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REPOSITIONING TERTIARY INSTITUTIONS WITHIN THE NIGERIAN INNOVATION SYSTEM FOR THE ACHIEVEMENT OF THE VISION 20:2020 MILLENNIUM DEVELOPMENT GOALS

M.O. Ilori
Technology Planning and Development Unit (TPDU
Obafemi Awolowo University, Ile-Ife

I.O. Abereijo
Centre for Industrial Research & Development (CIRD
Obafemi Awolowo University, Ile-Ife

S.A. Adegbite
Centre for Industrial Research & Development (CIRD)
Obafemi Awolowo University, Ile-Ife

A.A. Adeniyi
Technology Planning and Development Unit (TPDU)
Obafemi Awolowo University, Ile-Ife

ABSTRACT

The main focus of this paper is to understand the relevance of the tertiary institutions in the achievement of the Millennium Development Goals (MDGs) in Nigeria with the view of suggesting how they can be better positioned to assist the government in achieving the goals. The paper argues that while the Nigerian version of MDGs Documents is a welcome development, however it execution has its own challenges which require augmenting human capital and raising its quality. Therefore, the effective operation of the National Innovation System is an important factor for success in achieving MDGs, as it is the experience of some countries in the world. Therefore, the paper concludes that universities require restructuring so as to take responsibility for an active role in the more complex field of economic development, covering a portfolio of applied and basic research, consulting and community services, specialised training, distance learning and tech-based venture formation.

Keywords: Millennium Development Goal; National Innovation System; Tertiary Institutions; Repositioning.

1. INTRODUCTION

The fallout of the United Nations global conferences of the 1990s was the Millennium Declaration of 2000 which made a strong commitment to the right to development, to peace and security, to gender equality, to the eradication of the many dimensions of poverty and sustainable human development. The Millennium Development Goals (MDGs) that derive from this Declaration provide an agenda for global action. This agenda and the outcomes of the World Social Summit, the World Summit on Sustainable Development, the Doha Development Agenda, and the Monterrey Consensus are mutually supportive processes and essential building blocks of a worldwide partnership for sustainable development.

The Millennium Development Goals (MDGs) analytically anchored in the human development paradigm, representing a set of time-bound quantitative targets to reduce human poverty in its basic dimensions. They also represent a global commitment, a shared responsibility for both the developed and the developing world and provide a platform for addressing all challenges, especially human development challenges around the globe.

The MDGs have eight goals with the 21 targets (see http://www.un.org.millennium/declaration/ares552e.htm).

These are:

1. Eradicate extreme poverty and hunger
   - Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day.
   - Achieve full and productive employment and decent work for all, including women and young people.
   - Halve, between 1990 and 2015, the proportion of people who suffer from hunger.
2. Achieve universal primary education
   - Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.
3. Promote gender equality and empower women
   - Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015.
4. Reduce child mortality
   - Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.
5. Improve maternal health
   - Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio.
   - Achieve, by 2015, universal access to reproductive health.

6. Combat HIV/AIDS, malaria, and other diseases
   - Have halted by 2015 and begun to reverse the spread of HIV/AIDS.
   - Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it.
   - Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.
7. Ensure environmental sustainability
   - Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources.
   - Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.
   - Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.
   - By 2020, to have achieved a significant improvement in the lives of at least 100 million slum-dwellers.
8. Develop a global partnership for development
   - Develop further an open trading and financial system that is rule-based, predictable and non-discriminatory. Includes a commitment to good governance, development and poverty reduction, nationally and internationally.
   - Address the special needs of the least developed countries. This includes tariff and quota free access for their exports; enhanced programme of debt relief for heavily indebted poor countries; and cancellation of official bilateral debt; and more generous official development assistance for countries committed to poverty reduction.
   - Address the special needs of landlocked and small island developing states.
   - Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.
   - In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.
   - In cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies.

Since the commencement of this programme recent evidence suggests that progress in Africa in meeting the MDGs by the target date is picking up although a lot remains to be done (UNESC/ECA, 2008). Also, significant progress has been reported for indicators such as universal primary education and gender equality. Ghana, for example, is reported to be on track to meet the target of halving poverty by 2015. And there has been significant reduction in the prevalence of HIV. However, the continent's average annual growth rate of approximately 5.8 per cent still remains significantly lower than the 7 per cent annual growth rate required to reduce poverty by half by 2015. This growth is increasingly coming under threat from new developments.

However, if this surge is to evolve into a virtuous spiral that stimulates higher and sustained growth rates in a substantial number of African countries, a significant increase in investment in physical and human capital is needed over an extended period (The World Bank, 2008). This is because, as it is noted in this World Bank's report, there is an urgent need for countries in African to acquire the capabilities that will spawn new industries that create more productive jobs, multiple linkages, and more diversified exports. These capabilities derive from investment in physical assets, such as infrastructure and productive facilities, and in institutions and human capital. However, the salience of human capital is increased by the necessity of moving up the technological ladder in order to diversify into higher-value, knowledge- and research-intensive activities with good longer-term demand prospects (The World Bank, 2008).

Consequent on the above, it is the concern of this paper to further understand the relevance of the tertiary institutions in the achievement of the MDGs in Nigeria and therefore suggest how they can be better positioned to assist the government in achieving the Nigerian version of MDGs. In response to this initiative, the Nigerian governments, during Obasanjo's regime, at the three levels of government, have made efforts in the process of transformation of its political, economic and social systems. These efforts include the launching of "Economic Empowerment and Development Strategy" a document known as 'National Economic Empowerment and Development Strategy' (NEEDS) at the national level; 'State Economic Empowerment and Development Strategy' (SEEDS) at states level; and 'Local Economic Empowerment and Development Strategy' (LEEDS) at local governments level. These documents provides a framework for a nationally coordinated programme of action by the federal, state, and local governments; and focuses on four key strategies of re-orienting values, reducing poverty, creating wealth, and generating employment (Nigerian National Planning Commission, 2004). The Yar'adua's seven-point agenda is also a new response to the MDG initiatives.

However, while the revival of economic growth in Nigeria, as evidenced from the Nigerian version of MDGs Documents, is a welcome development yet it is important to be sustained over the future. This effort is indeed a necessity but with its own challenges. It is a necessity because this is the only way that poverty can be steadily reduced and progress made towards achieving the MDGs. It is a challenge because Nigeria is still lagging behind in meeting the pre-conditions for stable growth and is faced with tightening constraints on growth arising from inadequate infrastructures, instability in energy supply, inadequate food supply, and stiff entry barriers to the global markets for the manufacturing sector. All efforts at achieving the various targets set in the MDGs, and equally maintaining the momentum require harnessing more knowledge and capital as well as measures that will substantially enhance economic competitiveness and nurture expansion of new tradable activities. Investing heavily in physical infrastructure and productive capacity is important, however, maximising productivity and achieving competitiveness depends upon success in augmenting human capital and raising its quality. Therefore, the key to economic success in the present globalised world lies increasingly in how effectively a country can assimilate the available knowledge and build comparative advantage in selected areas with good growth prospects. It also depends on how it can enlarge the comparative advantage by pushing the frontiers of technology through innovation. While capital is a necessary and indeed the arbiter of economic success, survival in the world today is the capacity to mobilise knowledge and to use it to the full (The World Bank, 2008). In other word, economic success of a country depends on how effective it operates its National Innovation System (NIS).

2. THE NATIONAL INNOVATION SYSTEM

The National Innovation System (NIS) has been defined in different ways by various authors depending on the theoretical approach adopted. It as "the network of institutions in the public

and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies." (Freeman, 1987) This definition emphasises the interaction between the production system and the process of innovation.

The NIS is also described as being constituted by elements and relationships, located within or rooted inside the border of a nation state, which interact in the production, diffusion and use of new and economically useful knowledge. Often the interactions of the elements of the system are mutually reinforced in promoting learning to bring forth technical advances that nurture economic and social progress of a nation (Kwanjai, 2000), or may combine into constellations preventing learning processes (Lundvall, 1992). According to another author, such a system consists of the following distinct and interacting sub-systems (Lalkaka, 1999):

(i) Science and Technology (S&T) policy and policy instruments;
(ii) Technical human resources development;
(iii) Scientific research and its commercialisation;
(iv) Technology transactions in the international markets;
(v) Technical support and business development services;
(vi) Financing S&T; and
(vii) International cooperation.

Bound by the concept of innovation and the notion of a nation, the national innovation system, therefore, provides a framework for evaluating the totality of a nation's attempt at generating and applying knowledge for meeting the needs of her society.

3. Elements of National Innovation Systems

Using the generic model, three major elements of a national innovation system are identified as follows (Kwanjai, 2000):

(i) Educational institutions;
(ii) S&T and Research and Development (R&D) institutions; and
(iii) Firms and industries.

Higher educational institutions, particularly universities, perform the traditional functions of teaching and talent filtering by which new generations of scientists, technologists, and engineers are trained. They also have a social and statutory responsibility to participate in the generation of new knowledge through research and development activities which can be channeled and diffused by new ventures. In other words, tertiary institutions play important roles in four ways (Saint, 2004). First, through tertiary education, qualified and adaptable labour forces are trained, new knowledge accessed and/or generated; and even global knowledge is adapted for local use. Through this effort, poverty could be alleviated through direct contributions to economic growth. Secondly, tertiary education can also reduce poverty through redistribution and empowerment, by building of social capital and expanding opportunities for employability, income, and social mobility. Third, tertiary institutions also strengthen the entire education sector, by training and re-training of teachers and other professionals within the nation. Lastly, the outputs of the researches from tertiary institutions and technology adaptation can enhance food supply and rural incomes. Likewise, professionals, like doctors, nurses, teachers and administrators and so on, are trained to oversee and implement MDG activities. In addition, they foster relevant capacities in research, applied technology and community services that are essential for improving welfare levels for poor families, particularly vulnerable women and children, in those countries targeted by the MDGs.

Therefore, tertiary institutions, being key institutions of civil society, requires unique positioning, since their roles include assisting in developing the skills and creating the knowledge needed to provide effective services to the community and to make sound policy decisions at the government level (Figure 1). Also, they create the knowledge needed to better understand development challenges and identify locally relevant solutions.

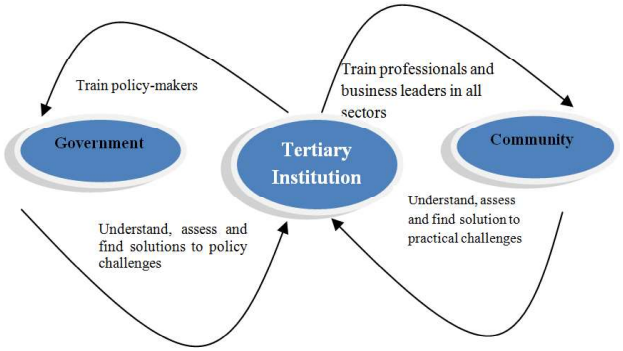

Figure 1: Interactions between Tertiary Institutions, Government and the Community (Association of Universities and Colleges of Canada, 2004)

For example, a good number of technology-based spin-offs in some regions in Europe and USA have emerged directly from academic research activities of universities. The pursuance of these functions has led to the emergence of new fields of science, processes and major new generic technologies of wide industrial and social significance (OECD, 1998).

The modern university also plays a more active role in consulting community services, specialised training and distance learning (Lalkaka, 1999). These are in response to the capacity building requirements of the global economic shift from resource endowments and factor costs to information- and experience-based knowledge. Public research and development institutes, another element of the NIS, are expected to undertake different lines of research that are of commercial applicability. These institutes vary in their mandates and sizes but derive their funding mainly from government sources. A current model of innovation systems, however, include at least some other types of actors (Figure 2), namely the financial system, technology brokers, industry and professional associations, the legal base, non-governmental organisations, press, public opinion, and international co-operation structures (Plonski, 2000; Oyelaran-Oyeyinka, 2002; Oyelaran-Oyeyinka and Barclay, 2003).

The innovative performance of an economy depends on how the individual institutions and actors (e.g. firms, research institutes, universities) perform in isolation and how they interact with other as elements of a collective system of knowledge creation and use, and on their interplay with social institutions (OECD, 1998). Without adequate development of these actors and institutions in the domestic and regional settings the innovation system remains underdeveloped and anaemic (Jinma, Disenso, and Bince, 2005).

4. Partnership within the National Innovation System

The need and the continuous search for knowledge within the national innovation system result in the development of partnership between the system's major actors. These partnerships cut across the public and private sectors. They are

often facilitated and stimulated by the government and are defined by a joint contribution of financial research, human and infrastructural resources either directly or in kind. The partnerships within the national innovation system according to the types and characteristics of the actors are as follows (Cervantes, 1990):

(i) Universities-Industry Partnership
(ii) Government-Industry Partnership.
(iii) Research Institutes-Industry Partnership; and
(iv) Any combination of (i), (ii) and (iii).

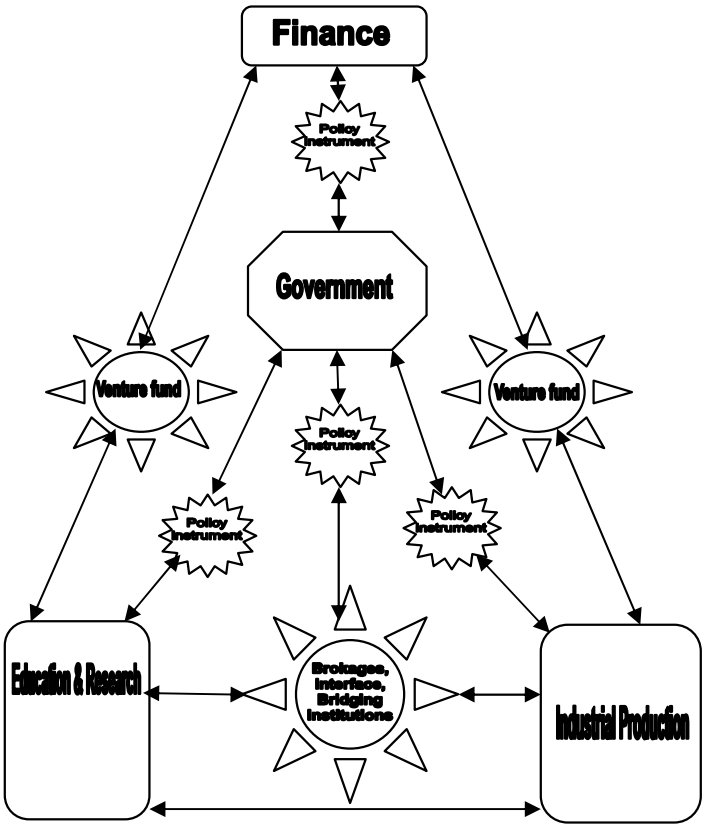

Figure 2: Typical Structure of Innovation among the Elements of the National Innovation System (Ilori, 2006) Adapted from (Tiftin, 1997).

It is noted that industry partnerships with research institutes are more common than those with universities in developed countries and have served as vehicles for meeting specific industry needs (Cervantes, 1990). Most of them started as collaborations with large firms, but the increasing prominence of small and medium-sized enterprises (SMEs) in their national economies has shifted focus to linkages involving groups of small firms and research provider. The University – Industry partnerships are spurred largely by the need for universities to look for additional sources of funds and industry's need to access a broader science for coping with the challenges of competition. Governments' inability to sustain previous growth rates in expenditure on university research has made these institutions more adventurous in seeking stronger linkages with industry (Senkers and Senker, 1997). This is reinforced by firms' willingness to take advantage of institutional innovations which are favourable to the introduction and diffusion of new technologies.

Three inter-related forces are dramatically changing the economic landscape today, which are technological innovation, entrepreneurship, and competitive global markets (Lalkaka, 2002). While the technological innovation is the process that drives a concept towards a marketable product or service, the entrepreneur is the agent of change who identifies an innovation to match a market opportunity and mobilises the human and financial resources to deliver the product or service at competitive costs and quality, in order to meet (or create) customer needs. Moreover, competitiveness is the ability to survive rivalries among the competitors through the use of wise decisions on factor endowments within an environment. The National Innovation System (NIS) integrates the roles and efforts of all the key players in the innovation system towards nation-wide economic development. The framework of globalisation within which the interactions among institutional players in the innovation system are taking place can create gap among nations because there is rapid movements of ideas, lifestyles and tastes, trade, business and finance. Hence, the solution lies in quickening the pace of technological innovation, with the impetus for change coming from all sections of society under competent political leadership Lalkaka, 2002).

Moreover, human capital also affects growth through multiple channels. This comes about by increasing allocative efficiency and the efficiency of asset management, utilisation, and maintenance; through entrepreneurship; and innovation, which raises productivity, unlocks new investment opportunities, and enhances export competitiveness. Therefore, by raising the level of education and its quality, countries in sub-Saharan African (SSA) may be able to stimulate innovation, promote the diversification of products and services, and maximise returns from capital assets through more efficient allocation and management. Hence, when tertiary institutions are equipped to impart quality education and conduct relevant applied research, they are more likely to cultivate multiple linkages with industry and to stimulate knowledge-based development through a variety of proven channels (The World Bank, 2008).

University-industry interaction is also seen as the most efficient form through which university inventions can get into practice. This is because university and industry can join and overlap research efforts to develop innovations and solve complex problems (Pavitt, 1998). In particular, this collective effort for knowledge development creates space for user-developer relations between the partners, which facilitates experimenting and testing products and concepts under development as well as further problem-solving based on fundamental research (Lee and Gaertner, 1994; Foray and Steinmueller, 2003). Moreover, it allows firms to become aware of new knowledge developments and to create new technological learning options on future technologies (Caloghirou, Ionnides and Vonortas, 2003). Therefore, as technological inter-disciplinarity and complexity, as well as competitive pressures to shorten product life increased, university-industry interaction has become acknowledged as crucial for the competitiveness of firms (Hagedoom, 2000; Pavitt, 1998; Calo ghirou, Ionnides and Vonortas, 2003).

The following are some examples of efforts of university Partnerships in Cooperation and Development (Association of Universities and Colleges of Canada, 2004):

(i) The partnership between the Memorial University of Newfoundland's Marine Institute and the Bunda College of Agriculture at the University of Malawi has been central to finding a new locally available protein source to replace the drastically depleted fish stocks in the country's main lake.
(ii) The partnership between the University of Western Ontario and the University of Costa Rica led to the piloting of the first survey of violence against women in Costa Rica,

providing a snapshot of the prevalence and costs of violence that will guide anti-violence policy and the delivery of gender-sensitive services.

(iii) The partnership between St. Francis Xavier University and the National Institute of Education in Bhutan is assisting Bhutan's national education reform by building the country's capacity to train all primary school administrators and headmasters in leading and running schools efficiently across the country. This was premised on the fact that leadership can make a difference in the quality of education in schools.

(iv) In South Africa, the University of Natal and the Kwazulu-Natal department of health partnered with McMaster University to research and design a primary health care training program with an important component on pregnancy, labour, post-natal care and prenatal transmission of HIV/AIDS. So far, the program has been delivered to 82 public health care nurses, 57 traditional birth attendants, 20 sangomas (traditional healers) and 565 female community leaders working throughout the province of Kwazulu-Natal.

(v) The partnership between the École de technologie supérieure and the Harbin University of Science and Technology in China led to technology transfer in hydroelectric-dam robotics and fostered new trade and cooperation initiatives between the two countries' universities and private sector enterprises.

5. Repositioning of Tertiary Institutions

The universities are therefore no longer teaching alone, but are restructured to take responsibility for an active role in the more complex field of economic development, covering a portfolio of applied and basic research, consulting and community services, specialised training, distance learning and tech-based venture formation (Lalkaka, 2002). That is, moving towards becoming an **entrepreneurial university**. Another important change in the function of the universities in the world today is the education curricula, where new courses are being introduced on the **management of knowledge**. This provides knowledge on key issues at the interfaces of science, engineering, business and civil society. The students are being exposed to **entrepreneurship development**, which seeks to transform the nascent entrepreneur into a successful enterprise-owner. For example, the Monterey Institute of Technology in Mexico runs technology incubators and a virtual university in Mexico with a consortium of 13 universities outside, addressing 9,000 degree and 35,000 non-degree student annually in Latin America. Also, the research universities have become seedbeds for innovation, with the University of California system earning $ 61 million in royalties and its 528 patents in 1997, while Stanford and M.I.T. each created 15 start-up companies (Lalkaka, 2002).

It is evident from the foregoing that knowledge resources have undoubtedly become the driver of modern economy. The only thing that endows a competitive edge on an organisation or a nation is what it knows, how it uses what it knows and how fast it can know something new (Prusak, 1996).

China's enviable and rapid economic emergence is contingent on selective investment in S&T human capital development hinged on radical educational reforms. The government adopted a plan of public subsidies that favours enrollment of the best minds in S&T Faculties that produce high externalities and contribute to greater innovation and ultimately economic growth. It is assumed that investing in very smart students in certain fields of study, such as research science or teaching, will spur the much needed technological change. Public spending per student increased from 13,000 Yuan (1,903 US Dollars) to 20,000 Yuan (2,929 US Dollars) between 1999 and 2002, while the public expenditure on education rose by 23 percent between 2005 and 2006, leading to an increase in the percentage of Gross Domestic Product (GDP) spent on education from 2.81 percent in 2005 to 3.01 percent in 2006 with the target of 4 percent by 2010.

Another significant feature of China's education reform is the increasing linkage among the elements of the NIS. China recognised the role of education, both formal and informal, in bringing about technological change and innovation and thus continued to increase their percentage of GDP spent on R&D. The lessons to be learnt from China experience are that economic growth is dependent on qualitative human capital and rational selective investment in education which generated unimaginable rate of economic growth as apparent in China's doubling of per capital GDP within 10 years. This landmark record took United States of America (USA) 40 years of selfless reforms (Martin, 2006).

6. Current Situation in Tertiary Institutions in Nigeria

Despite strong enrollment growth, most African tertiary institutions are not generating enough graduates, and many of them lack the skills needed to support national economic development in the 21st century (The World Bank, 2008). One important constraint on accelerating economic growth, as noted by this World Bank report, is in the choices made by policymaking bodies and capacity-building institutions responsible for higher-level human resource development. Specifically, in Nigeria the numbers of tertiary institutions include 101 approved Polytechnics and Monotechnics (49 federal-owned, 40 state-owned, and 12 private-owned) and 94 approved universities (27 federal-owned, 33 state-owned, and 34 private-owned) (NBTE, 2009; NUC, 2009). Likewise, over the past two decades tertiary student enrollments have increased far more quickly than tertiary budgets. In fact, enrollments more than tripled between 1991 and 2005, but the tertiary public financing was very poor. It is reported that public funding of education averaged 4.28 per cent of total government expenditure for a ten-year period (1990 – 2000) (Okebukola, 2002). Up till 1999, funding on education was well below 76 per cent of Gross Domestic Product (GDP) recommended by United Nations Educational, Scientific and Cultural Organisation (UNESCO). Even then, over 70 per cent of the allocation was expended on salaries and other personnel emolument. The UNESCO standard has never been met by any African country (Ilori, 2006).

Similarly, the total amount expended annually on research in the universities is approximately an average of 0.11 per cent of the Gross Domestic Product (GDP), which is made up of 98.81percent from government funding, 0 percent from industry and 4.46 percent from foreign agencies (Tables 1 and 2). The funds available to educate a student in the university continue to decrease drastically, thereby affecting educational quality and relevance (Donwa, 2006). The same situation is applicable in the Polytechnic where, according to another study it is revealed a mismatch between enrollment and available teachers, with huge staff shortfall over the years (Adeyemi, and Uko-Aviomoh, 2004). For example, between 1993/94 and 1999/2000 sessions the overall teacher to student ratio increased from 1:25 to 1:31. These trends are, in no doubt, making it increasingly difficult to provide the relevant knowledge and core skills needed for the country to boost competitiveness and sustain growth.

Another problem is the employers' complaint that majority of tertiary graduates are weak in problem solving, business understanding, computer use, teamwork, and communication skills. This is adduced to mismatches between the education provided and the capabilities required in the job market. Moreover, a combination of inadequate salaries, heavy teaching workloads resulting from declining staff-student ratios, deficient personnel management, and lack of research opportunities makes staff retention and recruitment increasingly difficult (Adeyemi, and Uko-Aviomoh, 2004). The linkage between the university and industry within the Nigerian Innovation System is very weak, due to some reasons, which include among others, cultural differences.

7. Repositioning Nigerian Tertiary Institutions to Contribute to the Achievement of MDGs

Considering these problems, it may be difficult for the tertiary institutions to play their role in the achievement of the Nigerian version of MDGs, the vision 2020:20 and the seven point agenda of Mr. President. Therefore, the following good practices are suggested to speed the journey toward a more effective and responsive tertiary education system in the country.

Table 1: Research Funding in Nigerian Universities

Year	Per cent Source of Funding			
	% GDP	Government	Industry	Foreign Agency
1990	0.01	100.0	-	-
1991	0.01	100.0	-	-
1992	0.02	100.0	-	-
1993	0.02	100.0	-	-
1994	0.02	100.0	-	-
1995	0.01	100.0	-	-
1996	0.01	100.0	-	-
1997	0.01	100.0	-	-
1998	0.01	100.0	-	-
1999	0.02	100.0	-	-
2000	0.30	100.0	-	-
2001	0.30	94.50	-	5.50
2002	0.30	87.84	-	12.16
2003	0.30	99.91	-	0.09
2004	0.30	99.93	-	0.07
Average	0.11	98.81	-	4.46

Source: (Donwa, 2006)

- **Develop a strategy for national human resource development**. As tertiary education becomes an important driver of economic growth, governments with constrained financial resources may have but to choose and strategically fund a limited number of priorities (The World Bank, 2008).
- **Reform financing arrangements to offer incentives for attaining policy goals while providing the stability necessary for institutions to plan strategically**. The task of funding tertiary education will become increasingly difficult in the years ahead as social demand increases. Hence, each country will have to devise a financing approach that plays to its economic strengths, its institutional capacities, and its political possibilities. Private sector may also have to increase their contribution towards funding education in the country (The World Bank, 2008). Government of Nigeria should aim at meeting the UNESCO recommended target (26 per cent) for funding education in the country. With this the poor laboratory facilities and practical can be upgraded. There should also be provision for enhancing staff capability in priority areas through an intensive programme of training and re-training and industrial exposure.
- Grant institutional autonomy, buttressed by appropriate accountability mechanisms, in order to increase opportunities for system differentiation and institutional innovation. The combination of autonomy, accountability, and competition within tertiary education systems is necessary in order to foster student learning performance. Autonomy in decision making can ensure institutional managers and governing bodies to act as they see necessary to promote educational achievement. An accountability system can identify and reward good institutional performance. Competition and competition and choice among institutions and academic programmes can lead to student demand creating performance incentives.

Table 2: Research Grant Allocation and Releases from 1987- 2003

S/N	Year of Release	Allocation (N'000,000)	Amount Released (N'000,000)
1	1989	12.78	12.78
2	1988	20.00	17.24
3	1989	20.00	20.00
4	1990	24.00	22.08
5	1991	51.27	16.65
6	1992	14.50	17.47
7	1993	122.18	122.18
8	1994	132.21	98.66
9	1995	155.54	73.97
10	1996	153.84	50.58
11	1997	194.01	122.02
12	1998	215.62	149.99
13	1999	302.74	183.50
14	2000	448.13	612.67
15	2001	206.41	206.41
16	2002	-	-
17	2003	73,44	73.44
	Total	2,146.66	1,799.64

Source: (Okebukola, 2002)

- Encourage diversity in teaching, and learning approaches that facilitate institutional specialisation. There is need to change the traditional pedagogy of teaching from disciplinary to interdisciplinary perspectives; from lectures to flexibility in learning and group work; and from memorisation of facts to problem solving. Others are practical learning (field trips, attachments, internships) as a complement to theory; learning assessment through project work that demonstrates competence instead of multiple choice examinations; communication skills; and computer literacy (The World Bank, 2008).
- **Foster the development of national and regional postgraduate programmes.** This is the best way to increase academic staff numbers and build research capacity. National R&D efforts are more likely to be sustainable when they are grounded in postgraduate programmes and the professional networks that emerge around them.
- **Search for lower-cost delivery alternatives for tertiary education**. Traditional face-to-face models of delivering post-secondary education are expensive and can limit developing countries' capacities for enrollment expansion. Hence, alternative, lower-cost delivery models are needed if educational access is to increase. This could be in form of

lifelong learning, ICT applications to education, online distance education, open source courses, self-paced learning, and so on (The World Bank, 2008).

- Government must be ready to put in place national research priorities and provide supportive policies to assist the tertiary institutions place their roles in the development of qualitative human resource, and generation of research and development (R&D) results that could translate into innovations. Capability for translating the R&D results into commercialisable product should be nurtured through effective linkages between the academia and domestic industry (The World Bank, 2008).
- A model hybrid coalition capable of resolving cultural differences between the academic and the industry has been proposed. The model will create a forum where effective means of communication would be developed and the two sectors would have the opportunity of interaction and exchange of ideas in an atmosphere of mutual trust and respect (Oyebisi, Ilori, and Nassar, 1996). Under this environment, both parties, together with Government, could establish the technological needs of the industry that requires R&D intervention and get involved in joint venture projects. Joint implementation of projects from research, technology development to production and marketing is feasible under this arrangement. This will ensure that only technology or R&D projects that are relevant to and of direct application to the industry are embarked upon (Oyebisi, Ilori, and Nassar, 1996).

- For science and technology (S&T) to succeed in promoting development, formulation and implementation of R&D policy and strategic planning should occupy a central position in the research institutes, universities and other tertiary institutions. The strategic planning should flow out from the National S&T, industrial and other relevant policies. The universities, polytechnics and research institutes should build intellectual capital around their core competencies and seek for opportunities to spin-out new technology-based enterprises arising from their R&D outputs and inventions. They should ensure that all S&T activities are aligned with their strategic directions. The growing changes of global scientific and business environment demand global partnership for future survival of our educational and research organisations. They should therefore reach out to other global institutions and seek opportunity for international projects and partnerships.
- Business units or science and technology parks having strong affiliation to educational and research organisations should be established to promote R&D markets and client industry relationship. Appropriate policy measures need to be put in place to encourage greater investment in local R&D by industry. The contributions of the private sector in support of R&D should be enhanced to be greater than that of Government. Government should put in place policy instruments such as tax incentives for R&D in order to encourage and promote private sector expenditure on R&D. A more robust patenting regime should also be put in place. Provision of adequate infrastructure and standardisation of locally fabricated equipment are necessary for effective operation of the Nigerian Innovation System (Ilori, 2006).
- Tertiary institutions must be ready to be more entrepreneurial and ready to function as networked partners and institutional collaborators. The curriculum revision is also important to streamline it to the dynamic needs of the labour market.

8. CONCLUSION

Both the MDG document and the Nigerian versions recognise the importance of a people-centered and multidisciplinary approach in the achievement of the goals contained in these documents. Also, the documents equally recognised the role of pro-poor growth and efficiency; a focus on inequality, women and marginalised groups; and social, political and civil empowerment in support of human dignity and freedom. This then suggests that any effort at achieving these without making knowledge creation, its dissemination and utilisation as part of its strategy might achieve very little.

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