ICT Development: The Experience of the Abdus Salam ICTP

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Abstract

The paper introduces the Information and Communication Technology (ICT) revolution that is changing society around the world. It mentions the limiting factors that preclude communities to use ICT and the solution represented by wireless. It gives the premise that motivated the Abdus Salam ICTP to became active in training developing countries professionals in the field of ICT and in the development of local area computer networks in academic and research organizations using wireless solutions. The paper describes briefly the activities and projects carried out by the Abdus Salam ICTP in the field.

Introduction

Computer and communications technologies, the two elements of the Information and Communication Technology (ICT) are transforming national and global societies and economies into information-driven societies and economies. Presently ICT account for more than 5 percent of the global GDP, and much more in industrialized countries.
ICT represents a revolution as important as it was the Industrial Revolution. It is already crossing national and regional boundaries creating challenges for slow-moving bureaucracies, both public and private, and changing the way we act and how we think. It is generating a change that will be difficult to manage but impossible to resist. ICT carries on high promise both in human and economic terms. Benefits could be obtained among others in: education at all levels, job training, health care, food security, environment management, and government efficiency but it is necessary to develop and adapt new systems and technologies to make a suitable use of ICT.

The technical limiting factors that often preclude communities to enter in the ICT revolution are essentially two: an outdated public telephone to support reliably adequate speed data, and the arbitrary high cost of the services. In order to beat this problem, solutions based on the most advanced techniques but with accessible costs have to be devised. Wireless, a rapidly growing technology that allows its use irrespective of the type of terrain, represents in many cases the best solution. Two impressive advantages of radio over wired systems are the abilities of the former to establish communication without the need of physical connection, and to support mobile communications. In addition wireless represents a powerful tool to leap-frog the communication technology gap between developed and developing world.

The building up of the ICT revolution poses the challenge of providing developing and emerging countries with an adequate way to be linked with the rest of the world to avoid the risk of being cut out from mainstream of information flow. Recognizing that the underlying problem is the lack of sufficient well-qualified human resources able to handle new systems and technologies, the academic community is the obvious starting point for these efforts. It can be expected that from this community know how will permeate to the rest of society.
This premise motivated the Abdus Salam ICTP to carry out intensive training activities for university professionals from developing countries and to establish a Programme of Training and System Development on Networking and Radiocommunications with the

collaboration of the United Nations University. Both wireless and computer networking have been used to help building up the ability of academic and research institutions to access ICT.

The Abdus Salam ICTP activities in ICT

The interest of the Abdus Salam ICTP in the field was already indicated ten years ago. In 1993 it signed with the Bureau of Development of Telecommunications of the International Telecommunication Union (BDT/ITU) and the International Union of Radio Science (URSI) a trilateral Memorandum of Understanding in order to collaborate towards the advancement of human resources and research and development capability in the field of telecommunication science and technology in developing countries. Already in 1989 the Centre started unilaterally a series of training activities that later received also the support of BDT/ITU and URSI. The milestones of these activities are:

1989 - 1st College on Theoretical and Experimental Radiopropagation Physics
(first of a series of biannual Colleges on the same topic).
1991-2nd College on Theoretical and Experimental Radiopropagation Physics
(with scientific and financial support from URSI).
1993-3rd College on Theoretical and Experimental Radiopropagation Physics
(first with financial support from also from ITU/BDT).
1993 to 1996- Activities cosponsored with ITU/BDT.

Since 1996, recognizing its growing importance, the activities have been oriented towards the use of wireless technologies for digital communications and computer networking.

1997- ICTP-URSI-ITU/BDT Workshop on the use of Radio for digital communications in developing countries.
1998- 1st ICTP-URSI-ITU/BDT School on the use of Radio for digital communications in developing countries (its 6th yearly edition was carried out in 2003). (Figure 1)
The web pages of the last three schools give in detail their content
(http://wireless.ictp.trieste.it/school_2001/index.html,
http://wireless.ictp.trieste.it/school_2002/index.html,
http://wireless.ictp.trieste.it/school_2003/index.html).

Figure 1: Field activities (right panel) and lectures during one of the recent Schools.

The Abdus Salam ICTP initiated in 1996 a Programme of Training and System Development on Networking and Radiocommunications that was suspended in 2000. The main objective of the Programme was to provide *technical assistance and training* to academic and research institutions in developing countries requesting help to establish small area computer networks and their connection to the Internet, either directly or through national networks.

The projects carried out under the programme have been the following:

In Africa:

1. A pilot project, aimed at the establishment of a computer network for education and research at the Obafemi Awolowo University of Ile-Ife, Nigeria. It was successfully completed by June 1996, with the use of *spread spectrum wireless technology*.

2. A project for the National Universities Network (NUNet) of the National Universities Commission of Nigeria with World Bank financial support (December 1996). Training was given in Trieste to 26 academic network managers and 16 network engineers representing 26 Nigerian Universities.

3. A Workshop on the use of Radio for Computer Networking was carried out at the University of Cape Coast, Ghana, from 31 August to 11 September 1998. It was supported also the United Nations University (UNU - Tokyo, Japan) and the University of Cape Coast (UCC - Cape Coast, Ghana), and other local organizations.

4. A follow up training activity for the National Universities Commission of Nigeria : *"Academic Networking Technology Workshop - NUNet Capacity"*. It took place in Ile-Ife and Abuja, in Nigeria, from 6 to 27 October 1997, where staff from all the 40 Nigerian Universities were trained in computer networking with the use of wireless links.

5. A project was carried out successfully at the *Bayero University in Kano, Nigeria*, in June 1997 to upgrade the local area network and to link by a spread spectrum radio link the two campus of the University placed few kilometres apart one from the other.

6 -A four-month personalized training activity was carried out at the ICTP from August to December 1997 to one representative each from two *Ghanaian Institutions*: the *University of Cape Coast* and the *Council for Scientific and Industrial Research (CSIR), Accra*.

7. A basic Training Laboratory for the Use of Radio for Computer Communications has been implemented at the University of Cape Coast with the support of the Programme. The Laboratory was first used during the Workshop described in 3 .

8. An Autumn Training Activity on Networking and Radiocommunications was held in Trieste from 14 September to 4 December 1998. It was supported also by the United Nations University (UNU - Tokyo, Japan). Participants were 14 scientists from Nigeria (7), Morocco (3), Angola (1), Senegal (1), Cote d'Ivoire (1), Romania (1).

Since 2000 the Centre has been involved in training activities and technical assistance in

the use of wireless for computer networking in Benin, Sudan and again in Nigeria.
The *S&T Collaborium* spin-off initiative was created to carry out activities by recruiting experts in ICT from well-known institutions worldwide (http://www.collaborium.org).

In Romania:

1. A pilot project for the establishment of a full Internet Connectivity between the *National Institute for Material Physics* (NIMP) located at the *Magurele Physics Platform* and the node of the *Polytechnic University of Bucharest, Romania* has been successfully carried out during July 1997. The Abdus Salam ICTP Programme provided hardware and expertise to install a spread spectrum wireless link at 2.4 GHz between NIMP in Magurele and Politechnic University in Bucharest in order to enhance the connectivity of the ICT infrastructure of the institute. The data rates was increased from 1KB/s by means of a telephonic line to 1.5 Mbps using wireless. By May 1998 four other institutes of the Magurele Physics Platform were connected using wire and wireless technology trough NIMP.

2. A *Seminar on Networking and Radiocommunication* was carried out in Bucharest, Romania, 13-17 December 1999, co-Organized with the *University of Bucharest (CREDIS)* and financed by the *World Bank.*
The collaboration of the Centre was requested again by CREDIS in 2000 and 2001 for training activities in Bucharest.

The progress of ICT in Nigeria: an example of a successful intervention of the Abdus Salam ICTP

Before 1996, no digital connection was available at the Obafemi Awolowo University, in Ile-Ife, Nigeria. The collaboration of the Abdus Salam ICTP in 1996 brought about the establishment of the University Computer network, by dial-up, with 3 subnets.
Considering the growth of the use of the campus computer network the University acquired in 1999 a VSAT symmetric connection with a 19.2 kbps with 8 subnets. In the year 2001, the bandwidth was increased to 64kbps uplink and 128kbps downlink, asymmetric connection. In 2002, 7 new subnets were added with 128kbps uplink, 512kbps downlink and many Cybercafes were established in the University campus.
The Obafemi Awolowo University in Ile-Ife became a reference point with in the field of ICT in Nigeria. As a result of this fact, the government appointed the Pioneer Director of the Information Technology and Communications Unit of the University, Prof. G.O. Ajayi, as Director of the National Information Technology Development Agency of Nigeria established in 2002.