



FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, NIGERIA

25TH Anniversary
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**The Future of Science and Technology Training
Institutions in Africa**

THE CHALLENGES AND OPPORTUNITIES

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VISION

The Federal University of Technology, Akure aims to be one of the best Universities of Technology in the World, committed to carving out an enviable niche for itself as a centre of excellence, epitomized by high quality programmes, products and contributions to the society.

MISSION

The Federal University of Technology, Akure will ceaselessly promote technological advancement through motivated and skilled staff dedicated to teaching and research, geared towards global needs and production of self-reliant high level manpower, goods and services.

PHILOSOPHY

The Philosophy of the University is premised on the strong desire to:

- Solve real life problems which require the knowledge of more than one subject area;
- Undertake a thorough identification of indigenous technologies;
- Identify those that can be upgraded and modernized; and
- Harness technological resources (equipment and technical know-how) in servicing as well as providing leadership to industrial and technological development in the country.

1. INTRODUCTION

I like to start by thanking the University Senate for inviting me to give the lecture to commemorate the 25th anniversary of the founding of the Federal university of Technology at Akure. Let me also congratulate you Mr Vice Chancellor and all the other University authorities on the occasion of this twenty fifth anniversary of your illustrious institution. Twenty five years of existence of any entity in this part of the world is an achievement. But it is even more so for a science and technology Institution, considering the lack of support for higher education institutions in the last two decades. This neglect posed many problems for most institutions and could have led to the total collapse of higher education had it not been for the imaginative and innovative leadership of institutions such as FUTA.

Today, as we celebrate the 25th anniversary of FUTA, it is of course important that we examine the past and see how far we have come and what hurdles we have overcome over the years. And no doubt there will be plenty of opportunity during the celebrations to do just that kind of reminiscence and reflection. However, it is also pertinent that we look to the future and start preparing strategies for the next 25 years. In this connection, I have decided to focus my lecture this afternoon on the challenges and opportunities that lie ahead for institutions such as FUTA. So my lecture will be on the subject: *The Future of Science and Technology training Institutions in Africa: The Challenges and Opportunities*.

2. RECENT HISTORY OF AFRICAN HIGHER EDUCATION, SCIENCE AND TECHNOLOGY

It is significant to note right at the outset that FUTA was established in 1982, just a few years after the first conference of African Ministers responsible for science and technology in Africa (CASTAFRICA1). That meeting, which was held in Dakar, Senegal, in 1974 has served as a historical reference point in discussions on the promotion of science and technology in Africa. Immediately after CASTAFRICA 1, several countries embarked on a range of activities for the promotion of science and technology. Ministries dedicated to the promotion of science and technology were established in many countries. And, since the economies in the region were very strong at that time, several research and training institutions were also built. These institutions were adequately funded. They had staff that had been trained in some of the best universities both at home and abroad. Interest in research was high as reflected by the number of African scientists publishing in international journals. Then things changed. What changed? Several things happened.

First, African economies went into decline and could no longer adequately support the higher education and research institutions that the government had created. These institutions were in competition with other sectors for the limited and dwindling resources. Since Science and Technology investment is always a long term one, it can never compete successfully with social service sectors such as health. So, it is not surprising that the institutions lost the competition.

One of the indirect consequences of the economic decline was the out-break of political conflicts and civil wars which led to the vandalization of institutions and the flight of scientists. Several of the earlier investments in staff and infrastructures were lost through this unfortunate episode.

But the biggest change was that brought about by Africa's development partners. Through various consultants, these partners had propagated the concept that investment in higher education in Africa has an inferior rate of return compared to that of basic education and that public subsidies for higher education tended to favour higher-income families from which majority of the university students came. Therefore, African Governments were advised not to invest in higher education. This effectively closed the door to international financial institutions where Governments traditionally borrow money to finance infrastructure projects. The World Bank recently acknowledged that expenditure on higher education declined from 17 % of the total education expenditure in 1985- 89 to 7% during the period 1995-99. The consequence of this decline in investment in higher education institutions is very visible today in the form of poor infrastructure and the high number of students that are squeezed into facilities that were intended for half the current level of student population.

The net effect of all of the above-mentioned changes was the near collapse of some institutions. Particularly hard-hit were the research institutions and centres such that most of them are still empty shells, with enough funds only to pay salaries and no funds to undertake research. Science and Technology training institutions have however manipulated very well around the crisis and have not only survived but have even continued to grow.

3. THE STATE OF SCIENCE AND TECHNOLOGY TRAINING INSTITUTIONS

In order to understand the challenges that scientific and technological training Institutions face in the future, let us look at some of the problems that confront them now. In 2005, the UNESCO Regional Office for Science and technology in Africa, working through its project the African Network of Scientific and Technological Institutions (ANSTI), conducted a study on the state of science and technology training institutions in Africa. What was observed at that time was very depressing. A few highlights of the findings will form the basis of the discussion of the challenges that S&T training Institutions now face. The survey, conducted among 20 institutions spread over all the geo-political regions of sub-Saharan Africa (excluding South Africa), revealed many problems confronting institutions in the region. In general, the report concluded that all the different resources required for the production of high quality graduates were weak in some of the institutions and in some cases completely lacking. Fortunately this is changing rapidly. We shall just quickly discuss some the issues identified.

3.1 Survey findings on the Staff Situation

University	Faculty	Total Study Population	Planned No. of staff	Actual No. of staff	% of filled positions
UZ	Eng	955	95	49	51.6
Malawi	Eng	474	69	56	81.2
Ahmadu	Eng	2287	161	86	53.4
Lagos	Eng	4063	142	88	62.0
JKUAT	Eng	794	149	90	60.4

Table 1: Percentage of staff at post (*Source: State of science and Technology Training Institutions. ANSTI 2005*)

The Report of the survey on the State of Science and Technology Training Institutions showed that most departments have only 60%-80% of the required staff at post. In some universities there are departments with only 30%-40% of the staff required. Among the universities surveyed, only university of Botswana had several departments with a full compliment of staff. Table 1 gives an indication of what prevails in a few selected institutions. The comprehensive report showed that in some universities there were science and engineering departments with only 30-40% of the total staff requirement.

The situation gets even worse when one considers that most of the staff at post are young and inexperienced. The survey established that on average the percentage of staff with PhD in science and engineering faculties in the institutions surveyed was just above 50%. This suggests that majority of staff in universities in the region are at the level of lecturer, assistant lecturer or research assistant because staff without PhD in most universities cannot proceed beyond these levels. Associated with the problem is the aging of the most experienced staff. One wonders what will happen as these grey-haired professors retire. Already we are dipping further into the retired crop of scientists to continue to offer courses in disciplines such as Physics.

3.2 Findings on Laboratory facilities

In the study by ANSTI/UNESCO, several Departments in the faculties of engineering were invited to estimate the percentage of equipment in working order, the age of the equipment and the fraction of the laboratory experiments which are skipped for lack of equipment. The result of the survey showed that in some departments only about 20% are in working order. In strong departments such as Civil, Mining and Engineering which attract funds from industry, about 80% of the equipment are in working order. This is not the case for, say, Metallurgy and Electrical/Electronic Engineering. The latter is due to the fact that electrical components change rapidly and replacement parts are difficult to get.

The biggest problem facing the laboratories is the very old age of the equipment. Most universities have laboratories where the average age of the equipment is more than 12 years (see Table 2). There are even those where most of the equipment date back to the establishment of the faculty/department. Laboratory technology has changed considerably in the last ten years with computer-controlled measuring instruments replacing manual measuring systems. Thus, the average age of the laboratory equipment in African institutions may be too high. And this may even affect the ability to do certain experiments. The survey found out that the percentage of experiments skipped for lack of equipment range from 10-60% and most respondents classified the state of the laboratory equipment as just average or poor.

University	Engineering Sciences	Age of Science and Tech. departments
Addis Ababa University	10	52
Michael Okpara University of Agriculture, Umudike	-	8
University of Zimbabwe	-	45
Univesity of Malawi	23	35
Ahmadu Bello University	-	
University of Lagos	26	38
Kwame Nkrumah University of Science and Technology	12.6	51
University of Nigeria, Nsukka	30	42
JKUAT	9	12
University of Dar es Salaam	-	
University of Nairobi	14.5	43
University of Botswana	4	20
University of Ibadan	11	27
University of Cape Coast	-	40
Universite De Lome – Togo	18	30
Ecole des Mines	-	-
<i>Average</i>		<i>15.8</i>

Table 2: Average age of equipment (Source: State of science and Technology Training Institutions. ANSTI 2005)

In the case where laboratory equipment are old there is need to have highly trained technical staff. Unfortunately a large fraction of the technical staff are fairly old and not very familiar with the emerging laboratory technologies. This is a trend that needs to be reversed.

3.3 Other findings

The survey also identified many other problems which adversely affect the delivery of Science and Engineering education and research. These include availability of

journals and learning materials, the lack of teaching technologies such as projectors and copying facilities for hand-outs, and the size of the student population which exceeds the capacity of the institutions.

4. THE CHALLENGES

It is not possible in one lecture to dwell on all the challenges facing institutions such as FUTA. But let us just concentrate on two areas: The staff development and rehabilitation of laboratories. These are two evidently important resources required for high quality training and it is important that we identify and overcome the challenges in acquiring them.

4.1 The challenge of staff development

One of the biggest challenges facing institutions in the region is related to staff availability. As earlier analysed in this lecture, the current staff situation in most institutions, especially the younger ones is not very satisfactory. It is characterised by shortage of staff as exemplified by the high level of vacant posts in many institutions and the inadequate numbers of staff with doctorate degrees. The challenge is to identify an innovative strategy that will ensure rapid and cost effective system of staff development. It is not simply a matter of increasing the enrolment of students at the post-graduate level and turning out PhD graduates who can then serve as staff members of Institutions. It involves not only training more students but retaining them in the universities.

Staff development requires actions at two levels. First, you must train younger scientists to the level of PhD and then one is confronted by the challenge of retaining them.

4.1.1 Challenge to staff Training

The challenges of staff training in the region are many. The first among them is the size of the problem which arises not only from the reduced financial support for higher education but also from the expansion of the student intake of existing universities and the creation of new ones. There is an increased demand for more staff. And therefore there is need to train large numbers of staff at the level of PhD at a time when the facilities for research and post-graduate training in some science disciplines are limited. How does an institutions train its scientists to PhD level when it lacks a large pool of staff with PhD? Addressing this question is a major challenge now facing many institutions. There are very few universities with the staff and other resources to be able train younger staff to the level of PhD in all disciplines of basic and engineering sciences. It is a vicious cycle. In order to have staff you must have staff in place. Or you cannot have staff if you don't have staff. In order to break this cycle you need intervention from other institutions. Institutional networking and linkage arrangements are very useful in this situation.

4.1.2 Retention

Retention was never a problem when the economies were buoyant and academic staff salaries were good. Today in Nigeria as indeed in most countries in Africa, Higher education institutions are suffering from brain drain within the country and away from the country. Local companies and parastatals are attracting some of the best staff with very high salaries and benefits. Vice-Chancellors, Deans and Heads of department feel unable to stop the exodus of staff once it starts and in some cases the flow becomes a flood taking away even the Vice-Chancellors.

Another recent development in Nigeria is the movement of staff from older established universities like FUTA to newer ones especially the private ones. The few experienced staff are being spread thinly among an ever-growing list of universities and the quality of training and research is suffering because most institutions lack the critical mass of scientists.

There is also, of course, the global problem of brain drain to developed countries. The external brain drain puts universities in a dilemma when it comes to training in highly specialised areas. On one hand, they will like their young staff to get the best training from any institution any where in the world where the facilities exist. On another hand they fear losing the staff once he or she leaves the institution for study abroad. The decision to approve study leave for young staff to study in prestigious universities like MIT or Cambridge, which will otherwise have been a very pleasant event now poses a dilemma for most Vice-chancellors. A hitherto happy event has become an agonising and risky action.

4.2 The Challenge of refurbishing the laboratories

Another major set of challenges that lie ahead of institutions such as FUTA is that of refurbishing the laboratories. No science and technology Institution can exist without good laboratories. The problem of laboratories can be put into two categories: *Obsolescence and poor maintenance*. Because of the long neglect of the infrastructure we now have situations where laboratory equipment have not been replaced for a long time and in some institutions equipment are as old as the institutions themselves, meaning that no new equipment were acquired since the first set of equipment were installed. We also have the problem of poor equipment maintenance arising from two realities: First the equipment are too old and can no longer be maintained; second, when the equipment can be maintained we find the technicians who could maintain them have long retired. New and younger technicians have no knowledge of how to carry out maintenance of such equipment. Thus, based on the realities alluded to, the only solution is a comprehensive replacement of the equipment in some of the laboratories. Therein lies the challenge. The wholesale replacement is costly. Yet in most cases there is no choice if we have to have good laboratories. In future, African Universities will have to confront this challenge. They will have to raise funds from public and private sectors for the replacement of laboratory equipment.

4.3 The Challenge of the Relevance of the Curricula

The relevance of the curricula is also a problem. Relevance and quality assurance go hand in hand. It is important to note that curricula revision is an activity that many institutions have carried out regularly. Such revision has in the past focused on academic quality and not on relevance or usefulness of the course content. There is a tendency to emphasise only academic quality. But quality for what? What good is knowledge that is not of benefit to society? African countries cannot afford at this stage of their development to pursue knowledge for knowledge sake. Institutions in the region are now being called upon to address national issues. Thus, curricula revision may no longer just address global standards but also local issues. The challenge here is to have programmes that are internationally recognised and yet locally relevant. Innovative new programmes, delivery techniques, practical exercises will be required in order to overcome this challenge. Quality should no longer be addressed in terms of content alone but in terms of usefulness and applicability of that content.

Knowledge should be translated to target local problems. It should be emphasised, for the avoidance of confusion, that the principles of basic and engineering sciences are universal. There is no such thing as “*African Science*”. However the application of the principles varies and therein lies the issue of relevance which should be addressed.

4.4 Other Challenges

Besides the challenges arising from the staff availability and laboratory facilities there are many others. These include those arising from the demographic changes leading to increase in demand for higher education. The absence of strong culture of research and innovation is also a major challenge which should be overcome if Science and Technology training institutions were to make significant contribution to the national research and innovation system. There is every evidence that the culture of research has weakened over the last decade and we need to reverse this trend

5. OPPORTUNITIES

The future of Science and technology training Institutions is filled with many challenges. But there are opportunities and some of these are highlighted below.

5.1 Commitment of National and regional bodies to Science and Technology

The first opportunity is a renewed commitment to the promotion of Science and technology both at the regional level and the national level. This has manifested itself in many ways. One example is the establishment of the African Ministerial Council on Science and Technology with a regional mandate to promote science and Technology for development. For the first time we have a regional governance and financing mechanism for the promotion of science and technology. This Council has already prepared an action plan for Science. This Plan was recently adopted by the

Heads of State at the African Union (AU) summit meeting in January 2007 in Addis Ababa. The summit itself was unique. For the first time, African Heads of State met to discuss Science and Technology instead of the usual issues of peace, security and political and economic integration. In fact, The Heads of state are now looking at Science and Technology as tools to address some of the vexing problems of the region such as poverty, civil strife and conflict. These are just two prominent examples of the region's commitment to Science and Technology which suggest that the spirit of 1974 CASTAFRICA¹ that brought about the establishment of institutions such as FUTA is back again with us. It is hoped that like the late 70s and early 80s, this new era will also lead to strengthening of Science and Technology institutions.

Already this commitment at the regional level is filtering to the national level. Several governments including the Nigerian government are making increased financial commitment to the promotion of science and technology. These include efforts to review the science, technology and innovations system and also the establishment of special funds for the promotion of scientific research. The last AU summit requested all member states to make additional efforts to ensure that 1% of their budgets were devoted to science and technology. And there are signs from a few countries that efforts to achieve this are already under way.

5.2 Improved economic performance in the region

Most Africa Governments are gradually increasing the financial support for Higher Education - and therefore Science and Technology training Institutions. This is due to the recent improvement in the performance of national economies. Due to the rise in the price of most of Africa's exports (mainly raw materials) and the improved level of governance, African economies are now growing at a rate that is higher than that of the demography. This offers an opportunity for governments to invest in infrastructures for higher education institutions and award increases in staff salaries. This augurs well for the future of staff development and the building of university infrastructure

5.3 Commitment of Development partners

Another opportunity is that arising from the change of policy of Africa's development partners. Development financial institutions are finally warming up to the idea of giving loans for the revitalisation of higher education in the region. For instance, the African Development Bank has recently developed a strategy for investing in Higher Education. The strategy covers provision of Government-guaranteed loans for infrastructure and forging partnership for staff development for the institutions. Other development partners are now providing grants for activities in science and technology. However one should throw in a word of caution about the latter because at a recent round table meeting of Ministers of science and technology organised by UNESCO in Paris, it became apparent from the remarks from some of the African Ministers that commitment to science from some of the development partners has been more in words than in real money.

5.4 Plans to establish African Science Fund

At the extra-ordinary meeting of the African Ministerial Council on Science and Technology (AMCOST), held in Cairo in November 2006, the decision was taken by the ministers to establish a fund to promote Science and Technology in the region. The African heads of state endorsed the idea at the AU summit held in Addis Ababa in January 2007. Following that approval, the third meeting of AMCOST, held in Mombasa Kenya in November 2007, recommended that the AU/NEPAD commission a study to determine the operational modalities for such a fund which will be managed by African Development Bank. The latter has already consented to manage the fund.

When the fund is established it will offer institutions financial support for expansion and refurbishing their teaching facilities

6. STRATEGIES FOR HARNESSING THE OPPORTUNITIES

The opportunities that have just been referred to will be lost unless we put in place strategies to harness them. The first action any institution must take in order to position itself to benefit from the prevailing good will at home and abroad is to reform its governance structure and management system. Institutions like FUTA must adopt a business approach in several of its activities in order to ensure that they receive income commensurate with the service they deliver. This will enable them to approach banks and other financial institutions for loans to put up buildings and purchase equipment for laboratories. The revitalisation of African institutions will proceed faster if it could also benefit from credits from financial institutions in addition to government grants. Some of the challenges that have just been mentioned require large amounts of money and hence good relationship with private sector sources of fund will be useful.

The decentralisation of responsibilities, resources and the equitable and sustainable distribution of income from university enterprises and consultancies will be another issue of governance that should be addressed through adequate policies. Another aspect of governance which needs to be examined is the disengagement of institutions from activities that should otherwise be done better by the private sector. Universities can always benefit from such activities as share holders rather than managers. Several of the financial problems of institutions arise from the unintended subsidy of loss-making ventures which should normally have been left to the private sector.

This brings me to another important strategy in harnessing opportunities for S and T institutions. It is Partnerships. The first type of partnership is that with the private sector. It is a well known fact that the future African institutions need to partner with the private sector for the training of their students and for the development of programmes and curricula that are relevant to the needs of society. Private sector partnerships are also required in the provision of services so that the institutions can concentrate on their core businesses of training, research and community service. In short the private sector can be a partner in the training, research and service delivery on campus.

Another type of partnerships is that among institutions such as networking, and linkages between two institutions. Networking will provide a medium for exchange of experiences, ideas and information on best practices. It will also enable the sharing of resources for training and research. Such resources could be financial as well as be in the form of equipment.

In strategies for the future we should not forget about the value of inter-disciplinarily in teaching and research. If we wish to make our training and research more relevant we must look for scientific programme that address specific developmental problems. These problems normally require skills and knowledge from more than one discipline. Universities must therefore put in place a system to promote interdisciplinary courses and research project.

7. CONCLUSION

In conclusion I will like to state that there are challenges in the future but there are many opportunities which, if harnessed, could further strengthen science and technology training Institutions such as FUTA. In the more detailed document on this subject I have actually proposed actions that help in the revitalisation of Science and Technology institutions. These are also contained in the ANSTI/UNESCO booklet on: *The Way Forward for the revitalising of Science and Technology training institutions in Africa.*

FUTA has done remarkably well. It has grown even during the turbulent period for higher education. Once again my congratulations. I wish you another prosperous 25 years. May the future be brighter than the past. May you harness the opportunities available to you to overcome all the challenges. And may you grow to be the best science and technology institution not only in Nigeria but all of Africa. God bless you all. Thanks you.

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