

Virtual Engineering Libraries and the Millennium Goals

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Abstract. Virtual Engineering Libraries can provide a low cost means of transmitting knowledge to those in needs. The establishment of a Virtual Library at the University of Khartoum is described. It provides a substantial flow of information to its users. The African Virtual Library is taking new directions with emphasis on teacher training. The prospective use of Virtual Engineering Libraries in pursuit of the Millennium Goals is substantial, provided that appropriate material can be made available. Its availability, and an increasing commitment to open access, should ensure successful outcomes. Distribution by CD will allow material to be provided at village level.

Keywords: Virtual Libraries Millennium Goals

Bridging the Great Divide

David Thom and Peter Greenwood delivered a paper in Tunis to the 2003 World Congress on the Digital Divide. It was called "Bridging the Great Divide", and discussed the possibility of using Virtual Libraries to assist developing countries.¹ The possibility was strengthened by the presence in Tunis of Dr Maaly of the University of Khartoum, who hoped to establish a Virtual Engineering Library in her University. UNESCO agreed to lend support to the proposal and Australia, which has a Virtual Engineering Library at Avel.edu.au, was asked to provide assistance.

The project was supported by UNESCO in partnership with the Australasian Virtual Engineering Library (AVEL-SKN), World Federation of Engineering Organisations (WFEO), the Sustainable Alternatives Network (SANet) and the Foundation Ecole d'Ingenieurs (EPF) through the International Institute of Women in Engineering (IIWE). A preparatory meeting was held in Tunis in October 2003 with representatives from U of K, Engineers Australia, UNESCO (Paris) and IPENZ (New Zealand). It was agreed that a representative of AVEL-SKN be nominated to take part in a workshop to develop a strategy for delivery of the prototype, and further development of the project in the Sudan. UNESCO would provide financial support

The Sudan Virtual Library

Mr Karlson (Charlie)Hargroves was nominated to attend the workshop. He holds a B.E. Civil Engineering from the University of Adelaide, and has experience in researching best practice in engineering and sustainable development. He made a five day visit to Khartoum. The main outcomes of the visit were:-

- the selection, in close consultation with the University of Khartoum Digital Library Committee, of a preferred combination of database, interface and server software to deliver the project,
- the development of a strategy to build content in the database through both internal and National sources together with the identification of core international material,
- successful meetings with representatives of relevant National stakeholders such as the Ministry of

Science and Technology, Sudan Engineers Union (WFEO member), Sudan Engineering Society and stakeholders within the University such as the Dean of the Engineering Faculty.

- the development of a strategy to build ongoing relationships with international networks and organisations to support the virtual library, and
- advice on options for the digitisation of existing hard copy material from current bibliographic level entries.

Further Development of the Project

The virtual library is providing information services in the field of engineering and sustainable development. It is planned to include

- a referral database of engineering institutes and organizations in Sudan,
- a referral database of Sudanese experts and faculty members in Engineering,
- Sudanese literature in engineering: research papers, thesis, dissertation, books, reports, etc.
- selected international contents in engineering for sustainable development.

It is expected that the SudVEL-SKN will increase information transparency, promote research and higher education in engineering, and assist projects in sustainable development throughout Sudan and the greater region. The University of Khartoum has made available a web server with very high specifications (speed, memory, storage, operating system.) and a reliable connection to the Internet. In addition, two work stations for data entry and software development have been set-up.

SudVEL-SKN will be considered a success when the interface provides access to a range of high quality authenticated data from the University and the world. The database will be a resource to support research and education in the Faculties of Engineering in Sudanese universities, and throughout the region and internationally. The initial activities in establishing the library included digitizing the theses and dissertations of the post-graduate studies in the University and working in partnership with Sudanese national engineering bodies to digitize their publications. Action was also taken to identify overseas

resources that could be added to the library, and lecture material provided by the Massachusetts Institute of Technology was a major addition. There remains a problem in that there is a need to keep abreast of developments in engineering, and the subscription charges of most engineering journals puts them beyond the limited foreign exchange budget of the Sudan University. Action is being taken to determine whether engineering institutions could provide their journals at lesser cost, and whether they could be provided as a part of international aid programs.

Current Status of Sudan Virtual Library.

There is strong support for the library. It has been aided considerably by the MIT material made available. It is to be expected that the librarians in charge of hard copy references are showing some reluctance to provide copies of their references to facilitate transfer to a virtual library. However the availability of the virtual library will be seen in due course as a valuable asset complemented by hard copy collections.² Future tasks for the library will include standards, linkages to all Sudanese engineering publications, interoperability with other Sudanese and regional libraries, and international activities including linkages with France.

It is of particular note that the Sudan Virtual Library is providing access to local as well as international knowledge, and is not solely reliant on overseas material which may not always be appropriate. It might also be necessary to develop a chat/ideas exchange area for the free exchange of practical knowledge.

We believe that this development provides a useful model. It was assisted by the availability of a relatively modest level of funding that was promptly made available. It was applied to an identified need by an effective group of people that were quickly mobilized and who met face-to-face at the outset to determine the goals and implement them promptly. Subsequent communication was conducted electronically as the task progressed.

The Millennium Development Goals

The Millennium Development Goals are a compact among nations to end human poverty. The Millennium Declaration was adopted by 189 nations in September 2000. Many countries are trapped in poverty and it is necessary to

- invest in human development to create a productive labour force,
- help small farmers increase productivity,
- invest in infrastructure, power, roads, and communications,
- establish small and medium size enterprises,
- promote human rights and social equity, and
- promote environmental sustainability.

There are quite a lot of engineering activities in the necessities I have listed.

The President of WFEO, Dato Lee Yee Cheong, is Co-chair of Millenium Goals Task Force 10. The Task Force

has to work out ways of meeting the goals, and has recently released a progress report. Its Executive Secretary is young Australian Engineer James Moody. There has been a recent decision by the United Nations that four African countries, Kenya, Senegal, Ghana, and Ethiopia, and Cambodia in SE Asia, be identified as countries that will be the test vehicles for Millenium Goals development. Of these countries only Kenya and Ghana have engineering institutions that belong to WFEO. It is considered highly desirable that each of these countries have an engineering institution that can consider how the engineering aspects of the millenium goals can best be achieved. Assistance should be provided to the Universities or Institutes of Technology to get some local engineering institution established. The Francophone countries of Senegal and Cambodia might obtain some assistance from France.

The African Virtual University (AVU) .

The World Bank established the African Virtual University in 1997, beginning in Ghana with three Universities and offering courses in Maths, Physics, Chemistry and Computer Science. Other African countries that were to participate were Ethiopia, Kenya, Uganda, Tanzania and Zimbabwe. The AVU initial contribution was regarded by many as unduly expensive, and a new approach is now being developed with particular emphasis being placed on teacher education and training to help in achieving millenium goals. Information and communication technologies must be harnessed to support achievement of these goals at an affordable cost.

The AVU is now an independent Inter-governmental organization based in Nairobi, with over 34 learning centres in 17 African countries. It attracted some criticism in its early days as a high cost operation, but is now committed to providing quality information at affordable rates. Its initial focus is in Science, Engineering and Technology, teacher training and health education. It provides its material in French or English. In a recent Learning Center Managers meeting, particular emphasis was placed on acquiring broad area bandwidth connectivity. One of its priority tasks is the development of an African Digital Library.³

Digital technologies are known for their potential in knowledge dissemination, effective learning and the delivery of efficient education services. This potential will not be realized unless these technologies are used extensively in training of teachers. Development of these technologies and their decreasing costs are expected to have major implications for learning. Approaches are planned to bridge the digital divide, increase access, improve quality and reduce inequity. The AVU is working with several Australian Universities. The Royal Melbourne Institute of Technology is providing courses in computer science and Curtin University is providing courses in Business. The New Jersey Institute of Technology is involved and the University of Laval in Quebec is supporting francophone studies. The Australian and Canadian governments have lent these projects their support.

Virtual Engineering Libraries and the Millennium Goals

Virtual Engineering Libraries should provide a useful resource to countries that are pursuing the Millennium Goals. There will need to be major programmes in developing countries to pursue such aims as improving the supply of safe drinking water, and making agriculture more productive. These programmes would be assisted if a substantial proportion of the population, and those involved in engineering and various applications of technology, are made aware of necessary steps to carry out the changes. Compact disks loaded with appropriate information could support teaching programmes in schools, technical colleges, and engineering faculties. The national engineering institutions of the developing countries should be involved in establishing appropriate programmes. There will be a need to have substantial education programmes at the village level, with young and old, male and female, sharing in the education task. The programmes will of course need to be in the appropriate local language.

Availability of Useful Information

The information needed in the developing countries is unlikely to be readily available. It needs to be made available in ways that make it easily utilised and understood by the target audience. This will often require that it be available at various levels and in the national language. An increasing amount of material is free to air. The campaign of Peter Suber, the Budapest Open Access Initiative, and the financial support of philanthropist George Soros, have led to an increasing number of individual researchers and of universities and research institutions making their articles available on the internet. In the engineering field the Massachusetts Institute of Technology has placed a very large proportion of its lecture material on line, and has made it freely available to Virtual Libraries.

UNESCO has recently published the Encyclopedia of Life Support Systems which is progressively publishing some sixteen encyclopedias. As of June of this year six encyclopedias are published, with an emphasis on development. Wikipedia sets out to provide an open source encyclopedia. Its articles are freely contributed and many are available in a range of languages. Wikipedia is free content, meaning that it may be freely used, freely edited, and is free to copy and redistribute. Nearly all of these information sources are aimed at university student level or higher, and special arrangements will need to be made to have material suitable for village level consumption, which will usually need to be in a local language. The most suitable medium for this sort of information is a compact disk which can be played and replayed until the messages are understood.

Budapest Open Access

In March 2001 Professor Peter Suber started writing the Free Online Scholarship Newsletter, which covers the movement to publish scientific and scholarly literature on the Internet and make it available to readers free of charge. Suber is also one of the drafters of the Budapest Open

Access Initiative. It arose from a meeting convened in Budapest by the Open Society Institute (OSI) in December 2001. The purpose of the meeting was to accelerate progress in the international effort to make research articles in all academic fields freely available on the internet. The participants represented many points of view, many academic disciplines, and many nations, and had experience with many of the ongoing initiatives that make up the open access movement. In Budapest they explored how the separate initiatives could work together to achieve broader, deeper, and faster success. They explored the most effective and affordable strategies for serving the interests of research, researchers, and the institutions and societies that support research. Finally, they explored how OSI and other foundations could use their resources most productively to aid the transition to open access and to make open-access publishing economically self-sustaining. The result is the Budapest Open Access Initiative. It is at once a statement of principle, a statement of strategy and a statement of commitment. The initiative has been signed by the Budapest participants and a growing number of individuals and organizations from around the world who represent researchers, universities, laboratories, libraries, foundations, journals, publishers, learned societies, and kindred open-access initiatives. It has been endorsed by the Vice-Chancellors of eight of Australia's leading Universities.

The philanthropist George Soros, has been active as a philanthropist since 1979, when he began providing funds to help black students attend the University of Cape Town. Today he is chairman of the Open Society Institute (OSI) and the founder of a network of philanthropic organizations that are active in more than 50 countries. Based primarily in Central and Eastern Europe and the former Soviet Union—but also in Africa, Latin America, Asia, and the United States—these foundations are dedicated to building and maintaining the infrastructure and institutions of an open society. They work closely with OSI to develop and implement a range of programs focusing on civil society, education, media, public health, and human rights as well as social, legal, and economic reform. In recent years, OSI and the Soros Foundations Network have spent more than \$400 million annually, to support projects in these and other focus areas.

Notes on Availability of Material.

There will be a need to obtain access to a wide range of material relating to the development tasks. If we focus first on the need for potable water there will need to be material, suited to the particular country concerned, that describes how best to develop and protect primary water storage areas, and how to transport the water from storage to users, and how to develop storage and reticulation facilities in populated areas, and how to make tanks and pipes, and maintain a watch on water purity and safe drinking. Where there are needs for planning a new approach to agriculture, there will be requirements to provide guidance on ways of managing the agricultural land and of establishing safeguards that will assist in overcoming the vagaries of floods and drought. Where new roads and railways are needed, and improved

communications, there should be information on how best to provide them and particularly how best to maintain them. It needs to cover the spectrum from design, to construction to operation and maintenance.

The necessary information is probably available within the engineering profession, and in universities and technical colleges, but its availability seems to be restricted. It will probably often be necessary for the programme of implementation of the Millennium Goals, to specifically produce a range of references describing the processes needed, and make them available to the virtual libraries to disseminate. The range desirable would extend from papers suitable for use in primary schools, to secondary schools, technical schools, land-owners and so on. Some expertise is required to identify, procure, or develop the information that should be provided to the developing country and its peoples. One useful step would be encourage engineering institutions to have conferences that address the problems, and allow the papers presented to be available. The national engineering institution should be closely involved in the overall national approach adopted, and should also be involved in dissemination to technical schools and to engineering schools in Universities.

Communication and Learning and the African National University.

The African National University, and its current focus on teachers, is an important component of the dissemination of information. High schools and technical colleges will need to be well served. It should be possible to have technical colleges produce guidance to villagers in their own languages which can be passed to local schools by compact disk. The African National University planners have spoken of the need to develop broad area bandwidth connectivity, but there should be no reason why compact disks and a computer in the school cannot serve to get the information to those in need.

A few years ago Thailand's Mechai Viravaidya visited Australia and discussed TBIRD or Thai Business Initiative in Rural Development. He advised that small to medium-scale manufacturing typically located in Bangkok could operate in rural settings and fuel local economic growth. Shoe factories were doing well in a number of rural locations. Most beneficiaries are women and comprise 70% of the work force. Cottage industries and vegetable banks also increase welfare substantially. Similar approaches could well be useful in achieving Millennium Goals.

The Way Forward

We believe that a combination of support for the Millennium Goals, national commitments to development programs, increased emphasis on education for all, aid to developing nation teachers, and the ability to transfer the methods of development to all involved, will be of great assistance in improving the lot of the poorer nations. We believe this will be aided by co-operative programmes between developed and developing countries, and by the use of virtual libraries. There will remain a substantial task to translate the work of the development planners into a national commitment. We believe this will be aided in the

engineering projects by partnerships between developed country engineering institutions and developing country engineering institutions. Agricultural engineering assistance will have a major role to play.

Engineering has a major role to play in pursuit of the Millennium Goals. It would be appropriate for the World Federation of Engineering Organisations, chaired by Dato Lee Yee Cheong, to consider establishing a Millennium Goals Task Force that would help guide the engineering support needed at international and national levels. A high priority would be the establishment of a national engineering organization where none currently exists. A complementary activity would be to establish a national engineering and technology plan to implement the Millennium Goals, and provide a basis for interaction between the national engineers and the national government. An important part of the national engineering and technology plan would be the production of plans for the production and maintenance of the new engineering (including agricultural engineering) requirements implicit in the Millennium Goals.

Most of us are from countries that have enthusiastically supported the Millennium Goals. There can be few better things to support in this world of ours. It will not be an easy task to achieve the Millennium Goals but it is a task well worth doing.

References

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2. The Sudan Virtual Engineering Library is available at <http://www.sudvel-uofk.net>
3. Recent discussions on the directions of the African Virtual University are at <http://www.avu.org/display.cfm>