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University Industry Linkages on Commercialization of Innovations of Higher Education: Evidence from Enugu State, South-East Nigeria.

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ABSTRACT

This study examined the university industry linkages on commercialization of innovations of higher education: evidence from Enugu state, South-East Nigeria. Four research questions and four hypotheses guided yje study. The methodology adopted by this study was descriptive survey research in which well validated questionnaire that was used to collect primary data from the five sample units. The said sample units included the University of Nigeria Nsukka (UNN), Enugu State University of Science & Technology (ESUT), Enugu, NOUN Enugu study centre, Enugu State Government (ENSG), and the Ama Plant of Nigerian Breweries Plc, Ameke Ngwo. The population for the study was 4,361 out of which a sample of 353 respondents was drawn using Cochran's finite population correction technique. Target respondents for the survey were selected using purposive sampling technique. The study was anchored on two theories, namely, the Diffusion of Information Theory (DOIT), and the New Growth Theory. Multiple Regression Analysis was used to test the four hypotheses of the study. It was the findings of the study that government policies had significant effect on the number of Intellectual Property Rights (IPRs) sold or bought; that funding mechanisms had significant effect on the number of research contracts awarded to the academic staff; that human resource development had significant effect on the number of scientific conferences or training sponsored by the government or firms; and that communication strategies had significant effect on the number of licensed inventions being marketed by universities in the system of innovation in Enugu State. It was the recommendation of this study that government should strive to provide the enabling environment that paves way for effective university-industry partnerships by way of formulation of sound policies or aligning of the nation's industrial policy with her education policy, strengthening of research governance and management and architecture an effective sustainable national system of innovation (NSI). Finally, it was also the recommendations of this study that a sustainable funding mechanism that will target multiple levels including government, private sector and productive sector be put in place; and that stakeholders in the university-industry linkages should embark on regular capacity-building on relevant skills, policy development, IPR management, marketing communications, and entrepreneurship among academic staff of Universities in Enugu State.

Keywords: university, industry, linkages, partnerships, commercialization, invention, private sector.

INTRODUCTION

All over the world, universities are increasingly being positioned as strategic assets in innovation and economic competitiveness, and as problem-solvers for socio-economic issues affecting their countries. Synergies between higher educational 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 (Barry, 2016; Mouton, 2014). As a matter of fact, there has to be a very strong collaborative partnership between Higher Educational Institutions, Government and the Industry, the "Triple Helix", the confluence which is a powerful one that

drives the economies of nations (Bogoro, 2015:2).

In the developed or industrialized countries, partnership between University and Research Institutes, on one hand, and industry and governments, on the other, is one of the most effective strategies for technology development and a useful tool for ensuring the effective and efficient application of science and technology to the resolution of social problems. Such partnerships take many forms including the joint execution of research projects, the award of research contracts, the development of curricula and the provision of continuing engineering education for practicing engineers and scientists. Due to the awareness of the direct and indirect benefits associated with the partnerships, they occur readily with less external prodding. Furthermore, each of the partners has in place the policies and institutional arrangements to engage in such collaborative work and researchers with scientific ideas of economic value are assisted in forging links with industries/entrepreneurs and financial institutions (Bamiro, 2015).

However, in most African countries, partnership between local industries and universities is not very common. Hence, the transformation of research results to products/technologies is usually left to the individuals who, without the necessary institutional framework and experience, only allow the idea to collect dust in a little known journal. There are several reasons why the enabling institutional arrangements for such partnerships have not developed over the years. In fact, many countries in Africa lack an enabling environment for reorienting and aligning universities and other higher education institutions (Universities) towards a more entrepreneurial role. Apart from perhaps the Maghreb region and South Africa, most of sub-Saharan Africa lack high-tech industries and a true technology culture that arises from the constant pressure to update and deepen technology in order to survive in a competitive marketplace (Sawyerr and Barry, 2018). Many of Africa's industries are often small to medium-scale firms producing for local markets, while the relatively larger ones are subsidiaries of transnational companies which draw upon the in-house R&D capabilities of the parent company. Others note lack of awareness of the existing research results and new technologies by industry; the absence of strong involvement of the users in defining the research agenda; and, the irrelevance of some university research (Dhesi and Chadha, 2016). Other factors identified include lack of sufficiently qualified researchers, weak research infrastructure, inadequate funding for research, and donor-influenced research priorities (Barry, 2016; Mouton, 2017). Under such conditions, the link between the supply of skills and new knowledge from higher education institutions in Africa and the demand for these from industries and other parts of the productive sectors are not clearly established. Low investment in science and technology and lack of national strategies further compound the difficulties (Mouton, 2018).

In Nigeria, the university system was initiated with the establishment of the first university in 1948. The colonial government was essentially concerned with creating a pool of manpower required for the civil service. The immediate post-independence years witnessed the establishment of three new universities one in each of the three regions that then existed. Since then till date, the number of educational and knowledge infrastructure has grown astronomically with 153, over 100 polytechnics, over 98 Colleges and over 300 research institutes and innovation agencies (Ogunwusi & Ibrahim, 2014; Jegede, 2016a,

2016b 2016c, 2017). It was generally recognized that the relatively few educated Nigerians lacked any knowledge of managerial and technical skills required for industrial production and development. The establishment of these institutions was thus part of the efforts to improve the local supply of skilled manpower (Adeoti, 2016).

On one hand, universities in Nigeria increased in number (and some also increased in size) and, on the other hand, industrialization was promoted under import substitution strategy. Both university development and industrialization progressed in the decades of 1960s and 1970s. Educational development and industrialization were both supported by the oil economy until the decline in the price of crude oil in the late 1970s. The de-industrialization that was glaring by mid 1980s and the crisis of decline in government support for the universities that began in late 1970s brought out the first set of indications that both the university system and the Import Substitution Industrialization (ISI) strategy were very weak and unable to sustain economic growth of the 1960s and early 1970s. The increasing role of knowledge in development suggests that universities, government and industry have to interact not only to create, but also to employ knowledge for development. While there are ample evidence of interaction between universities and industry in developed and newly industrializing countries, developing countries are replete with universities that function, for the most part, independent of industry; and industry that depends on foreign sources of knowledge to sustain production and possibly meet competitive challenges.

Research findings simply refers to the outcome in the form of special knowledge that results from a research efforts, be it, basic research, applied research or development researcher carried out by higher institutions of learning, research institutes, or industrial firms (Bentley, 2018). In the linear model of innovation, public research especially in the universities generates basic knowledge, which leads to inventions and inventions when commercialized, become innovations (Adeoti, 2016b). Innovation, on the other hand, is defined as the application of basic knowledge acquired through science and technology research and investment to achieve physical production of goods and services (Roggers, 2007). It must noted that this knowledge might be acquired through learning, research or experience. But until this knowledge is applied in physical production of goods and services and translated to development, it cannot be considered to be innovation. From this simplistic view of the innovation process, the research activities in the universities and public research institutes are isolated from industry. Industrial research and development (R&D) activities that contribute to the real technological change required for economic progress are located outside the ivory towers. However, several studies that illustrated the NSI framework have proven that economies that are innovation-driven (i.e. knowledge economies) are characterized by evident strong university-industry collaborations, especially in strategic sectors of the economy.

In this paper, we examined the effect of tripartite linkages involving Universities, industry, and government on commercialization of research findings towards increased economic growth and development in Nigeria. We obtained empirical evidence from selected Universities, firms and government. These were represented by the Enugu State Government, University of Nigeria Nsukka (UNN), Enugu State University of Science & Technology (ESUT), and National Open

University of Nigeria (NOUN) Enugu Centre and on the side of industry, the Ama Plant of the Nigerian Breweries Plc, 9th Mile Corner Ngwo, and Innoson Industrial & Technical Co. Ltd, Enugu.

Statement of the Problem

In Nigeria, while the national Science, Technology and Innovation (STI) system is expansive and massive, it has not resulted in significant expansion in industrial activities and national economic prosperity. This is because of little or no interaction among the actors, weak infrastructure and insignificant fund appropriation, thereby limiting national economic, technological and industrial growth and development. In view of the low level of industrialisation in Nigeria, the country has institutionalized a vision 20-2020 to position it as one of the top 20 global economies by the year 2020, Thus, Nigeria aims at significantly increasing the manufacturing local content and linkages with other sectors of the economy with the specific objective of enhancing global competitiveness of locally produced goods and services. In achieving this role, there is need to intensify effort in developing science and technology infrastructure, and thereby expand the potential of innovation in the industrialization process. From assessment by experts, Nigeria's journey towards achievement of its vision 20/2020 initiative will be constrained by a number of factors. Among these are the country's low technological capabilities, low level of infrastructure to modulate innovation capacity or ability to create or apply new knowledge to solve practical problems. According to experts, Nigeria currently stands at 66th position out of 73 countries in an assessment that ranked nations according to innovation capacity.

In 1986, the first National Policy on Science and Technology (S&T) was launched. The policy identified that S&T-related activities in the country had been carried out without well defined national direction. The public universities, research institutes and research outfits in private sector companies are expected to be drivers of research and development and home-grown technologies. Furthermore, R&D are expected to lead to home-grown industries and multinational companies within the country, However, since 1964 till now, despite the endowment of the nation with a large population and abundant natural resources, Nigeria is yet to advance economically. Up till now, the nation does not have any globally branded product, multinational company, technical and managerial expertise or worldwide range of Intellectual Property Rights exploited globally that emanated from its indigenous knowledge and industrial efforts. While educational and knowledge infrastructure abound in the country with about 153 universities, over 125 Polytechnics, over 98 Colleges of Education, over 300 institutions composed of research institutes, innovation agencies and policy implementation departments, multinational companies and large pool of skilled labor force including a sizeable number of diaspora, the economy is still technologically weak with a very high national poverty incidence that implies that over 100 million Nigerians are living below the poverty line. In fact, many countries in Africa lack an enabling environment for reorienting and aligning universities and other higher education institutions (universities) towards a more entrepreneurial role.

Apart from perhaps the Maghreb region and South Africa, most of sub-Saharan Africa lack high-tech industries and a true technology culture that arises from the constant pressure to update and deepen technology in order to survive in a competitive marketplace (Sawyerr and Barry, 2018). Many of Africa's industries are often small to medium-scale firms producing for local markets, while the

relatively larger ones are subsidiaries of transnational companies which draw upon the in-house R&D capabilities of the parent company. Others note lack of awareness of the existing research results and new technologies by industry; the absence of strong involvement of the users in defining the research agenda; and, the irrelevance of some university research (Dhesi and Chadha, 2016). Other factors identified include lack of sufficiently qualified researchers, weak research infrastructure, inadequate funding for research, and donor-influenced research priorities (Barry, 2016; Mouton, 2017). Under such conditions, the link between the supply of skills and new knowledge from higher education institutions in Africa and the demand for these from industries and other parts of the productive sectors are not clearly established. Low investment in science and technology and lack of national strategies further compound the difficulties (Mouton, 2018).

Purpose of the Study

The main purpose of this study is the impact of University-industry linkages on commercialization of innovations of higher education. This study pursued the following specific objectives:

1. To find out the influence of government policies on university industry linkages on the number of licensed inventions being sold or bought in the system of innovation in Enugu State, Nigeria.
2. To investigate the influence of funding mechanisms on the number of research contracts awarded to academic staff in Enugu State, Nigeria.
3. To assess the influence of human resource development on the number of scientific conferences or training programmes sponsored by government or industries in Enugu State, Nigeria.
4. To examine the influence of communications strategies on the number of licensed inventions being marketed or sold by universities in Enugu State, Nigeria.

Research Questions

The following research questions were raised to guide the study:

1. What is the influence of government policies on university industry linkages on the number of licensed inventions being sold or bought in the system of innovation in Enugu State, Nigeria?
2. What is the influence of funding mechanisms on the number of research contracts awarded to academic staff in Enugu State, Nigeria?
3. What is the influence of human resource development on the number of scientific conference or training sponsored by government or industries in Enugu State, Nigeria?
4. What is the influence of communications strategies on the number of licensed inventions being marketed or sold by Universities in Enugu State, Nigeria?

Research Hypotheses

The following hypotheses were formulated to guide the study and were tested at 0,5 level of confidence.

i: Government policies on university industry linkages have no significant influence on the number of licensed inventions being sold or bought in the system of innovation in Enugu State, Nigeria.

ii: Funding mechanisms for university industry linkages have no significant influence on the number of research contracts awarded to academic staff in Enugu State, Nigeria.

iii: Human resource development in key areas of university influence on the

number of scientific conferences or training sponsored by government or industries in Enugu State, Nigeria.

iv: Communications strategies with the outside world by universities have no significant influence on the number of licensed inventions being marketed or sold by Universities in Enugu State, Nigeria.

Methodology

This study adopted descriptive survey research in which pre-tested and well validated questionnaire was used to collect data from respondents who were selected from the selected staff of selected departments or units of the five (5) sample units, namely, Innoson Industry & Industrial Co. Ltd, Enugu, ENSG, Ama plant of NBL, UNN, ESUT, and NOUN, Enugu Study Centre under investigation. In addition, secondary data were also collected from published and unpublished official documents obtained from these institutions and manufacturing industries. The population of the sample units was 4,361. From this population, a sample of 353 was drawn using Cochran's finite population correction technique.

The questionnaire comprised 19 close-ended items set on the 4-point Likert-type scale. Results of the reliability test of the questionnaire showed it had Cronbach's Alpa index of 0.84. The respondents were selected using purposive sampling method, which allowed selection of only the senior management staff of the sample units who had good knowledge of issues concerning university Industry-government linkages.

Descriptive statistics that consisted of frequency counts, tables and percentages was used to analyze the data collected. Inferential statistics known as Multiple Regression Analysis was used in testing the hypotheses of the study. Both the analysis and tests were done with the aid of SPSS software.

Results

Results of the analysis showed that out of the 353 questionnaire distributed, 333 (94:4%) were returned well completed, 13 (3.9%) were not returned at all, while 7 (2.0%) were returned but rejected owing to inappropriate completion. It was the responses borne by the 333 well completed questionnaires that were extracted and coded into data that were used for both the subsequent analysis and test. In this section, the results of the Multiple Regression Analysis based on the model earlier specified above by the study are presented below.

As earlier stated, the hypotheses of the study are tested using Multiple Regression Analysis. The test was carried out using the primary data generated from the field survey. As part of the test procedure, the said data were fed into the SPSS software according to each of the four hypotheses. The results of the test are displayed in tables 1,2 and 3 below.

Test of Hypotheses

The four hypotheses were tested by using the primary data generated from the field survey. The test of the hypotheses was based on the results of the Multiple Regression Analysis as contained in Table 3 above.

Hypotheses 1:

i: Government policies on university-industry government linkages have no significant effect on the number of licensed inventions being sold or bought in the system of innovation in Enugu State, Nigeria.

TABLE 1: MODEL SUMMARY

Model 1	R	R Square	Adjusted R Squared	Std Error of Estimate	Durbin Watsun stat.
1	0.547	0.229	0.601	0.91487	2.614732

(a) **Dependent variable:** number of licensed inventions bought or sold, number of research contracts awarded, number of scientific conferences or trainings sponsored, and number of licensed inventions marketed or sold.

(b) **Predictors (constants):** government policies, funding mechanisms, human resource development, communication strategies

Source: Field Survey at UNN, ESUT, NOUN and NBL, Enugu, 2019; published and unpublished a documents by UNN, NOUN, ESUT, ENSG, and NBL.

Table 3 shows that the beta value is 0.097, while the probability is 0.002, which is less than the critical probability of 0.5.This means that there is very low probability that the statement overall model was insignificant was true.

Decision

The probability of the model (0.002) is less than the critical probability of 0.5 and the model found to be significant with a calculated F-value of 10.0. Based on the decision rule for Regression Analysis, the null hypothesis is hereby rejected and the alternate hypothesis accepted. We therefore, conclude that government policies have significant effect on the number of licensed inventions being sold or bought in the system of innovation in Enugu State, Nigeria.

Hypothesis.2

ii: Funding mechanisms for university industry-government linkages have no significant effect on the number of research contracts awarded to academic staff in Enugu State, Nigeria.

TABLE 2: ANOVA MODEL

Source of difference	Sum of squares	Df	Mean square	f,	Sig
Between Groups	8.111	3	2.7923	10	.000
Within Groups	37.306	347	0.270		
Total	45.415	350			

(a) **Dependent variable:** number of licensed inventions bought or sold, number of research contracts awarded, number of scientific conferences or trainings sponsored, and number of licensed inventions marketed or sold.

(b) **Predictors (constants):** government policies, funding mechanisms, human resource development, communication strategies

Source: Field Survey at UNN, ESUT, NOUN and NBL, Enugu, 2019; published and unpublished a documents by UNN, NOUN, ESUT, ENSG, and NBL.

Table 3 also shows that the beta value of the model is 0.279 as it pertains to funding mechanisms has probability of 0.001, which is less than the critical probability of 0.5.

Decision

Since the probability of the regression model as it pertains to funding mechanisms is 0.001 which is less the 0.5 critical probability threshold and the model significant at a calculated F-Value of 10.0, we should reject the null hypothesis and accept its alternate one going by the decision rule of the study. We, therefore, conclude that funding mechanisms have significant effect on the number of research contracts awarded to academic staff in Enugu State, Nigeria.

Hypothesis.3

iii: Human resource development in key areas of University Industry-government linkages has no significant effect on the number of scientific conferences or training sponsored by government or industries in Enugu State, Nigeria.

TABLE 3: CO-EFFICIENT

	Unstandardized		**Standardized**	**T**	**Sig**
	Coefficients		**coefficients**		
	B	**STD Error**	**Beta**		
Constant	1.659	0.242		6.85	0.000
government polices	0.83	0.07	0.097	1.189	0.002
funding mechanisms	0.22	0.065	0.279		0.001
human resource development	-0128	0.05	0.203		0.002
communication strategies	0.314	0.071	0.307	1.51	0.019

(a) **Dependent variables:** number of licensed inventions bought or sold, number of research contracts awarded, number of scientific conferences or trainings sponsored, and number of licensed inventions marketed or sold.

(b) **Predictors (constants):** government policies, funding mechanisms, human resource development, communication strategies

Source: Field Survey at UNN, ESUT, NOUN and NBL, Enugu, 2019; published and unpublished a documents by UNN, NOUN, ESUT, ENSG, and NBL.

Table 3 shows that the beta value of the model with regard to human resource development is 0.203, while its probability is 0.012 which is less than the critical probability of 0.5.

Decision
Given the fact that the probability of the model as it pertains to human resource development is 0.012, which is less than the critical probability of 0.5, we should reject the null hypothesis and accept the alternate one. We have no other option, therefore, than to conclude that human recourse development has significant effect on the number of scientific conferences or training sponsored by government or industries in Enugu State, Nigeria.

Hypothesis No.4
iv: Communications strategies with the outside world by universities have no significant effect on the number of licensed inventions being marketed or sold by Universities in Enugu State, Nigeria.

TABLE 2: ANOVA MODEL

Source of difference	Sum of squares	Df	Mean square	f,	Sig
Between Groups	8.111	3	2.7923	10	.000
Within Groups	37.306	347	0.270		
Total	45.415	350			

(a) **Dependent variable:** number of licensed inventions bought or sold, number of research contracts awarded, number of scientific conferences or trainings sponsored, and number of licensed inventions marketed or sold.

Table 3 also shows that the beta value of the model with regard to communication strategies is 0.307, while its probability is 0.019, which is less than the critical probability of 0.5.

Decision
Since the probability of communication strategies is 0.019, which is less than 0.05, we should reject the null hypothesis and accept its alternate one. We, therefore, conclude that communication strategies have significant effect on the number of licensed inventions being marketed or sold by Universities in Enugu State, Nigeria.

The results of the Multiple Regression Analysis as displayed in tables 1 and 2 are interpreted below. Table 1 shows that the Adjusted R Squared has the value of r^2 = 0.602 which indicates that when all the variables are combined, the multiple linear regression model could explain for approximately 60% of the variation in commercialization of research findings in Enugu State. In table 2, it is shown that the calculated F-value is 10.0, which shows that the regression model is very significant and well specified at the probability of 0.000. Table 3 shows that the four independent (predictors) variables have the following beta and probability values: government policies (B = 0.097; p = 0.002); funding mechanisms (B = 0.279; p = 0.001); human resource development (B = 0.203; p = 0.012); communication strategies (B = 0.314; p = 0.019). From table 3, we can easily construct the prediction equation of the relationship or model as follows:
Commercialization of research findings = 1.659 + 0.097 (government policies) + 0.279 (funding mechanisms) + 0.203 (human resource development + 0.307 (communication strategies).

When interpreted, the equation tells us that when government policies go up by 0.097 or 10%, commercialization of research findings goes up by 1 and when funding mechanisms go up by 0.279 or 28%, commercialization of research findings goes up by 1. The table also shows that when human resource development goes up 0.203 or 20%, commercialization of research findings goes up by 1; and when communication strategies go up by 0.307 or 31%, commercialization research findings goes up by 1.

Discussion and Findings

This study holds far-reaching and great implications for the development of science and technology, the national system of innovation (NSI), the industrial sector, the higher education sector and, above all, economic development in Nigeria. By and large, this study has somewhat opened the eyes of members of the Triple Helix (government, industry and academia) to the challenge of envisioning a new horizon of development that would focus on the role of knowledge as the basis for economic transformation of Nigeria. In the days gone by, it was economic resources that drive the economy; today, we have indeed arrived a new horizon, whereby it has become clear that it is knowledge that drives the economy.

The aforementioned new vision for economic transformation implies that government is now saddled with the challenge of formulating a new policy that will place grates emphasis on renewing research and public science infrastructure, building technical capacity, increased finding, stimulating business development and increased participation in the global economy. The logical implication of the foregoing is that for the aforementioned policy foci to achieve the desired results there is need to strengthen Nigeria's national system of innovation (NSI) by architecturing it with the appropriate frameworks and polities to govern and incentivize university-industry interactions, partnership and collaborations.

The results of this study also first and foremost implies that the academia have to come out from their present lethargic concern and properly and clearly define their place and potential contribution to national development so that their senior officials can engage with the local industry from a clear position. Again, emphasis should be on quality assurance in all their processes, namely, curricula of academic programmes, instructional delivery and learning transactions, instructional materials, and assessment and evaluation so as to guarantee quality of output (graduates, research findings, teaching, and community service) the foregoing is very important as it is this that can convince the industry towards forging mere and greater partnership with the academia. How to effectively communicate such evidence of such quality output to the industry is another aspect of the challenge. Finally, another implication of this study is that the academia more than ever before need strong leadership capable of prioritizing university-industry linkages, orienting research efforts to local need, and forgoing grater inter-disciplinary research collaboration among researchers from diverse academic fields or disciplines in solving current national or local problems.

Conclusion

The literature demonstrates that strengthening University linkages with the productive sector in Africa, including Nigeria, is constrained by inter alia: low numbers of qualified faculty, including doctorate degree holders, brain drain, ageing faculty, and other issues associated with retention; low enrolment in maths, engineering, and other science-related disciplines against large enrolments in social

sciences and humanities; inadequate research infrastructure at many universities and lack of access to up-to-date publications; funding constraints; and teaching rather than research-focused mandates. These constraints, however, should not be considered as a deterrent to strengthening working relationship with the productive sector, but should be taken into account in devising the best way forward.

There is no gainsaying the fact that University Industry partnership is a very crucial logical strategy for building technological capacity and promoting economic development of Nigeria. The partnership will bring together generators and developers of knowledge (universities and research institutions) and those, who utilize that knowledge for economic development (industry). Thus, it is a useful mechanism for utilizing national scientific and technological capacity for development. Additionally, the partnership offers opportunities to all stakeholders. For the HEI and the scientist, it is an opportunity to generate income and strengthen their capacities. It also capacitates them to serve their communities and enhance their profile in society. Industry also benefits in many ways including access to scientific resources available in the universities and the improvements in their technologies and operating performance, which may rise from the partnership.

For this to ensue, however, certain factors are pertinent. First, the scientist needs to take measured steps to address the concerns and misgivings of industry and also take cognizance of the peculiarities of local industries. It is clear from the analysis presented that there are specific needs and expectations from industry which scientists should do well to recognize and address. The concerns of industry as far as the partnership is concerned will include the cost of the invention, the economic value and whether it fits into their overall programmes.

Recommendation

Furthermore, scientists should also take note of the character, in particular the size and nature of ownership (foreign owned or multi-nationals) of the industries. In order to achieve quick results on partnership, locally owned industries should be approached for partnership. They are not saddled with the long decision making process of local branches of multi-national companies. Nor are they likely to always look abroad for solutions to local problems.

Secondly, measures need to be taken by all stakeholders to address the constraints on all sides that inhibit the partnership. First, government has to create the enabling environment. Unlike the industrialized countries where partnership of this sort can take place effectively on an ad hoc basis without much government intervention, in our context, this has to be facilitated by government policy, finance and institutional arrangements. Ad hoc arrangements or partnerships that are not based on policies are not sustainable in the long run and may even be counterproductive.

Industry and institutions also have several huddles to overcome in order to forge an effective partnership. These constraints are in general derived from the scarcity of financial resources, the absence of relevant human resources in local industries, negative attitude towards local ideas and the nature (size and ownership) of the industries. These factors affect the ability to finance the cooperation and implement projects, the ability to interpret scientific research results for further development, the ability to carry out risk assessment, the demand and the size of the market for local technologies and the industrial partners' ability to take decisions relating to the partnership.

Fund and support should be made available for strengthening the capacity of Nigerian higher educational institutions to develop partnerships and linkages with industry and the broader productive sectors. This funding should be the responsibility of governments, private sector entities, and local and international development partners, among others.

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