

## Organizational Management Priorities for Advancing Science, Technology & Innovation in Nigeria

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**Abstract.** Consensus of opinion among researchers seems to indicate that the hub of a country's strategic economic growth and development is science, technology and innovation (STI). Nigeria is a country blessed with a large population and abundant natural resources; yet it is unable to experience any major economic breakthrough. To overcome this situation, several STI-related policies and strategies on building technological competence were adopted and apparently did not seem to work. In this article an attempt is made to depart slightly from the earlier perspective in the Nigeria's STI policy agenda which only emphasize the development of technological capability by identifying factors like the provision of adequate funding, investing in key infrastructure, creation of technological innovations, and focusing on a few core technologies, as the solutions. Alternatively, it is argued that non-technological capabilities like management innovations, managerial competencies development, as well as transforming organizations to be knowledge-based should also be accorded high priority in the STI agenda. Accordingly a framework is deployed and expanded suggesting proposition of new policy emphasis that would increase organization's capacity to absorb knowledge, build entrepreneurial outlook, and facilitate managerial best practices and learning abilities which can ultimately result in higher productivity and growth.

**Keywords:** Organizational Management, Science, Technology & Innovation, Nigeria

### 1. Introduction

Today, entire economies of the world are judged by the investment they make in science, technology and innovation (STI) because of the crucial role they play as the most effective means of enhancing growth and socio-economic development of nations through their impact on income distribution pattern, employment, trade, environment, industrial structure, defence and security matters (Ahmed and Stein, 2004).

In the continent of Africa, particularly Sub-Sahara, governments have emphasized the overwhelming significance of scientific, technological and as well as innovative changes in the development process. Various policy documents contain expressions of desires by countries to promote scientific and technological development in a bid to accelerate economic change and enhance the well being of their people. Such emphasis has also been reiterated in regional and continental meetings and conferences attended variously by heads of state, academics, researchers and professionals. The most significant meetings were the United Nations Conference on Science and Technology held in Vienna in 1979, CASTAFRICA I and CASTAFRICA II in 1974 & 1984, and Lagos Plan of Action in 1980 which exhorted African countries to integrate scientific and technological imperatives in their development endeavors. Ibidapo-Obe (2010) and Dutse (2008) further reemphasize the fundamental position of STI in addressing the critical issues of economic transformation and globalization; reduction of unemployment, underemployment, poverty, hunger and disease, and the sustainable use of natural resources facing the world today.

Stemming from the recognition of this fact, coupled with the fundamental developmental aspiration, Nigeria embarked on a series of new STI initiatives while correspondingly buttressing the research and

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development programmes that had been there before. These efforts are varied both in extent, scope and emphasis across the various organizations with major emphasis on technology-related macro variables considerations for building STI capabilities and disregarding the strategic relevance of the non-technological factors. Consequently, while the STI initiatives have been marked by some successes, there are also cases of notable failures that warranted questions from experts on the effectiveness of the current STI policy approach. In this article focus is placed on the often neglected but important role of organizational management strategies which involve emphasizing the application of management innovation, developing managerial competencies & capabilities, promoting national passion for organizational management, promoting the transformation of organizations to be knowledge-driven as well as encouraging private sector in the national STI ambition. These have the potentials of speeding up STI and productivity growth in both private and public organizations.

## 2. Review of Literature

Considerable number of literature exists supporting the idea that STI is significant to development of African societies and indeed Nigeria. A significant number of them promote the belief that African nations need to invest more and develop directed-policy initiatives aimed at promoting STI. This is critical to economic growth in the short and long term national plans (Raymond, 1996). To achieve this end, extensive programs and sizeable amount of funds are being channelled to STI policy initiatives around Africa. Yet, in spite of all these, many African countries are unable to achieve any meaningful progress in STI and on the contrary some countries are even witnessing decrease in productivity (Forstner and Isaksson, 2002). As can be seen in table 1, sub-Saharan Africa, less South Africa, performed poorly in terms of technological efforts as revealed by the lack of adequate skills as represented by enrolment in tertiary and technical education which was 1.7 in 1985 and 2.7 in 1998 per 1000 of population, while research and development per capita recorded no investment. However, the level of technological imports represented by royalties and technical fees was also zero but slightly grew up to \$0.2 per capita in 1998. In terms of information & communication technology infrastructure represented by the number of telephone mainlines and personal computers per 1000 of the population stood at 5.7 and 3.4 in 1998 respectively.

**Table 1: Africa's Technology Gap**

Group or region	Skills		Technological effort		Technology imports		ICT Infrastructure	
	Tertiary technical enrolment (per 1,000 of pop.)		R&D per capita (\$)		Royalties and technical fees per capita (\$)		Telephone mainlines (per 1,000 of pop.)	Personal computers per 1,000 of pop.)
	1985	1998	1985	1998	1985	1998	1998	1998
<b>World</b>	<b>11.1</b>	<b>14.6</b>	<b>22.9</b>	<b>71.4</b>	<b>2.6</b>	<b>14.2</b>	<b>152.5</b>	<b>64.9</b>
Industrialized countries	34.3	40.1	122.3	402.4	12.0	66.2	571.1	316.5
Transition economies	..	26.3	..	8.8	..	2.5	214.0	42.7
Developing countries	6.3	8.7	0.6	4.6	0.6	3.9	62.6	14.2
East Asia	4.6	9.2	..	8.7	..	7.1	82.7	19.3
East Asia less China	12.3	21.9	3.2	31.0	2.7	26.6	119.3	48.6
South Asia	5.1	5.4	0.3	0.3	-	0.2	19.7	2.6
Latin America and the Caribbean	16.6	17.3	1.1	6.3	1.9	5.3	122.3	33.3
Sub-Saharan Africa	..	4.0	0.6	1.3	0.4	0.6	16.5	7.8
Sub-Saharan Africa less South Africa	1.7	2.7	-	-	-	0.2	5.7	3.4
Middle East and North Africa	13.6	20.5	0.4	1.4	0.1	3	115	14.8

*Source: UNIDO, Industrial Development Report 2004:177 as in UNCTAD 2005*

In attempting to explain this, (Oyelaran-Oyeyinka 2004) observes that several expert views have been advanced to explain Africa's technology gap and bleak economic growth performance vis-à-vis STI. For instance (UNCTAD 2001 and World Bank, 2011) covered several issue on policy; the works of (Easterly and Levine 1997, Sachs and Warner 1997; UCTAD, 2004 and 2009) provide insights in to structural and institutional factors; while (Ikiara 2003; Huq,2006 and Juma 2006) touched on the lack of adequate technological and managerial capabilities which hamper any meaningful technology transfer.

While these factors explain parts of Africa's and indeed Nigeria's growth problems in relation to the contributions of STI, comprehensive analysis of the nature and role of organisational management in the development and management of STI agenda in Nigeria is still lacking. Apparently, the current debate tends to ignore the considerable significant potentials of organizational management tactics on the country's STI systems in spite of (Volberda and Bosch 2004) description of them as the least expensive ways to boost innovation in organizations in both the private and public sector.

### 3. Nigeria's Global Competitiveness

Currently, African Development Bank (ADB, 2010) describes the country as having potentially the largest consumer and labour market on the continent with a population of over 150 billion people. Figures from the Global Competitiveness Report (2010-2011) reveal a current GDP level of US\$173.4 billion, a per capita of US\$1,142 and GDP (Purchasing power parity) as share percentage of the world total of 0.48%. On similar development the Central Bank of Nigeria (CBN, 2009) and International Monetary Fund (IMF 2010) records show that the Real Gross Domestic Product (GDP) in Nigeria grew by 7.69% in 2010, higher than the growth rate of 7.45% recorded in the corresponding period of 2009. IMF (2010) projects a growth rate of 7.3 % in 2011. The 2010 growth rate is the highest since 2008,

To underline the country's economic potentials (Goldman Sachs, 2007) projected Nigeria to be among the 20 largest economies in the world by 2025 provided the growth and investment potentials in energy, infrastructure, urbanization, human capital and technology are promoted. Similarly, (Malik, Teal and Baptist, 2006) and (ADB, 2010) opined that if Nigeria can succeed in strategic transformation of its manufacturing sector as suggested by many experts and recent policy initiatives, growth rate may reach 2diggits in the next five years. This would put Nigeria's growth rate ahead of two other emerging markets, Brazil and Russia, and slightly behind India and China. However, a somewhat gloomy picture is emerging from current records coming from the World Economic Forum Report (2010) on the nation's global competitiveness rating. The country has fallen from the rank of 94<sup>th</sup> in 2008 to 99<sup>th</sup> in 2009 and 127<sup>th</sup> in 2010 see table 2. Indeed this has been attributed to problems in the nation's macroeconomic environment which is currently at 97<sup>th</sup> from its 20<sup>th</sup> position in 2009. Similarly due to the current fiscal deficit the country's credit rating places Nigeria at 91<sup>st</sup> of all countries covered. Other areas of the country's worsening assessments are institutional environment, poor corporate ethics, weak auditing reporting standards, insecurity, poor infrastructure, low rate of technology acquisition and penetration as well as health and primary education levels. This puts Nigeria at the first stage of development.

**Table 2: Nigeria's Global Competitive Index**

	Rank (out of 139)	Score (1-7)
<b>GCI 2010-2011</b> .....	<b>127</b>	<b>3.4</b>
GCI 2009-2010 (out of 133).....	99	3.6
GCI 2008-2009 (out of 134).....	94	3.8
<b>Basic requirements</b> .....	<b>136</b>	<b>3.1</b>
1st pillar: Institutions.....	121	3.2
2nd pillar: Infrastructure.....	135	2.0
3rd pillar: Macroeconomic environment.....	97	4.3
4th pillar: Health and primary education.....	137	3.0
<b>Efficiency enhancers</b> .....	<b>84</b>	<b>3.8</b>
5th pillar: Higher education and training.....	118	3.0
6th pillar: Goods market efficiency.....	87	4.0
7th pillar: Labor market efficiency.....	74	4.3
8th pillar: Financial market development.....	84	4.0
9th pillar: Technological readiness.....	104	3.0
10th pillar: Market size.....	30	4.6
<b>Innovation and sophistication factors</b> .....	<b>83</b>	<b>3.3</b>
11th pillar: Business sophistication.....	76	3.8
12th pillar: Innovation.....	98	2.9

Source: World Economic Forum - Global Competitiveness Report 2010-2011:260

The report identified some areas of strategic strength that can be used to reposition the country in terms of global competitiveness. These are as relatively the large market and regional business sophistication resulting from the presence of professional managers and application of organizational management practice of delegating decision-making practice. Suffice it to state that the above gloomy situation would require Nigeria to have a new policy pattern on advancement in science, technology and innovation as necessary preconditions for achieving any meaningful development in Nigeria.

#### 4. Nigeria's Science Technology Innovation Agenda – the Gap

Although STI related institutions started emerging since the colonial era, Nigeria had neither a full-fledged Ministry of Science and Technology nor a body of coherent national policy on STI until mid 1960s (Adenikinju, 2005). The desire and concern to build up scientific, technological and industrial productivity came up between 1960s and 1980s, and did not receive the desired priority attention, basically remaining within the circles of government bureaucracy and the nation's academia (Abdullahi, 2004). Serious efforts to promote STI started in 1970 with establishment of the Nigerian Council for Science and Technology (NCST) under Decree No.6 of 1970 (FMST, 1990). Other policies include the establishment of National Science and Technology Development Agency (NSTDA) by Decree No. 5 of 1977, 1979, establishment of additional research institutes made up of 18 agro-based, 3 industrial and 1 medical, in addition to that University based research started receiving funding (Aluko-Olokun, 1999).

A turning point in the country's STI agenda came with the establishment of Federal Ministry of Science and Technology (FMST) through the Science and Technology Act No.1 of January, 1980 later to be scrapped and be re-established in 1993. This period was followed by the establishment of National Agency for Science and Engineering Infrastructure (NASeni) by Decree No.33 of 1992 alongside the establishment of more universities and polytechnics. Since the re-establishment of Federal Ministry of Science and Technology, series of policies have been coming up ranging from Policy on Linkage of the Federal Ministry of Science and Technology with Universities, National and International research Institutes, Policy on Human Capacity Building of Nigerians in, and Transfer of Technology by Multinational Companies, Policy on Cooperation of Federal Government Ministries and Federal Ministry of Science and Technology based Capital Projects at Federal, State and Local Government levels, Policy on Appropriate Technologies for Empowering Small and Medium-Scale Enterprises (SMEs), Policy on Engineering Materials Development, Policy on Science and Technology Data Bank, Policy on Intellectual Property Rights, Policy on Energy Research and Development, Policies on Biotechnology, Space Research, Information technology to Presidential Council on Science and Technology (Abdullahi, 2004).

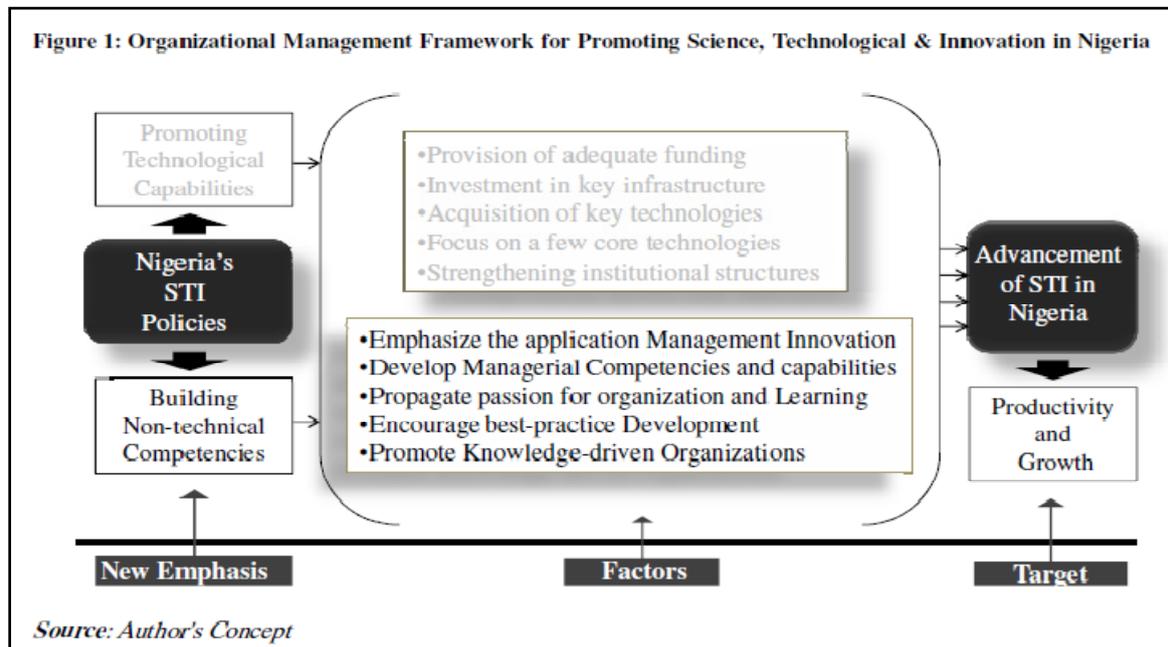
While these formidable changes are still taking place, the policies generally seem not to attract a high funding premium in the government policy agenda. Budgetary allocation to the ministry and institutions is also quite low and direct government policy to support business R&D is also not significant (Adenikinju, 2005). Other challenges include absence of adequate equipment and infrastructure, lack of strong disciplinary focus in scientific institutions, disconnection of application of new technologies from socioeconomic problems (Nzewi, 2005), Short-term thinking and reactive mode action, as well as system linkage failures and poor coordination (Adewoye, 2010). From the above it is obvious that new policy paradigm is urgently needed to actualize the country's vision of growth through the advancement of STI.

#### 5. Rationale for Emphasizing Organizational Management Factors

Currently, the central issues dominating Nigeria's STI debate are concentrated on technology-related macro variables, like the increasing funding by government and increasing investments by firms in R&D (Ibidapo-Obe, 2010), providing conducive home country policy Measures (UNIDO, 2004) acquisition of licensed technologies (Adenikinju, 2005), training and harvesting more scientist and engineers (Adewoye, 2010), provision of infrastructure for scientific knowledge sharing (Abdullahi, 2004 and Adewoye, 2010) and selecting the most promising technologies for the future. The driving idea as described by (Volberda and Bosch, 2004) in this case, is for a developing country to invest in only a few core technologies, such as nanotechnology or biotechnology and also engage in technology cooperation (UNIDO, 2002). From the foregoing it becomes apparent that the debate is strongly biased towards *technological Capabilities* and the total disregard for what has been described by (Lam,2004) as *organizational innovation* similar to the observation of (Volberda and Bosch, 2004) in the case of Netherlands.

On similar issue (Juma, 2006) underscore the need for a new paradigm by emphasizing the ... “*need to pay more attention to investing in people and promoting technological innovation*” . . . (p.3). Therefore, this new drive will involve deliberate targeted approach in simultaneously building capabilities and capacities in these two key areas - technological and non-technological, but with higher emphasis on the non-

technological factors because as (Lam, 2004) argues “organizational innovation may be a necessary precondition for technological innovation, and thus it is important to take greater account of the role of endogenous organizational forces such as capacity for learning, values, interests and power in shaping organizational transformation and technological change..p.1”



The Policy framework deployed in Figure 1 has been decomposed to provide a promising direction for national action which recognizes that organizational Management processes of internal organizational reform and transformation may be a necessary precondition for advancement of STI. It therefore, follows that in line with the new pattern, government would have to pursue STI policies with emphasis on the organizational management factors alongside the existing policies on funding, infrastructure, key and core technologies and institutional structures. The fainted factors in figure 1 signify area of less emphasis while the boldness signifies areas of high emphasis i.e. on the application management innovation, developing managerial competencies and capabilities, Propagating national passion for organization and learning, encourage best-practices development, as well as transforming organizations to be Knowledge-Driven.

## 6. Emphasize the application Management Innovation

This is crucial for change from the norm that has not been effective and it involves invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals (Birkinshaw, Hamel and Mol, 2008). Pursuant to this government policy should emphasize investment in administrative factors that enhance absorption of knowledge and its successful application. Serrat (2010) describe this approach as the prime driver of sustainable competitive advantage in the 21st century.

## 7. Develop Managerial Competencies and Capabilities

Entrenching managerial competencies can aid Nigeria’s organizations both private and public take a more unified and coordinated approach in designing improvements to STI systems since organizational and technological innovations are intertwined (Lam, 2004) Different organizations, businesses and public services are using competency models to better integrate global trends and strategies with their organizational requirements (UNIDO, 2002). Similarly, in developing the managerial capabilities (Volberda and Van Den Bosch, 2004) suggest that emphasis should also be placed on developing “*broad knowledge-base, absorptive capacity, managerial experimentation, higher-order learning and various management roles (hierarchy, teaming, shared norms) to increase the assimilation of external knowledge and the utilization for innovation*” p.1.

## **8. Propagate national passion for in Organization and Learning**

Ignite and propagate passion for organization and learning in youth and empower them to use managerial and technology knowledge and skills creatively to meet the challenges of tomorrow. The establishment of faculties of Technology Management in the nation's Federal Universities of Technology is a welcome development and a step towards the right direction in inculcating entrepreneurial and managerial skills in the next generation of scientist and engineers. Training received from such faculties should inculcate the belief in youth that for science and technology to play any meaningful role in reducing hunger and poverty, or finding cure for diseases such as malaria, to protecting the environment, managerial innovation is equally an important factor. Through public reorientation process, make them also believe that these are universal aspirations, shared by everyone.

## **9. Encourage Best practices development**

Encourage private sector to establish and operate demand-driven managerial capability and competency training centres through financial and other incentives, under carefully designed industry initiatives, supported and coordinated by government, for quality control and accreditation systems. Alongside, organize and engage in STI ranking by developing appropriate assessment mechanisms for innovation in organizational management. This process can be strengthened by entrenching the culture of developing progress report on managerial and organizational innovations to be part of modern corporate governance and annual reporting system.

## **10. Promote the Transformation of organizations to be Knowledge-Driven**

This approach will require taking a holistic approach to the pursuit of better performance in all organizations involve in STI process. Policy should promote provision of fully integrated platforms, information infrastructure, resources and applications to help organizations access and understand individual, group, and organizational information that affects performance. Cohen and Levinthal (1990) explain that innovative outputs depend on the prior accumulation of knowledge that enables innovators to assimilate and exploit new knowledge. These will, in many ways enable people at all levels of organizations to make administrative, technical, financial, and operational decisions that support the overall organizational goals by allowing easy access to current and relevant information, generate reports and examine key performance indicators. It also enables collaboration among personnel leading to better and more relevant decisions, which can positively increases productivity across an organization.

## **11. Conclusion**

Comprehensive and all encompassing STI policies offer potentially powerful means to attaining national excellence in science ,technology and innovation leading to creativity, productivity and growth via technological and non-technological capacity-pooling. However, Nigeria's STI debate remains dominated by issues of policy emphasis inclined to technological factors and total disregard for non-technological factors. This may explain the ineffectiveness of the policies in facilitating creativity, innovativeness and improved productivity.

New approaches to Nigeria's public policy would help to address the STI-related challenges confronting the nation. The new approach requires new thinking and emphasis points across the spectrum of national STI and development endeavour, not merely on funding, infrastructure, scientists and core technologies, but also on organizational management innovations which must be made to keep pace with technological innovations. This requires the development and application of strategies that would emphasize changes in current organizational processes governing daily managerial and technical works. In essence, the new policy focus would actually require redefinition of resources, creation of performance networks, availing flexibility, options and opportunities for excellence. It must also encourage and facilitate speed, adaptation, and foresight in the nation's organizations by identifying and rewarding best practices. Focusing on best practices rather than on failures is a way to provide positive incentives for reform efforts and encourage a constructive outlook on development (Alberti and Bertucci, 2006). This approach may in a way contribute to the

Nigeria's advancement in STI and consequently, productivity growth and sustainable global competitiveness of the its economy

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