetic zeolite catalysts by Ahmed (2014) there will be need to discover the actual cost of producing this synthetic zeolite and whether this feat can be replicated elsewhere using the locally available clay in that area among other things. Thus interview method will be a necessary research tool. An econometric tool known as simulations will be used to project the cost of having small scale production plants based on the size of the pilot study production plant employed in Ahmed (2014) research analysis. The aim is to ensure that in a worse-case scenario where numerous small scale producers of the indigenous zeolite catalyst dominate the market- that is to say that the economies of scale associated with large scale production is not taken advantaged of due to
some constraints in the market and/or production process, the cost will be significantly less than continued use of imported zeolites in the refining of petroleum.

EXPECTED RESULTS

It is expected that the cost of producing a ton of the blend of synthetic zeolite locally will be significantly lower than importing a ton of regular commercial zeolite. However, it is also suspected that localizing the indigenous zeolite producing industry to a given area could raise distribution/delivery costs to end users across the nation. Another envisaged issue expected is the ability of the industry to meet local demand adequately given the bureaucratic process involved in funding industrial concerns in Nigeria. Thus the encouragement of small to medium scale industrial concerns in this line of production is recommended while adequate policies are put in place to create a soft-landing for the industry to thrive.

BENEFITS OF EMPLOYING SOCIAL SCIENCE RESEARCH TOOLS FOR ENHANCING GROWTH IN THE INDIGENOUS ZEOLITE PRODUCTION INDUSTRY

Environmental friendly goals can be reached by creating uses for the end product of zeolite industrial concerns and other industries in general. Ways of achieving this feat is not far-fetched as it includes the appropriate and heavy employment of research techniques- for instance survey method and staff especially those with research in social science background to gather information from the industries and back, among other things. The advantages of this kind of collaboration between zeolite research institutes and zeolite industrial concerns are numerous. Some are as follows: - Provision of a ready market for the output of zeolite related industries and innovations from the zeolite research institutes, absorption of harmful end products from the environment by proper dissemination of information from the industries and the research institutes and back, enhance constructive competition between zeolite related firms and researchers, increase industrial concerns confidence and support in research institutes and drastically cut down cost of importation of synthetic zeolites while promoting increased production of refined products to meet demand, at home and abroad.

REFERENCES
