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Inspection and Insertion- a novel Triple Helix Model Collaboration with Kano Metropolis as Example

Jibrin Umar M,Chukwu Uche P. and Amonye Michael C.
National Board for Technology Incubation (NBTI),
Federal Ministry of Science and Technology (FMST), Abuja

Abstract: *The modern world is swept by change. New technologies emerge constantly, new markets are opening up. There are new competitors but also great new opportunities, as unlimited activities can take place within a limited space. Our success depends on how well we exploit our most valuable assets: knowledge, skills and creativity and ability to synergize. These are the key to designing high-value goods and services and advanced business practices. They are at the heart of a modern, knowledge driven creative economy. This new world challenges business to be innovative and creative, to improve performance continuously; to build new alliances and ventures. But it also challenges Government: to create and execute a new industrial policy. (Bryson et al 2000). It challenges the academia as new knowledge generators, to ensure that research results are directed to solving immediate problems in the society and industry. It challenges the industry to seek constructive and productive collaboration with the academia towards the continuous evolution of processes and products in order to become firmly competitive in the world market. According to the Triple Helix model of knowledge-based innovation, interaction among different actors of three sectors—university, industry, and government—generates a country's innovation process as well as its development progress. In this paper, a new concept of inspection & insertion as a methodology for varied applications through which the employment of the triple Helix Model can be used to foster better productive relationship between Government, Industry and academia in Nigeria. Some areas in Kano Metropolis have been used as samples to display a new strategy of industrialization which can be replicated in all nooks and crannies of the country to generate new and better products and services that shall meet global competitiveness.*

Keywords: *Triple Helix, Industry, University, Government, Productivity, insertion*

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I. Introduction

Lack of advanced education and technology, lack of combination of theory and practice and knowledge-sharing mechanisms, lack of proper financing in industry, lack of mutual interaction between university and industry, lack of an innovative role played by government and constructive regulatory control are among the factors diminishing the country's strength to move towards knowledge-based innovation and global advancement. The Nigerian situation is such that whereas the industry struggles to keep up within the limited technology knowledge it acquired at inception, the government makes and updates policies without the requisite input from the industry while the academia continuously churns out research results that offer little positive impact on innovative creation and productivity by way of industrial assimilation, proliferation and commercialization.There are two broad assumptions underlying the establishment and management of universities in Nigeria. The first one is that universities are set up to perform certain well defined functions such as teaching, research and knowledge production and could remain outside the broad national, cultural and political influence. Second, and specific to the research function, the notion of research and development (R&D) without much attention to downstream activities that involve commercialization, limits the relevance of university research (Oyelaran-Oyeyinka and Adebowale 2012)**.** The time has come for a rethink and strategizing to assign a third role to the universities as equitable contributors to the country's economic development, if we are to transform to a knowledge based and knowledge driven economy as a sine qua non to continuous wealth creation and economic cum technological advancement by way of constant generation of competitive goods and services emanating from ever evolving new knowledge.

The 1998/99 World Development Report highlighted the role of knowledge in development. Countries that experienced economic growth in the recent decades were found to be those that applied knowledge in their production processes rather than those that accumulated physical capital. Scientific knowledge was found to expand the limits of other factors of production thereby enabling a long run sustainable growth in output. Indeed, most of the economically advanced countries were found to have invested a greater proportion of their

annual income on scientific research which eventually paid off in their sustained output growth and consequently improved standard of living(Obembe 2012).

The Triple Helix thesis proposes that the university can play an enhanced role in innovation in increasingly knowledge-based societies. The institutional innovations as projected by the triple helix model, aim to promote closer relations between universities and firms. The ''endless frontier'' of basic research funded as an end in itself, with only long-term practical results expected, is being replaced by an ''endless transition'' model in which basic research is linked to utilization through a series of intermediate processes, often stimulated by government. The increased salience of knowledge and research to economic development has opened up a third mission: the role of the university in economic development. Can academia encompass a third mission of economic development in addition to research and teaching? How can each of these various tasks contribute to the mission of the university?(Etzkowitz and Leydesdorff 2000).

Harnessing the immense benefits of collaborating with knowledge based institutions is a win-win strategy that spells well for industry, the institutions, government and the masses at large. There has been the problem of inertia and how best to go about it. We have taken it from conventional corners to wit to put industries near universities and vice versa and contemplated on building co-habiting set-ups; but the infrastructural and operational demands become so enormous that the project seems impossible. Hence hitherto industry-university collaboration has remained distanced, minute, inefficient and of little economic impact. This novel concept of inspection and insertion as a methodology for varied applications through which the employment of the triple Helix Model can be used to foster better productive relationship between Government, Industry and academia in Nigeria has come handy as a tool to infill co-ordinated and collaborative knowledge based technological cum economic practice in selected industrial units across the country.This paper proposes Inspection & Insertion as a novel method of application of the triple helix model for fast tracking the industrialization of Nigeria. Like a thermodynamic system, Inspection and Insertion defines a 'target industrial consortium' as a specified area of multiple economic activities around which we can draw a boundary. The boundaries may be fixed or moveable. Business information, technology, communication systems, knowledge of all forms, humans and goods as well coordinated cooperation and collaboration can be transported within and in or out of the boundary. For this primary presentation, Kano State has been chosen as target society from which target industrial consortiums shall be constructed.

Kano State is located in the north-west region of Nigeria. It has a total land area of 20,131 km^2 (7,773 sq mi), which represents 3.13% of the entire total area of the country. Kano State is bounded on the west by Katsina State, on the south-west by Kaduna State, on the east by Jigawa State and southeast by Bauchi State. It is a part of the Sudano-sahelian region of the country and comprises of 44 local government areas, which divide into three geo-political zones, namely Kano Central, Kano South and Kano North. Kano has a total population of 9,383,682 and population density of 470 per/sq km. Kano metropolitan has population of 2,163,225 (NPC, 2006). 75% of the people living in Kano are living in rural areas. Currently the rate of population growth observed to be 2.9% per annum in Kano State. Moreover, high dependency ratio has been observed in Kano State and about 47% of the total populations in the study area are under 15 years of age. (Bello and Tuna 2014). Human Development Index (HDI) for Kano state is the same with that of the country.The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. Just as in the 2013 HDR, a long and healthy life is measured by life expectancy. Access to knowledge is measured by: i) mean years of education among the adult population, which is the average number of years of education received in a life-time by people aged 25 years and older; and ii) expected years of schooling for children of school-entry age, which is the total number of years of schooling a child of school-entry age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2011 international dollars converted using purchasing power parity (PPP) rates.Nigeria's HDI value for 2013 is 0.504— which is in the low human development category; positioning the country at 152 out of 187 countries and territories. Between 2005 and 2013, Nigeria's HDI value increased from 0.466 to 0.504, an increase of 8.1 percent or an average annual increase of about 0.98 percent. The rank is shared with Cameroon. Mean year of schooling and Life expectancy are 5.2 years and 52.5 years respectively. (UNDP 2014).

Over less than a century, the population size in Kano state had increased from 2.4 million in 1931 to about 9.3 million in 2006 (even after the creation of Jigawa State from Kano State) and about 29.1million in 2013 (estimate based on 3.34 annual growth rate). This has not only confirmed Malthus (1798) prediction, but also lowers the extent of re-multiplication to less than 5 years and further magnifies the power of population in terms of growth rate. With a total land area of 21,276.87Km2, Kano state had in 1991 contained an average of 273 persons per square kilometer but in 2006, the density had increased by about 1.6 times (over 150%) with a density of about 441/Km2. The current estimate (2013) shows a density of about 1,365 persons per square kilometer; increased by about 3.1 times (over 300%). (Ibrahim 2014).

II. Aim and Objectives

The aim of this proposal is to enhance the fostering of Academia-industry collaborationin Nigeria, in a favourable environment sustained by befitting policies of government, wherefore university teaching and research shall directly impact on industry activity and growth while students shall be trained to be industry prone and ready productive economic assets.

The objectives include:

a. To utilize the R&D results from the Universities for the creation of new goods and enhancement of services.
b. To create jobs, wealth and reduce poverty within the Universities and environs.
c. To create entrepreneurial cultures within the system such that the lecturers and their students will be involved in the commercialization of R&D results.
d. To create a platform for technical support to the manufacturing sector from knowledge source towards production of value added and competitive goods.
e. To generate revenue through royalties from intellectual properties.

III. Methodology

This paper is a pronouncement emanating from years of aiding start-ups with linkages to universities and other R&D institutions as well as from the experiences gained by administering Technology Incubation programme in Nigeria since the inauguration of the National Board for Technology Incubation (NBTI), in 2005.It is believed that experience that is supported by trending global practice can be indigenized to suit our local environment.

The concept of Technology Incubation was introduced to the Nigerian Government by the United Nations Development Program (UNDP) and the United Nations Fund for Science and Technology for Development (UNFSTD) in 1988. The Federal Government then commissioned a consortium of three firms to advice on the desirability and implementation modality. Eventually, the first Technology Incubation Centre (TIC) in Nigeria was established in Agege in 1993, followed by the ones in Kano and Aba in 1994 and 1996 respectively. Subsequently more TICs were established. As at today, there are 27 TICs in Nigeria. The National Board for Technology Incubation coordinates the activities of all the TICs in Nigeria.

IV. Current Global Situation

The powerful forces driving change in our world today - demographics, globalization, and technology - are demanding change in the role, character, and relationship of knowledge organizations such as research universities, institutional R&D organizations, industries and government. A radically new system for creating wealth has evolved that depends upon the creation and application of new knowledge. Across the globe, universities are being positioned as strategic assets in innovation and economic competitiveness, and as problem-solvers for socio-economic issues affecting their countries. Synergies between higher education institutions and industries (and other players in the productive sector) can play a critical role in securing and leveraging additional resources for higher education, promoting innovation and technology transfer, and ensuring that graduates have the skills and knowledge required to effectively contribute to the workforce. In Europe, the US, Latin America Asia and even Africa, issues of knowledge and technology transfer have moved to the forefront of attention in economic, social and industrial policy**(Njogah et al 2013).**

V. Current Local Situation

Academia Productivity

It is sad to note that every year in Nigeria, millions of high quality graduates from various technical, vocational and academic institutions, at various levels become certificated only to wonder and roam the streets, looking for jobs that are not there. Most end up in menial jobs while the rest become permanent liabilities to their parents and guardians who spent huge sums of money to train them. Most of them in the engineering, science and related disciplines execute very successful and need driven projects. Investigation shows that most of these projects are abandoned as soon as they are scored. Apart from the graduating students, academia research productivity is high in the publishing of journal articles, technical reports, conference papers, working papers, and occasional papers. On the other hand, their research productivity is lower in the publishing of textbooks, book chapters, monographs, and patents and certified inventions(Okiki 2013). A fact of our current situation is that research and development results are not fully utilized to impact on the industry and economy. This situation is common to all academic institutions both in Kano state and the country at large.

Knowledge based assets of Kano State

The state is blessed with lots of academic institutions as well academic personalities of various disciplines. Knowledge based assets of the state include among others:

i. A story of a giant university (Bayero University Kano) supporting three (3) other universities within the state. They are Kano State University (KUT), Wudil; North west University (NWU), Kano; and Nigerian Police Academy, (NPA) also in Wudi, Kano..
ii. A Polytechnic with numerous science and engineering faculties.
iii. A State with sound industrial base and strong political awareness.
iv. Committed Lecturers and researchers.
v. Strong Engineering and Science faculties with ICT backing centre.
vi. Strong Business Administration Department that can support R&D commercialization.
vii. Strong Consultancy Services Unit that can serve as a central co-ordination for commercialization.
viii. Existence of synergizing institutions for collaboration takeoff such as incubation, parks, clusters, financial linkage institutions and potential government support.
ix. Existence of Directorate of Research, Innovation & Partnership as a new initiative by the Vice-Chancellor, Bayero University Kano, Prof. Abubakar Adamu Rasheed.

VI. Necessity for Triple helix

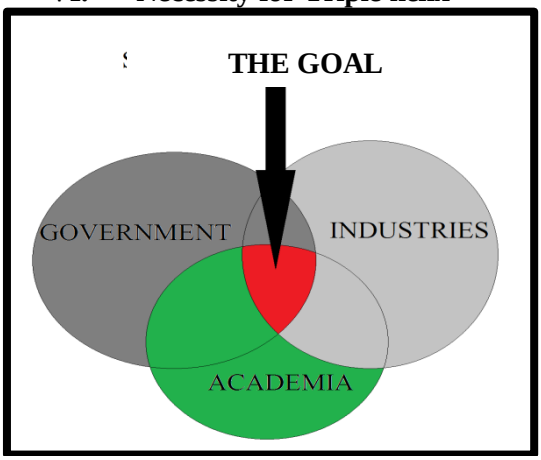

Figure 1: Triple Helix Model

The concept of the Triple Helix of University-Industry-Government relationships developed in the 1990s by Etzkowitz (1993) and Etzkowitz and Leydesdorff (1995), encompassing elements of precursor works by Lowe (1982) and Sábato and Mackenzi (1982), interprets the shift from a dominating industry-government dyad in the Industrial Society to a growing triadic relationship between university-industry-government in the Knowledge Society. The Triple Helix model contrives that the potential for innovation and economic development in a Knowledge Society lies in a more prominent role for the university and in the hybridization of elements from university, industry and government to generate new institutional and social formats for the production, transfer and application of knowledge. This vision encompasses not only the creative destruction that appears as a natural innovation dynamics, but also the creative renewal that arises within each of the three institutional spheres of university, industry and government, as well as at their intersections (Rangaa and Etzkowitz 2011).

The "triple helix" is a spiral model of innovation that captures multiple reciprocal relationships at different points in the process of knowledge capitalization. The first dimension of the triple helix model is internal transformation in each of the helices, such as the development of lateral ties among companies through strategic alliances or an assumption of an economic development mission by universities.The second is the influence of one helix upon another, for example, the role of the federal government when it institutes indirect industrial policies to aid innovation creation, industrial growth and commercialization. The third dimension is the creation of a new overlay of trilateral networks and organizations from the interaction among the three helices, formed for the purpose of coming up with new ideas and formats for high-tech development. The triple helix denotes the university-industry-government relationship as one of relatively equal, yet interdependent, institutional spheres which overlap(Etzkowitz 2002).

The threemembers of the helix must show faith, sincerity and commitment that would lead to genuine relationship, interaction and growth. Firstly increased interaction must be fostered among industries that are within an industrial consortium. Secondly increased relationship aimed at problem solving through knowledge backed evolutionary innovative creations must be promoted. Thirdly the industry and academia must work together to advice government on important directions and policies which it shall enforce for the realization of the common goal of industrialization and continuous economic growth. The government shall seek to

understand and cooperate with industry and academia as if they are one organ with each other for the realization of the desired results. This is the dream depictedby the central intersection of the triple helix. This is the goal.

VII. Inspection and Insertion

A long time ago, all R&D results were directly moved into the market by the developer or concerned Micro, Small or Medium enterprise. But since the introduction of technology incubation programme in Nigeria by the establishment of the first Technology Incubation Centre (TIC) at Agege, Lagos in 1993, followed by the ones in Kano and Aba in 1994 and 1996 respectively and the culminating inauguration of the National Board for Technology Incubation (NBTI), in 2005, as well as the subsequent establishment of more incubation centres, numerous R&D results became enhanced and more competitive as they are taken through an incubation process or through a Science or technology park or through a cluster of its type into the market and economic mainstream. Coordinated clusters and Science & Technology parks are later introductions following intensified activities of technology incubation programme. Figure 2 shows various routes through which R&D gets into the market.

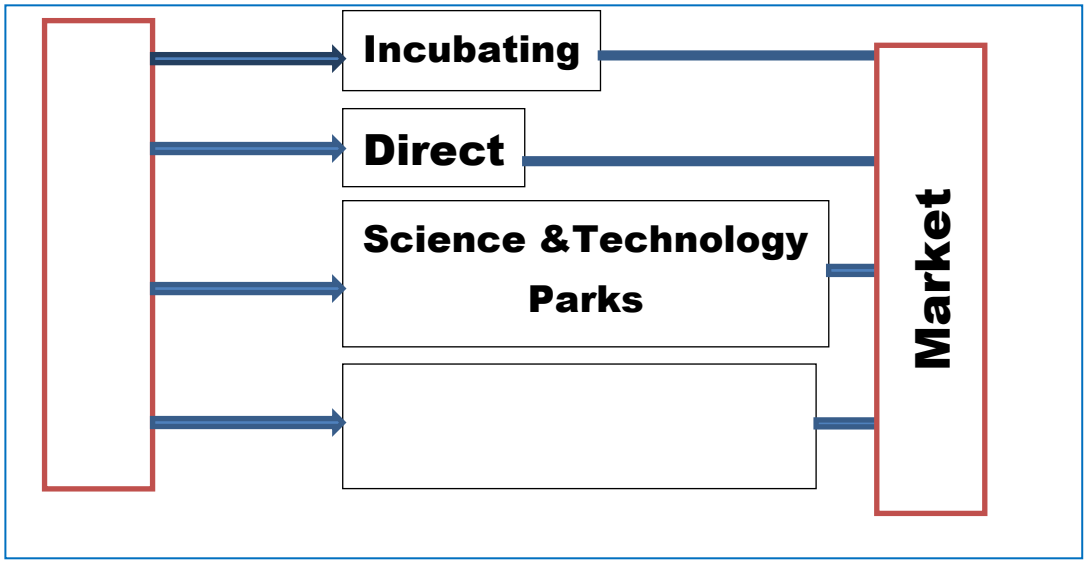

Fig. 2: Conventional R&D Commercialization Routes

Technology business incubation is a veritable tool for industrialization and economic growth. Its operations are structured to achieve the following (a): to boost the industrial base of the country; commercialization of R&D results; upgrade and enhance the application of indigenous technologies. (b): to nurture the start-up and growth of new innovative businesses engaged in value added low, medium and high technological related activities over a period of time, and (c): to promote functional linkage between research and industry.

Science parks, also known as technology or research parks, or innovation and science centers are generally defined by the International Association of Science Parks as a property-based initiative, which has formal and operational links with universities or other higher educational institution, or major centers of research; designed to encourage the formation and growth of knowledge-based industries or high value-added firms, normally resident on site; and has a steady management team actively engaged in fostering the transfer of technology and business skills to tenant organizations. There are currently about 700 parks worldwide. The first park was founded in California in 1951, at what is now the center of the Silicon Valley –the University of Stanford**.** Technology parks are designed to facilitate the production and commercialization of advanced technologies by forging synergies among research centers, education institutions, and technology-based companies. Tenants of technology parks are usually small companies at an early development stage pursuing an ambitious growth strategy based on the incubation of new ideas. (Petree et al 2000).

A technological cluster is a geographical concentration of related technology firms including competitors, suppliers, distributors, and customers; usually around scientific research centers and universities. A functioning technological cluster is composed of a number of players that work in concert to create a highly innovative and productive environment for the growth of the existing and creation of new businesses in the cluster. The increased interest in cluster development is driven by a desire on the part of regional development authorities for economic growth. There are generally three advantages for a company to locate in a cluster. The

first advantage is the presence of a large labor pool due to the geographical concentration of firms in the same industry or in closely related ones. The second advantage is the availability of related materials and other inputs at lower costs. These inputs include tangibles, like raw material and supplies, and intangibles like consultations and collaboration. The third advantage is the intensity of knowledge exchange that can lead to knowledge spillovers between nearby firms and institutions in the cluster. (Fallah 2005).

It is to be noted that the operations of both the Science and technology parks and the technology clusters are basically elongated incubation processes going beyond the period of incubation for essentially basic mentoring, common facilities, and access to market as well funding sources and ancillary services are provided as in incubation.Inspection and Insertion aims at bringing the three things together always and everywhere, and starts with identification and selection of an industrial consortium from a target area like Kano state for example. Firstly, inspect the consortium with a view to determining what is available or lacking of the three members in the helix. Then insert it by inviting the nearest located member into the fold. Secondly, guided by the canvassed relationship of the triple helix as explained in Section 5 paragraph 2, the companies and industries in the consortium are caused to engage in a mutually benefiting relationship without regard to whether they produce like items or not, as there are invariably several common needs and problems they must necessarily share.

Similarly the Universities and other higher institutions as well as research institutions within the consortium, are encouraged to enter into lasting collective relationship. Once this is done the environment becomes conducive for the already bunched and relating industry to collaborate with the already bunched and relating academia. Project topics and R&D problems are sourced from the united industry, solved by the united academia wherefore the two can easily invite the government to see and witness which of their problems could be addressed through enabling policies. This is the new way forward. It does not require huge investment in land procurement and building infrastructures. It could be applied by way of creating new clusters as shown in figures 3 and 4, or energizing an existing cluster as shown in figure 5; or on the other hand as bringing three things together as shown in figure 6.

Figure 3 shows the focus is K/Ruwa/Kwakwachi market area. Lots of technical and technological activities including equipment fabrication and motor vehicle repairs take place in the enclave. When Bayero University (BUK), Hydraulic Equipment Development Institute (HEDI)/NASEM, SMEDAN and TIC are inserted by way of collaboration, products and services emanating from the area are bound to become better and more competitive.

Similarly in Figure 4, the focus is on Technology Incubation centre (TIC), Kano. When Bayero University and the Kano State University of Technology are inserted by way of concerted collaboration, lots of products in the areas of agriculture and biotechnology would be enhanced and become more competitive. New products shall be created promoting innovation and industrialization. Figure 5 shows an already existing cluster, the Kano Computer Village. It is an industry standing on its own. When R&D institutions are inserted in accordance with the triple helix model, more and better products of innovation shall definitely proceed from the cluster. Figure 6 is an industrial consortium containing universities, agricultural and water resources, industries and markets. Linking all these intuitions in a coordinated and concerted collaboration in tandem with the triple helix model shall obviously promote creation of new products and promote industrialization.

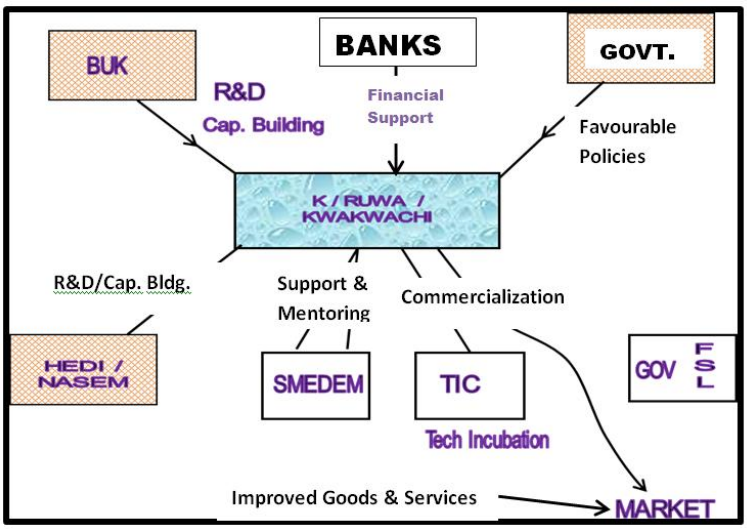

Fig. 3: Creation of New Cluster at K/Ruwa/Kwakwachi by Inspection & Insertion

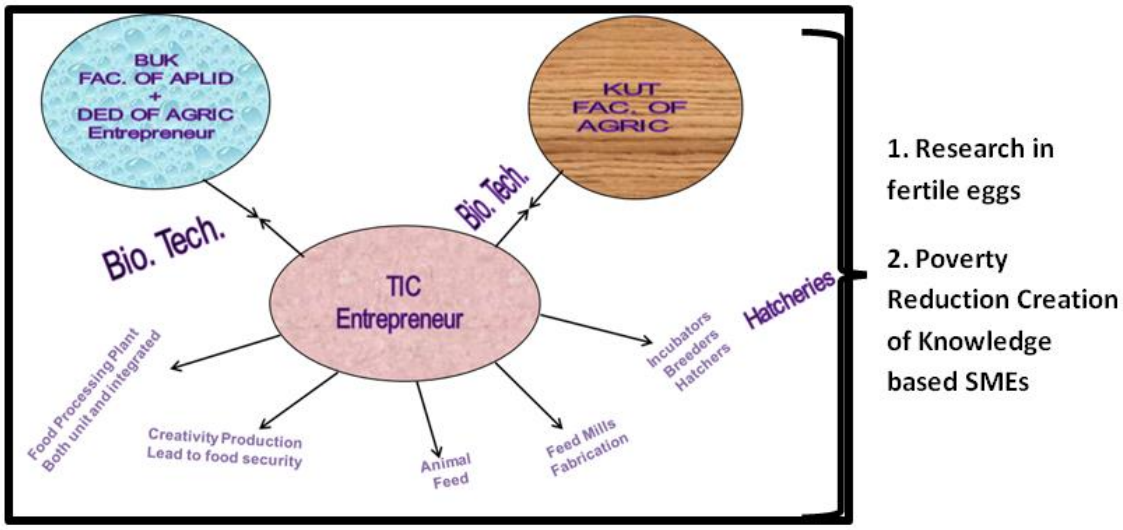

Figure 4: Creation of New Clusters at Tic-Kano by Inspection & Insertion

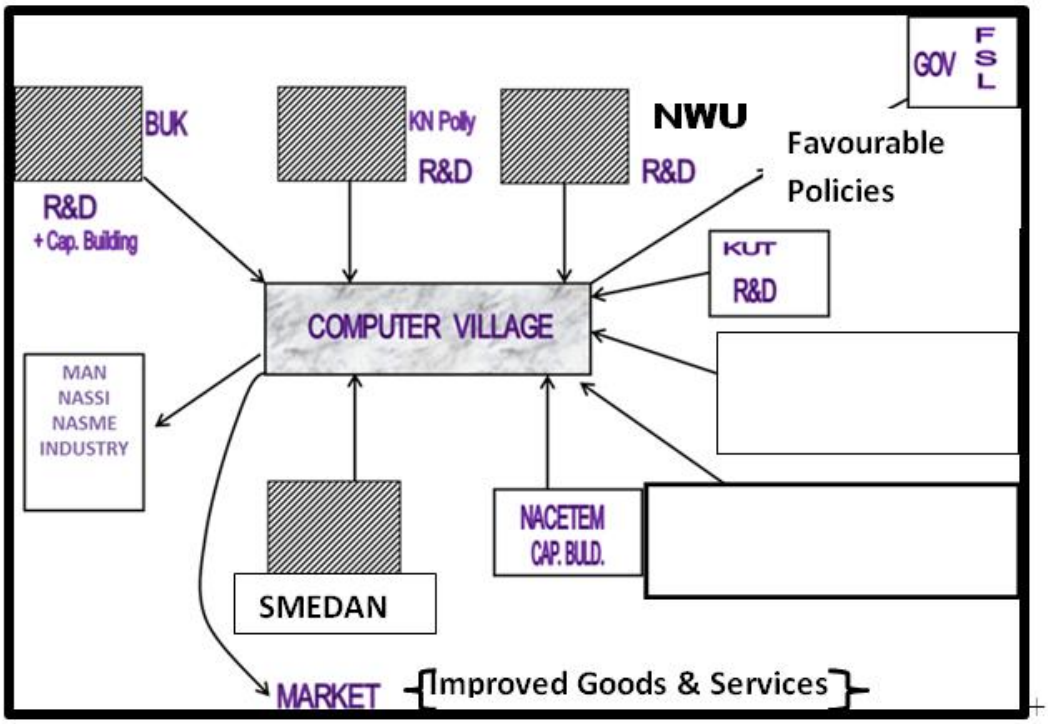

Figure 5: Energizing Existing Cluster by Inspection & Insertion

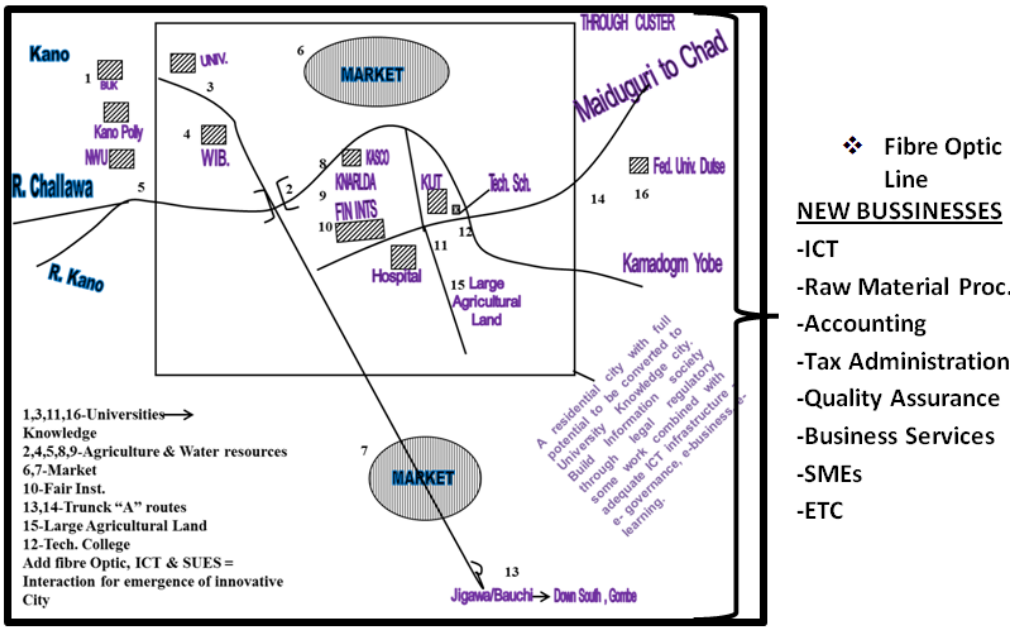

Figure 6: Synergy for Three Things by Inspection & Insertion

VIII. Conclusion

We do not need to wait for huge budget to position industries within University walls by way of University Technology Parks in order to place the country on the right path of industrialization. It is opined that action can startby defining a boundary and by Inspection& Insertion in accordance with the triple helix model revolutionize the industrial process for our dear country Nigeria.

I call on Bayero University, Kano and particularly the Faculty of Engineering to rise to the occasion; take up any of the examples shown, create a collaborative team to identify by name all industries, academia and government within the enclave with a view to establishing coordinated daily collaboration amongst all and sundry; whereby products and services of industries shall be made available to the academia for purposes of enhancement. This congenial relationship shall continue to evolve new products and systems to the benefit of all.

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