

Strengthening African Capacity in Nuclear Science and Technology through ICT based Training

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Introduction

The major thrust of the International Atomic Energy Agency's (IAEA) technology transfer programmes towards developing countries is to promote the application of useful nuclear technologies in key areas of national significance to meet priority development needs with special emphasis on food security, human health, water resource management and nuclear instrumentation. In this context, the development of sufficiently qualified human resources is being given the highest priority and special modalities suitable to African countries' environment need to be worked out. The conventional form of educational/training through fellowships or group training suffers a number of drawbacks. On the other hand, the tremendous developments that have taken place in information and communication technologies over the last few years, is having a profound impact on all sectors of the society. As a result, new learning methods, formats and resources are being developed. Among these, ICTs offer mass customization as technology allows individual differences in the goals, learning styles and abilities of the trainees to be accommodated while providing immediate feedback on progress made and results achieved, thus enhancing productivity and positively impacting national development needs and programmes.

Towards this end, the IAEA through the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) funded a regional project on ICT-based training/educational material that focus on a number of key nuclear technologies believed to be necessary for meeting priority development needs.

The Project started in January 2003 with 15 African countries participating, Nigeria joined in 2005 with the Nigeria Atomic Energy Commission (NAEC) as the counterpart institution. By the end of the project in December 2007 there were 22 Countries participating.

Presented here are the Project objectives; Strategy and implementation arrangement; Project organization, co-ordination and reporting procedure; End project situation and Conclusion.

2 Objectives

2.1 Development objective:

The overall objective is to establish a sustainable national capability in using potential Information Communication Technologies economically for training and education in the field of nuclear science and technology, relating to agriculture, human health, environmental monitoring, water resource management, nuclear instrumentation and other nuclear and related fields.

2.2 Immediate objectives:

- I) to perform the conceptual design of all project requirements, objectives and content, including detailed workplan and implementation strategy.

- II) to acquire and/or develop and evaluate ICT learning/training materials in selected nuclear fields tailored to priority needs of participating countries which can be delivered economically.
- III) to identify suitable counterpart institutions in participating countries, to upgrade their infrastructure up to the level of suitable training tele-centres in specific nuclear fields and to influence their empowerment by the national competent authority
- IV) to help participating countries to select suitable national personnel for training as trainers in various nuclear fields and to support their training through the organization of regional and national workshops.

2.3 Target beneficiaries

At the level of this project, the direct beneficiaries are counterpart institutions (in this case the Nigeria Atomic Energy Commission), which host the various ICT-based training programmes including the physical facilities.

The end-users are professionals and technicians at the various research centres who will be trained using the established ICT-assisted training programmes.

3 Project Strategy and Implementation Arrangements

The project was implemented in 3 complementary and interrelated phases:

- Initial planning phase (duration of 6 months);
- Experimental pilot phase which lasted about 30 months from the completion of phase 1; and
- Full-scale implementation phase, which start upon the successful implementation of the second phase for a duration of two years.

A brief description of the specific objectives of each phase, the activities carried out and results obtained is provided herein.

3.1 The Initial Strategic Planning Phase:

This phase is intended to identify and establish a number of essential parameters of importance to the project as a whole and integral to the appropriate design and formulation of the second phase. These are:

- (i) Definition of priority development areas of potential interest to be addressed by the project, in the case of Nigeria, human health, food security, and nuclear instrumentation.
- (ii) The nuclear technologies/techniques used in the proposed development areas.
- (iii) Identify end-user institutions where the project could be effectively launched on a pilot scale.
- (iv) Assessment of ICT assets and capabilities, together with required human and physical resources.
- (v) The setting up of project management and organization; National Steering Committee with membership drawn from relevant national institutions, Appointment of Project Coordinator and Project Management Team by the counterpart institution (NAEC), and nominations of Thematic Coordinator by end-user institutions.

3.2 The Pilot Experimental Phase:

This phase focused on conducting selected activities to prepare the beneficiary institutions for the application of ICT-based learning/training modules in the selected area(s) of nuclear science and technology. Assessed the potential for the full-scale implementation phase, built the required capacities, and created a favorable environment for securing success.

The major building blocks comprising this phase include:

- I. Human resources development; including training of trainers and sensitization of decision-makers and competent authorities.
- II. Learning/training content development and/or acquisition.
- III. Identification, upgrading and enabling of training tele-centers.
- IV. Evaluation and assessment.

3.2.1 Human Resources development

A key element for the potential success of this initiative is the creation of a national cadre, which is capable of effectively using the selected nuclear technologies/techniques in successfully meeting the targeted priority development needs. As such, the project features a number of capacity building measures whose emphasis and scope are carefully designed and selected to systematically achieve this goal. These measures may be summarized as follows:

- Training workshops;
- Fellowships, where necessary;
- Advisory assistance through expert missions and exchange of national consultants.

a) Training Workshops: Eight training workshops were held to address the different elements comprising the problem at hand. These include training on: basic ICT skills; the selected nuclear technologies/techniques; and the applications of these technologies to the solution of development problem at hand. A total of 147 personnel drawn from the participating countries were trained.

b) Fellowships:

A number of fellowships were offered during the project to provide potential trainers and local supervisors with an exposure to existing training/learning tele-centers.

c) Advisory Missions:

These were offered on demand to assist participating countries in detailed planning, building model central tele-centres, fund-raising, effectively using ICT-enhanced training/learning material and upgrading of infrastructural necessities. There were three of such missions during the project.

3.2.2 Content Development

This block aims at (i) identifying/developing appropriate technical materials in traditional form on the specific nuclear technologies/techniques of interest and its applications to the selected priority development area(s); (ii) converting this material into ICT-enhanced content and creating useful and relevant applications.

ICT-enhancement of the training/learning material proceeded along three levels of varying complexity, which were conveniently chosen for optimal implementation and cost-effectiveness. Level A involves the use of existing resources and ICT-enhanced material, while Level B introduces some modifications/adaptations to existing ICT-based material for local environment, technology, or problem area. Level C relies on complete authoring and production in fields where no suitable ICT-based material is available. The relative utilization of these three levels during the pilot phase of the project was estimated at 60, 30 and 10 percent respectively. The selected materials were developed in a variety of forms depending on the selected mode of delivery (e.g., CD-ROMs, web-based, etc.).

Great deals of the traditional content were already developed and available, others were developed through Task Force constituted during the course of the project.

Subject area covered include Nuclear Analytical Technique, Nuclear Instrumentation, Radiotherapy, Pest Control, Artificial Insemination, Animal Disease Surveillance and Maintenance of medical and scientific equipment.

3.2.3 Training Tele-Centers

The ICT-based training/learning materials mentioned above is intended for deployment in African countries where the necessary ICT infrastructure might not be readily available. Therefore, effort through the project resources was devoted to setting up/upgrading training tele-centre furnished with the necessary hardware and software facilities and equipped with the telecommunication means selected for delivery and dissemination of the ICT-based training/learning material.

Currently there are 12 operational telecentres, five countries including Nigeria have received equipment and are ready for installation while the remaining five countries are still in the initial planning stage.

3.3 The Full-Scale Implementation Phase:

This is the phase where all the inputs from the concerned Member States, project partners involving donor countries and development organizations, are merged into a real testing phase where the ICT-enhanced learning/training material is deployed/delivered by the trained personnel in technologically equipped tele-centres and effectively utilised towards meeting the established national priority development needs. So far Tunisia, Egypt, Zambia, Algeria and Morocco have attained this phase.

4 Project Organization, Co-Ordination and Reporting Procedure

The project was organized and implemented according to the established principles and rules governing the provision of technical assistance by the IAEA to developing Member States and in conformity with AFRA and donor requirements for development projects.

The overall management of the project was the responsibility of the AFRA Field Management Committee (AFRA-FMC) and Africa Section, Department of Technical Co-operation of IAEA. Technical backstopping was provided by the IAEA Technical Divisions concerned as well as regional and international experts particularly from donor countries and organisations; as well as partners.

The whole project was continuously monitored technically by the AFRA-FMC, the National Project Coordinators as well as representatives of the donors, partners and, where necessary, invited consultants

Each participating country nominated their National Project Co-coordinator and Thematic Coordinators for each thematic area, constituted a National Steering Committee and Project Management Team.

4.1 National Project Coordinator (NPC)

The NPC co-coordinated all activities which are necessary for the implementation of the programme activities in co-operation with Ministries and other national bodies and institutions, and ensured that each activity receives the local support necessary for its smooth implementation in accordance with the programme workplan.

4.2 Thematic Coordinator

Thematic Coordinators are scientists with broad experience in their thematic area and knowledge in the utilization of ICT tools, nominated by their institutions. They interfaced through the NPC between the Agency and all national institutions interested in the objectives of their thematic area, and ensure that the project's benefits and assistance are timely channelled to all national

institutions participating in their thematic area and to report any difficulty/obstacle that may hamper this process.

4.3 Regional Thematic Coordinator

Regional Thematic Coordinators are nominated from and by the PCs at the first coordination meeting. They liaise with the national project coordinators at regional level on their specific thematic area, to gather, centralise and distribute information related to his/her thematic area and to advise on and facilitate the implementation of the activities in thematic areas

4.4 Project Co-ordination Meetings

Project Co-ordination Meetings were held every two years to review the project progress, plan future activities and report on achievements at national and regional level. The first Coordination Meeting was held in January 2003 at the commencement of the Project, A midterm review meeting was held in 2005 and the final coordination meeting was held in December 2007.

5 End of project situation

At the end of this project, the technical feasibility and economic viability of the selected ICT-assisted training/learning programmes in all fields of nuclear techniques will be understood, documented and illustrated. In particular,

- The availability of ICTs training materials in the selected fields has been ascertained and costs estimated.
- A number of ICT-based training/learning module in each selected nuclear field have been developed tested and released for use in Member States.
- A number of operational ICT Tele-centres are in place, together with adequate trained personnel to run and supervise training programmes in some selected nuclear field;
- There is increased awareness of decision-makers, trainers as well as technical personnel on the potential of this tool as a sustainable and cost-effective solution for training manpower.
- Deficiencies in ICT infrastructure has been identified and where possible, rectified.
- The large-scale introduction of ICT-assisted training tools is now better comprehended and requirements for expansion defined.

6 Conclusions

There is positive impact of this project in terms of human resources and acquisition of basic infrastructure to deliver ICT based training and education in the field of nuclear science and technology, relating to agriculture, human health, environmental monitoring, water resource management, nuclear instrumentation and other nuclear related fields. Secondly there is a strong government commitment in terms resources provided by NAEC and the integration of the project into the overall information and knowledge management strategy of NAEC to support it human resources development effort.

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