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Background Paper

Reforms in Higher Education and the Use of Information Technology

A Typology of Higher Education Institutions in Africa

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INTRODUCTION

Mapping of African Higher Institutions and Policy Emanating

Though relatively young, Universities in Sub-Saharan post-independent Africa have achieved much. They have grown from just 6 institutions in the '60s to more than 100 in 1993 (See ADEA 1999). The increase in number of institutions of higher learning during the post-independence period have, with some success, dealt with increasing enrolment, largely replaced expatriate with indigenous staff produced skilled human resources required to manage mostly public institutions. The overall model of universities was inherited from the ex-colonial powers, namely to supply the public administration with qualified personnel including supply of teachers. The model itself was elitist in terms of replacing the colonial public officials by local staff as well as a necessary step in post-independent Africa to model their Higher Education Institutions on the ex-colonial powers.

2. There is much to suggest that African Universities have reached, or are reaching the end of their initial phase of development. This is due to a number of factors, which can be summed up into external and internal causes. In fact many African countries have adopted Reforms in Higher Education because of these very factors (See W.Saint, 1995).

3. Internally enrolments have increased faster than the capacity to plan for the physical as well as financial capacity to sustain such growth. The 80s were the turning point for a number of countries, both developed as well as developing countries, with regards to education and education reforms. The reason for the re-thinking of the role and cost of Tertiary education was caused by a combination of external costs to the global economy-increases in oil prices and consequent increase in raw materials, and the political shift from demand side Keynesian macroeconomic to market oriented liberal policies. The privatisation of previously public services and the introduction of market forces to enhance efficiency and efficacy followed. The role of the State changed, or better still, shifted from provider of services to facilitator of market forces. This was applied to some degree in all countries, especially in Europe where the welfare state was part of its post-II World War history.

4. In Africa the situation had a even larger impact because of the balance of payments problems and the consequent structural adjustment plans to alleviate their debt problem ensuing. Prior to this in the immediate post-colonial/independence period the investment in Tertiary Education in Africa was based on the need for Government officials, to replace ex-pat staff, and to achieve macroeconomic growth.

5. In so doing the educational system was heavily subsidised by governments, if not completely made free of charge for the society at large. Thus there was a consequent relative high increase in enrolment, without

reaching at the continental aggregate level a comparable enrolment rate as Asia. The approximate figure for Africa is 2.5-3.3% of graduates from the age cohort group-a rather low figure for economic development (World Bank Indicators: 2001) Consequently the investment in Tertiary education was based on the quantity aspect of supplying the State bureaucracy, in some way rent-seeking rather than productive employment. The perennial equity problems associated with Tertiary education i.e. the pro-poor nature of primary education as against lower social returns on Universities or Higher Education Institutions, resulted in a small group of university graduates who where in the higher income groups and were eventually employed in the public sector.

6. As was stated above the crisis of the 80s brought about a rethinking of tertiary education, not as a separate area but as part of an efficient use of public resources. The external shock to the national economies was the catalyst in most cases to the ensuing reforms in Higher Education. This is indicative in itself since the Tertiary education system in general, although showing signs of fatigue prior to the 80s, was thought of as a means of "catching-up" with the developed world by producing high-skilled personnel.

7. Current patterns of higher education expenditure are unsustainable in many cases, overall education sector budgets have decreased and this is also due to, among other factors, an increased emphasis in low-income countries on primary education. Without delving into the rates of return theories (See Psacharopoulos G (1994) the pro-poor nature of primary education and its relation to poverty reduction has resulted in less resources allocated to the tertiary sectors. This fact is in some way in contradiction with the new needs of knowledge-based skills in the labour market, which require tertiary education.

8. As was said above the '90s in Sub-Saharan Africa were marked by a series of reforms in Tertiary education. Although the reforms, as can be expected, vary, a number of common issues can be ascertained in this overview. The areas of importance, which were addressed in the educational reforms chosen for the mapping of Higher Education Institutes were/are the following:

- Access
- Financing
- Curriculum development
- Equity
- Public/Private partnerships

Some general observations on Map of African Universities

9. Table 1 depicts ownership of Higher Education Institutions, private public or mixed as well as foreign or domestic. The information on the ownership structure of Tertiary organisations was divided into public,

private and mixed. At first glance there are very few private universities and even fewer foreign universities. The vast majority of the countries had primary and secondary Teacher training courses separate from University Institutions, the training of formal teachers is seen as external to University subjects. Yet many Universities have an Education Department, if not faculty, within their humanities or liberal arts. Another point to mention is that in most developed countries teacher training is part and parcel of University supply- with the option of a post-graduate short course in teaching techniques.

Table 1: Ownership structure

Countries	1999 Per capita Income Constant 1990	*Universities/ Institutions* public	private	foreign
Algeria	2,195	Y		
Angola	877	Y		
Benin	459	Y		
Botswana	4,074	Y		
Burkina Faso	322	Y		
Burundi	163	Y		
Cameroon		Y		
Cape Verde	1,174			
Central African Republic	468	Y		
Chad	229	Y		
Comoros	381			
Congo, Dem. Rep.	104	Y	Y	
Congo, Rep.		Y		
Cote d'Ivoire	812	Y		
Egypt	950	Y	Y	
Equatorial Guinea	975	Y		
Eritrea	223	Y		
Ethiopia	125	Y		
Gabon		Y		
Gambia, The	314			
Ghana	474	Y		
Guinea	514	Y		
Guinea-Bissau	317			
Kenya	368	Y	Y	Y
Korea	11,958	Y	Y	Y
Lesotho	397	Y		
Liberia	595	Y	Y	
Libya	4,397	Y		
Madagascar	214	Y		

Malawi	230	Y		
Mali	273	Y		
Mauritania	607	Y		
Mauritius	3,389	Y		
Mayotte				
Mozambique	99	Y	Y	
Namibia	1,984	Y		
Niger	282	Y		
Nigeria	353	Y	Y	
Rwanda	397	Y	Y	
Sao Tome and Principe	463			
Senegal	820	Y		
Seychelles	6,100			
Sierra Leone	122	Y		
Somalia				
South Africa	2585	Y	Y	Y
Sudan		Y	Y	
Swaziland	1,151	Y		
Tanzania	187	Y		
Togo	387	Y		
Uganda	279	Y	Y	
Zambia	477	Y		
Zimbabwe	638	Y	Y	

Sources: Economic Commission for Africa for Income per capita figures (Col 1); UNESCO Guide to Higher Education in Africa, 1999

10. Table 1 shows the ownership structure of Universities in Africa. At first glance there are a number of private Tertiary Institutions in various African countries. In most cases the private Institutions are domestically owned, which shows an amount of private sector investment in Tertiary education. This is interesting in itself, since it shows firstly a market for the education good, which has its own return on investment. Secondly since the reforms in Africa have introduced some form of cost-sharing, then the fee-gap for private or public Higher Education has diminished. This fits into a competitive environment in Tertiary Education not only on services but also in terms of cost between private and public universities.

11. It is interesting to note that private Higher Education Institutions are Universities rather than Vocational or Teacher Training Institutes. This could be due to the higher rate of return for University Education, and/or due to an assumption by the private sector that Tertiary Education is Government responsibility in general but the problem of access is more pronounced in Universities. Thus filling it the access gap, with a high return, was a "good" investment by the private sector.

12. A problem faced by African countries educational authorities is how these private universities fit into the Tertiary educational system in terms of quality, curricula and equity. The institutional framework for managing a different market-public and private-through quality assessment accreditation procedures have not been put into place, except for Uganda, Nigeria and the relatively new situation has caused a re-thinking on the role of the State in Tertiary education. The foreign owned universities, again universities rather than Tertiary Institutions, are usually well known world-wide-e.g. American University in Nairobi and Egypt- and their accreditation does not cause a serious problem for the graduates since they are recognised on the labour market. Yet the legal-administrative problems of private participation in the provision of Tertiary education as a public good has not been sufficiently dealt with in the African continent.

13. The public Higher Education Institutions are practically all non-confessional except for Uganda, Sudan and Niger that have Islamic universities as public universities. Unfortunately there is no disaggregate data on enrolment between secular and religious universities. Also Mozambique, Demoractic Republic of Congo have State Catholic Universities whilst Kenya has a private Catholic University. In South Africa there is also a private Christian University, whilst Rwanda has an Adventist University as a State organisation. Finally Mauritania has a Higher Education Institute which is an Islamic centre of research.

14. It is interesting to note that the religious Universities, again Universities and not Institutions except for Mauritania, are not very frequent in Africa. If the ex-colonial powers have until this very day religious universities of highstanding e.g. Belgium's Louvain run by the Jesuits, why this is not present in Africa. The secular character of the independent African State is a general characteristic and probably the religious organisations are involved at the lower levels of education e.g. missionary schools, koranic schools etc.

15. **Financing**: Table 2 divided through the financing mechanism of Tertiary Education, one can have an interesting picture of the complexity of financing mechanisms in Higher Education in Africa. As was said above financing of Tertiary Education in Africa has become crucial in terms of dwindling public resources for education in general and Tertiary education in particular. The high unit cost of higher education in Africa has caused a shift of resources to secondary or primary schools. The effect of high unit cost on public resources was further emphasised with the pro-poor education strategy introduced in Africa in the 90s. The consequences were to both use efficiently public resources, however limited, as well as introduce some form of private expenditure on high education costs, which meant Tertiary and sometimes secondary education.

Table 2: Financing in African Universities

Countries	Per capita Income Constant 1990		
		Public	Private
Algeria	2,195	Y	Y
Angola	877	Y	
Benin	459		Y
Botswana	4,074		Y
Burkina Faso	322	Y	
Burundi	163		Y
Cameroon			Y
Cape Verde	1,174		
Central African Republic	468	Y	
Chad	229		Y
Comoros	381		
Congo, Dem. Rep.	.. 104	Y	
Congo, Rep.		Y	
Cote d'Ivoire	812		Y
Egypt	950	Y	Y
Equatorial Guinea	975		
Eritrea	223	Y	
Ethiopia	125	Y	
Gabon		Y	
Gambia, The	314		
Ghana	474	Y	
Guinea	514	Y	
Guinea-Bissau	317		
Kenya	368		Y
Korea	11,958	Y	Y
Lesotho	397		Y
Liberia	595	Y	
Libya	4,397	Y	
Madagascar	214		Y
Malawi	230		Y
Mali	273		Y
Mauritania	607	Y	
Mauritius	3,389	Y	
Mayotte			
Mozambique	99		Y
Namibia	1,984		Y

Niger	282	Y	
Nigeria	353	Y	Y
Rwanda	397		Y
Sao Tome and Principe	463		
Senegal	820		Y
Seychelles	6,100		
Sierra Leone	122	Y	
Somalia		Y	
South Africa	2585		Y
Sudan			Y
Swaziland	1,151		Y
Tanzania	187		Y
Togo	387		Y
Uganda	279		Y
Zambia	477		Y
Zimbabwe	638		Y

Sources: Economic Commission for Africa for Income per capita figures (Col 1); UNESCO Guide to Higher Education in Africa, 1999

16. Table 2 gives us an idea of the fees or free access to Tertiary education. The first column is when there are no fees charged, that is zero tuition and services. Whilst if both public and private financing have a Y (y for Yes) then the tuition fees vary between 0 and above. Private financing, that is column 3 alone is when there is some fee to be met by households.

17. The data does not give the fees in a breakdown of tuition or ancillary services or does not relate the fee to any disposable income or GDP per capita. Yet from the World Bank table 2000 the average unit cost is 657% of GDP per capita, which could act as a benchmark (See "Can Africa claim the 21st century?").

18. Only 16 countries in Africa do not charge any fees 7 of which are Francophone. There is a high possibility that the ex-French colonies have been late with their reforms and the model still seems to be the French schooling system, which has remained more elitist. It would be interesting to compare graduate unemployment in Francophone and Anglophone countries, because of the model's output that in France is geared towards the public administration but in the African Francophone countries is geared towards the labour market.

19. The second point that one can see from Table 3 is that the majority of African countries have introduced some form of private cost of Tertiary Institutions. Therefore there is recognition of cost sharing as a mechanism to decrease public expenditure on Tertiary education. Unfortunately there is no data on what the fees cost, yet if we take a number of examples then some indications could be drawn. In Kenya the cost is minimum of Ksh 20,000 to a maximum of Ksh 415,000 (approximately $256 to $5345). If the GDP per

capita is $356, see table3, then the fees whether for tuition or living expenses is a large percentage of GDP. Thus although there is some form of saving on public resources, the problem of equity becomes very crucial. In Kenya there is a loans board that caters for fees to be paid, applying affirmative action on low-income, regional representation and gender bias thus the equity problem is in some way mitigated. Another example could be Uganda average course cost is U Sh 3,000,000 and a GDP per capita of $279. The Uganda Government sets a threshold of number of graduates free of charge the rest have such costs without a loan/scholarship scheme.

20. For an efficient as well as equitable system the cost-sharing scheme must be flanked by a reimbursable amount to attend Tertiary education institutions, with some bias towards low-income groups for equitable distribution among income levels. Since the number of graduates in Africa is considered low e.g. 0.06% of Ethiopians and 0.08% in Burkina Faso of the population were enrolled in Universities, whilst 3% in Chile and 6% in Korea were (See Transforming Africa's Economies, 2000), the increase in access is a necessity for the national economies of Africa. This is because of the high-skilled nature of the knowledge economy requires graduates, and this phenomena is also present in the developed countries where the last ILO report quoted OECD saying that in a survey of 17 countries nearly 75% of the population cannot actively participate in the economy.

21. Increasing access together with diminishing public resources is not an easy task, especially with a poor population, which sets limits on cost sharing unless public funds are available for loans and/or bursaries. An alternative could be the enhanced role of the private sector not only through the establishment of Tertiary Institutions but also financing low-income students, private banking loan portfolio towards education etc. In other words the private sector could take a more strategic role in Tertiary Education as an investment towards its supply of labour.

22. **Type of degree program**: This is an interesting set of data, since there are 3 types of inherited educational systems- British, French and Portuguese. The majority of countries offer post-graduate courses-both at master as well as doctoral degrees, without some form of co-ordination at regional or sub-regional level. It seemingly is an expensive service given by every university and indistinctively of the inherited educational system.

Table 3: Type of Degree Program

Countries	Per capita Income Constant 1990	*Type of degree program*			
Algeria	2,195	4-year	2/3-year	diploma	Post Graduate

Angola	877		Y	Y	Y
Benin	459		Y	Y	Y
Botswana	4,074		Y		Y
Burkina Faso	322	Y			Y
Burundi	163			Y	Y
Cameroon			Y	Y	Y
Cape Verde	1,174		Y	Y	Y
Central African Republic	468				
Chad	229		Y	Y	Y
Comoros	381		Y	Y	
Congo, Dem. Rep.	104		Y	Y	Y
Cote d'Ivoire	812		Y	Y	Y
Egypt	950		Y	Y	Y
Equatorial Guinea	975		Y	Y	Y
Eritrea	223				
Ethiopia	125	Y			
Gabon		Y		Y	Y
Gambia, The	314		Y	Y	Y
Ghana	474			Y	
Guinea	514				
Guinea-Bissau	317			Y	Y
Kenya	368				
Korea	11,968	Y			Y
Lesotho	397	Y	Y	Y	Y
Liberia	595	Y		Y	Y
Libya	4,397	Y			Y
Madagascar	214	Y			Y
Malawi	230		Y		Y
Mali	273	Y			Y
Mauritania	607	Y			Y
Mauritius	3,389		Y		
Mayotte					
Mozambique	99	Y	Y	Y	Y
Namibia	1,984		Y		
Niger	282	Y		Y	Y
Nigeria	353		Y		Y
Rwanda	397	Y			Y
Sao Tome and Principe	463		Y		Y
Senegal	820				
Seychelles	6,100		Y		Y
Sierra Leone	122				
Somalia		Y			Y
South Africa	2585				

Sudan		Y	Y	Y	Y
Swaziland	1,151		Y		Y
Tanzania	187	Y			Y
Togo	387		Y		Y
Uganda	279		Y		Y
Zambia	477		Y	Y	Y
Zimbabwe	638	Y			Y
		Y			Y

Sources: Economic Commission for Africa for Income per capita figures (Col 1); UNESCO Guide to Higher Education in Africa, 1999

23. A second point, which emerges from the data, is that first degrees vary in terms of time necessary to obtain the degree. The ex-French countries have a 2/3 year first degree and post graduate courses, with the first degree "Licence" seemingly close to a diploma rather than a degree. The skills obtained through a "Licence" might be less than a degree and require postgraduate expertise, consequently prolonging the years of study and hence the cost.

24. On the other hand the ex-British colonies have, in their vast majority adopted a mixture of US College system and British degrees. This is because the first degree is 4 years, not the typical B.A.-3 year program but a 4-year programme of a common 1-year and a 3-year specific course. This could be for a number of reasons, namely that the standards of freshmen must be at par because of the different levels of secondary education. Another reason is that the university graduate in any subject requires a multidisciplinary approach, hence the necessity of an extra year. Whatever the reasons for so doing, the extra year does have a cost, which should be evaluated against the opportunity cost of a 3-year program.

25. The policy implications are that the cost is high because of the variety of degree, diploma and post-graduate courses offered. Even assuming that the quality is low, there is still a cost at national level that could be alleviated. In this respect the work of AERC in Africa could be enhanced in providing Ph.D.s at regional level rather every Higher Education Institution offering its own. Another point to be made is that with different degrees between Francophone and Anglophone countries the creation of African Unity with one labour market will have serious accreditation problems. For example in Europe the recognition of the "licence" and the Anglo-Saxon B.A together with German degrees has created large legal problems for job applicants with different academic qualifications.

26. In Africa the low quality of secondary schools has been the cause for longer first degrees, yet the unit cost of secondary schooling is much lower than Tertiary education and the policy should shift to increasing the quality at the lower level rather than a longer program. If Africa aims at a continental

market the co-ordination of educational systems in general, and Tertiary in particular should be one of the necessary underpinnings of the single market. The existence of different historical models of Tertiary Education, although there seems to be a tendency towards the single Anglo-Saxon model e.g. Mozambique, creates a costly system because of its limited transferability outside national economies and also the adaptability of curricula for Africa.

27. **Delivery Method:** Data on delivery method was confined to whether the countries listed had in tertiary education distance learning as one of their policy options. The data available does not distinguish the areas covered by distance learning, what type of technology, etc. Thus the countries listed that offer distance learning range from "Open University" type in South Africa to radio programmes Guinea.

28. The optimal use of IT in distance learning, and not only in distance learning, should be analysed in terms of technology used- one-way or two-way and relative costs involved, critical mass to cover fixed/ development costs.

Table 4:Delivery Method

Countries	Per capita Income Constant 1990	Delivery method	
Algeria	2,195	Residential	Distance
Angola	877	Y	
Benin	459	Y	
Botswana	4,074	Y	
Burkina Faso	322	Y	
Burundi	163	Y	
Cameroon		Y	
Cape Verde	1,174	Y	
Central African Republic	468		
Chad	229	Y	
Comoros	381	Y	
Congo, Dem. Rep.	104		
		Y	
Cote d'Ivoire	812	Y	
Egypt	950	Y	Y
Equatorial Guinea	975	Y	Y
Eritrea	223		
Ethiopia	125	Y	Y
Gabon		Y	
Gambia, The	314	Y	
Ghana	474	Y	
Guinea	514		
Guinea-Bissau	317	Y	Y
Kenya	368		
Korea	11,958	Y	Y
Lesotho	397	Y	Y
Liberia	595	Y	Y
Libya	4,397	Y	
Madagascar	214	Y	Y
Malawi	230	Y	Y
Mali	273	Y	
Mauritania	607		
Mauritius	3,389	Y	
Mayotte			
Mozambique	99		
Namibia	1,984	Y	
Niger	282	Y	

Nigeria	353	Y	
Rwanda	397	Y	Y
Sao Tome and Principe	463	Y	
Senegal	820		
Seychelles	6,100	Y	
Sierra Leone	122		
Somalia		Y	
South Africa	2585		
Sudan		Y	Y
Swaziland	1,151	Y	Y
Tanzania	187	Y	
Togo	387	Y	Y
Uganda	279	Y	
Zambia	477	Y	Y
Zimbabwe	638	Y	Y
		Y	Y

Sources: Economic Commission for Africa for Income per capita figures (Col 1); UNESCO Guide to Higher Education in Africa, 1999

29. One of the possibilities to reduce unit cost of Tertiary education is to decrease the ancillary costs, unfortunately the data does not give a breakdown between tuition and services, yet one can say that this cost in whatever proportion could be largely eliminate through the use of distance delivery.

30. Only 16 countries have a Distance delivery module, probably as an option, which is complimentary to traditional course structure. The formal schooling mechanism that is based on classroom delivery creates a tradition, which is very difficult to break at Tertiary level. If in U.K., with Open University, and U.S.A with established distance institutions the percentage of Tertiary students who use distance learning is low. This could be because of accreditation, also the disincentive of working/studying not in a campus environment and tradition of classroom methods. In the developed world the module of distance education institutions is a mixture of distance and residential that aims at mitigating the problems listed above.

31. This is considering distance education as a single technology but there are different technologies with different costs. The knowledge based economy would require an investment in National Information Technology Strategies, and one of the fields should be the upgrading of the distance learning modules in Africa taking into account efficiency of delivery and cost.

Table 5: Cost of Distance Learning, different Technologies and number of students

Average annual cost in $US/number of students for distance learning and Tecnologies,1990's					
	Number of students per annum				
	50	125	250	625	1250
One way technologies					
Print		2.61		0.6	0.37
Audiocassettes		3.51		1.3	1.02
Pre-recorded instructional television					
(hypothetical)					
25 courses	7.71	3.09	1.54	0.6	0.31
10 courses	7.95	3.18	1.59	0.6	0.31
1 course	18.8	7.5	3.39	1.5	0.75
Radio		14.9		3	10.99
Educational broadcast TV		110		22	10.99
Computer-based learning					
Low-end	59.3	18.8	11.3	6.8	4.5
High-end	323	131	66.8	29	15.75
Two-way technologies					
Audio conferencing		7.21		4.1	3.67
Live, interactive lectures		67.2	50.1	34	29
Video conferencing	56.7	22.2	16.8	14	14.19
384 kilobits/ s					
Computer conferencing					
Dual-mode					
Institution	1.45	1.12	1.09	1	0.93
Student	0.69	0.69	0.69	0.7	0.69
Combined	2.25	1.81	1.8	1.7	1.68
Source: A. W. Bates "Technology, open learning and distance education"					

(London,Routledge,1995)					

32. The above Table gives an idea per student of distance learning at different amount of students and the policy choice should take into account the technology available, the market (critical mass) necessary to diminish cost as well as the module disadvantages in terms of disincentive of individual learning and accreditation.

33. **Economic Research**: The complexity of the African Tertiary system is not sufficient to elicit common ground of analysis and research for further study.

34. First of all access one of the largest problems in Africa must be increased together with, a more efficient use of public resources. To do this the use of distance education could be one of the tools. The present state of distance education in Africa is complimentary to traditional schooling rather than a strategic choice.

35. A strategic choice of employing Information technology in the national economy and its corollary in Tertiary education should be investigated, since there is a world-wide tendency for Information Technology to decrease in price (See "The IT revolution and developing countries: Late-comer Advantage", 2001). Secondly the IT itself is not only a tool but also a source of knowledge and hence has a double-effect of lowering delivery price and increasing the knowledge base. Also the knowledge-based nature of IT allows a shift from passive participant to active contributor to the accumulation of such knowledge. In this context the two-way technology, although having the highest development cost (See Table 5 above), is the most advantageous since its involves interaction and a possibility of a "cultural" shift from given imported models of Tertiary Education to locally constructed relevant information. This could feed into the development of curricula, developed for the African continent.

36. In operative terms, a research area should be envisaged to increase access through Distance Learning, but the tasks of such an economic research project should also exploit the potential of the World Wide Web to achieve the positive externalities ensuing. The institutional arrangement for such an endeavour must be organised at regional and eventually continent level. AERC, which has a co-ordinated effort on Ph.D.s in Africa, could be one of the partners to develop this study alongside ADB and ECA to achieve in the short –term an IT application to education at the first stage at regional level.

37. The regional level would be more efficient since the Tertiary Education system cuts across linguistic lines –Anglophone and Francophone-thus it would be less costly to research into institutions, which have a common historical background. Secondly there should be, and this is another area of research, a study on the harmonisation of degree programs in Africa, not choosing a blueprint for all but again using IT to achieve knowledge inputs,

managerial efficient techniques alongside labour manpower planning techniques to arrive at some form of common ground. This will help in the transferability of degrees across the African regions because of the legal standing of a recognised degree. This is of utmost importance if the idea of African Unity is also to be based on the free movement of people/labour.

38. Another area of research that could be developed is the co-ordination of post-graduate courses at sub-regional and/or regional levels. Post-graduate courses are very costly and as can be seen from Table 3, most universities have individual programs. This possibly decreases the fixed cost element by having a number of research institutes of international standards established at regional level whose task would be to produce highly skilled personnel. This would fit into the Tertiary Education system as such as well as network into the production of Research and Development in Africa.