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A Pilot Project to Reverse Brain Drain to Brain Gain in Africa

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Abstract: In some African states, economic and social conditions have led young Africans to flee their home countries to seek higher-quality education, well-paid jobs and more promising careers, and better living conditions abroad. Recent studies suggest that more highly skilled Africans reside and work abroad than in Africa itself. The need to reverse the brain drain into a brain gain for Africa has been reaffirmed in the New Partnership for Africa's Development Framework and Action Plan. Within its mandate to promote mobility of students and academics and international cooperation, UNESCO has launched the UNESCO-HP partnership in some African countries where loss of highly skilled Africans constitutes a major impediment to sustainable development. The partnership will reinforce national capacities by developing linkages and networks among experts working abroad, and their peers and students at home, and by promoting mobility schemes so as to allow departed experts to return to their country of origin for short teaching or fellowship periods. This project builds on the successful experience of a first UNESCO-HP initiative launched in March, 2003, in South East Europe. This paper describes the practical approach to be taken in the UNESCO-HP collaboration.

Keywords: brain drain, brain gain, mobility, Diaspora, virtual organization, information technology, resource sharing, grid.

1. Introduction and Background

Brain drain is widely recognized as a major impediment to development in Africa. Consider, for example, the following introduction to the Migration for Development in Africa (MIDA) program of the International Organization for Migration (IOM):

"Many parts of the African continent are currently affected by a shortage of qualified human resources. Large-scale departures of executives and university graduates have contributed to this shortage.

Thousands of African professionals such as medical doctors, nurses, accountants, engineers, managers, teachers, etc. leave Africa each year. The main reason for their departure has been to improve their living conditions, either by pursuing studies or by seeking better-paying jobs. Others depart fleeing from insecurity and/or unstable political and socio-economic conditions.

The resulting brain drain heightens the dependency of African economies by compelling them to resort to costly foreign expertise in many areas, which in turn creates a widening vicious circle." [1]

The need to address this issue has been clearly recognized for many years, as evidenced, for example, by the report of the regional conference on brain drain and capacity building in Africa of the UN Economic and Social Council's Economic Commission for Africa, held in Addis Ababa, Ethiopia, in February, 2000 [2]. Agreement on the fundamental underlying approach to address the problem has been reemphasized in the

document describing a global strategy of migration for development for the years 2006-2010 published by the IOM in June, 2006 [3].

Several national and international organizations have been created that address brain drain and development both within Africa [4] and elsewhere [5, 6]. Fundamental principles behind efforts to ameliorate the brain drain problem and address capacity building have been enunciated at the recent NEPAD workshop in Johannesburg, South Africa, in November, 2006 [7, 8].

The fundamental underlying assumption behind this proposal is that advances in science and technology lead to economic progress. Recent support for the validity of this assumption has been presented in an editorial (p.13) and article (pp. 75-76) in The Economist [9] on African science. As R. K. Pachauri, director general of The Energy and Resource Institute in New Delhi, India has argued in a recent editorial in Science [10], "The challenge of widespread worldwide poverty has typically been addressed through doles and handouts as convenient but largely ineffective palliatives. Seldom have programs in this area created avenues for applying modern science and technology to develop local skills and capacity, which alone can generate income and employment on a sustainable basis."

2. Purpose and Scope

The purpose of this paper is to present a proposal to prototype what is believed to be a novel approach to use modern information and communications technology to help develop local skills and capacity. The approach is to provide opportunities for ambitious, intelligent young people, and highly skilled ex-patriots to develop and exercise their skills in their home institutions through the use of information and communications technologies. An important aspect of the proposal made here is the use of high-speed networks, where available, to enable international collaboration, including with the European Commmunity, and sharing of resources.

While modest in light of a problem the magnitude of a continent, and restricted to a few countries and institutions, the method proposed has the advantage of being based on successful experience, albeit in a different part of the world, down-to-earth and practical.

The scope of the present paper is deliberately limited. This paper is not, and is not intended to be a scholarly article on the exceedingly complex and controversial issue of brain drain and brain gain. Consistently with the purpose and scope so stated, web-based references have been used for the most part, as these are readily accessible to interested readers who may not have access to scholarly libraries. The references are intended to be representative only, and are far from complete. A great deal of material on brain drain/gain can be found on the Science and Development Network (www.scidev.net), which encourages exchange and debate on the topics covered here.

3. Methodology

The approach is to donate information technology and limited operational funding to selected institutions in a few countries. The beneficiary institutions will be chosen on the basis of the strength of proposals as to how the donated IT equipment and funds will be used to address the objectives of the project described in section 5, below.

Criteria under consideration to assess the strength of proposals include the following

- strength of research in the institution and department
- availability of appropriately skilled personnel to lead participation in the project
- interest in collaboration
- status of IT in the institution; ability to deploy and operate the equipment granted
- clear plans to meet project objectives with measurable milestones
- governance to ensure that funds are well spent

- evidence of desire to retain and support young researchers
- availability of young researchers with interest in using the donated equipment

Young people need role models, and mentoring. It is not possible, or desirable, to eliminate entirely the possibility for young people to travel and be physically present at overseas institutions. One may, however, reduce this requirement and mitigate the need.

What must be done is to identify individuals in the African Diaspora who are willing to mentor and encourage young scientists and engineers in Africa. Means for exchange will be provided, both in terms of visits to home institutions in Africa, and through provision of modern information technology equipment to be installed at beneficiary institutions. Beneficiaries under this partnership will be enabled and encouraged to join research and development collaborations using the donated equipment, among themselves, in Africa, and beyond. For example, research and development funding under the 7th Framework Programme of the European Community 2007-2013 [11] will be available to support collaborations that include participants from Africa.

4. Technology Description

The joint UNESCO – HP program will take advantage of a major evolution in the way science and engineering are done in the modern world. Scientific research has, to a very significant degree, become a team sport. Consider the following example: in 2005, part of an artificial satellite was steered into collision with the comet 9P/Tempel 1. Scientific instruments on the mother satellite and at observatories around the world observed the debris ejected from the comet by the collision, and enabled the determination of the chemical and mineral composition of the comet. The report on the earth-based campaign published in the renowned journal Science had 209 authors from 84 institutions [12].

What can be learned from the remarkable collaboration on this experiment? The scientific work was done by a world-wide distributed community, many of whose members have never actually met each other, using shared tools and resources including instruments, communication networks, and computers. The community of people who performed this work formed a virtual organization, and they pooled and shared tools and resources, including their own skills and knowledge, to achieve a common objective.

The international scientific community has recognized the need for a persistent infrastructure to support such collaborations among geographically distributed virtual organizations. This infrastructure is called the grid [13]. Grid middleware makes it possible to register available resources, to discover such resources, to authenticate a user requesting access to resources, and verify such a user is in fact authorized to access them; to schedule work using the resources, and to move data around in networks as needed.

Grid infrastructure enables science to be done anywhere, any time, by anyone. Local scientific infrastructure does not need to be adequate to the whole task; it is sufficient to be able to connect to the Internet, become a member of the appropriate virtual organization. Access to possibly rare and expensive equipment is then shared through the virtual organization using the grid infrastructure. This UNESCO-HP project is intended to help foster the creation of such a grid for Africa. Of course, this is a huge task. And there are critical parts that, with the best will in the world, are far outside the scope of this project. Networking is fundamental to the creation of an Africa grid - high performance networks linking participating African institutions, and connecting Africa to Europe and the rest of the world are essential. What HP can do is provide the IT part of ICT (Information and Communications Technology), and HP can provide some means to use the IT effectively. The C part, the networking, has to be assured by the participating African states.

Various initiatives are underway to provide high-speed networking capabilities in Africa, including, for example, a new undersea fibre optic cable along the east coast of Africa [14, 15, 16]. At the time of writing, none of these initiatives appears to have reached

the stage of practical implementation. An article summarizing the various high-speed networking initiatives for Africa appeared in the South African Financial Mail on January 19, 2007 [17].

5. Previous Experience

To illustrate what can be achieved with a grid infrastructure, consider what has been accomplished in a previous UNESCO – HP project, "Piloting solutions for alleviating brain drain in South East Europe".

In April 2005, the participating institutions met with representatives of UNESCO's Regional Office for Science and Technology in Europe (ROSTE) and HP in Ohrid, FYR of Macedonia, for a workshop to review what had been accomplished in the project during the previous year. At that workshop, HP recommended creating a grid infrastructure in the western Balkans to link the participating institutions, and share their resources to collaborate on projects of common interest. This suggestion met enthusiastic agreement. HP subsequently sponsored attendance by a number of researchers at the grid summer school that year in Budapest, Hungary. And in September 2005, HP and UNESCO-ROSTE organized a workshop graciously hosted by CERN in Geneva on "Grid - the Key to Scientific Collaboration".

At this workshop, participating institutions were introduced to representatives of the South East European Grid (SEE Grid) project, a part of the EU-funded Enable Grids for E-SciencE (EGEE) project [18], as well as to the director of the EGEE, and representatives of the European Commission. Following these, several beneficiary institutions have joined the SEE Grid, and have proposed research projects for funding by the EU under its Framework Programme. In at least one case, a leading researcher who had left the western Balkans has returned to his previous home institution.

For the African project, HP will donate state-of-the-art IT equipment and some operational funding. HP will broker contacts with other organizations that can help, as we have done with the EC through the participation of Mr. Bernhard Fabianek, European Commission Information Society and Media Directorate-General Research Infrastructure, in the launch meeting for this project at UNESCO in Paris on November 20, 2006. Opportunities for workshops and training to transfer skills to participating beneficiary institutions will be sought and exploited.

6. Project Objectives

Our hope is that the IT equipment and funding will be used to connect to networked resources in Africa and beyond; to enable the formation of virtual organizations and effective R&D collaborations independently of the geographical location; to facilitate exchange, mentoring, and collaboration with the African Diaspora; to create an infrastructure for highly skilled people to address high priority local issues; and thereby complement existing efforts to stem the loss of skilled manpower from participating African countries.

Concrete objectives of the project include the creation of web sites and establishment of human networks for information and knowledge sharing; the initiation of joint projects and exchange programs; the strengthening of ties between students and researchers at home with the Diaspora; and reinforcement of teaching and research capacities.

The grid infrastructure should enable easy, open access to distributed resources; deliver high quality user services; enable the identification and training of application groups; provide sound security tools and practices; and encourage education on grid technology in university curricula.

7. Conclusions

The project described here will be just beginning at the time of IST-Africa 2007. This paper will serve as the basis for a workshop proposed for IST-Africa 2007, to which the beneficiary institutions under the project and other interested parties will be invited, and initial discussions on concrete implementation steps will be held. It is hoped that initial steps for implementation will take place this summer, and the project will run initially for one year, although we hope to be able to continue beyond a year.

Among the expected results, we would like to see a database of the scientific and engineering Diaspora created for each beneficiary institution, contact taken up with at least one ex-patriot and a visit to the institution at least planned, and at least one student of the institution beginning a scientific project that makes uses of the donated infrastructure. We hope for measurable empirical significance, but experience with the previous project is that consequences are unlikely to be measurable in the first or even second year. Perhaps the most important measure of success would be that the overall infrastructure becomes sustainable over the longer term, and that additional institutions join the project.

We conclude with a few words on sustainability. The infrastructure proposed to be created here will be of little value if it is dismantled at the end of this project. In order to attract additional and ongoing funding to guarantee a truly persistent infrastructure in the form of a grid for Africa, it is essential that the project build strong partnerships; establish an extensive user base; and achieve measurable results on high priority local projects.

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