



CHAPTER 2

AFRICA

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The story of schoolnets in Africa is the tale of a pioneering, innovative attempt to apply new information and communications technologies (ICTs) to resource-poor environments as a means of enhancing development in general, and education access, efficiency and quality in particular.

At the heart of the schoolnet process lies a fundamental transformation in the way learning and teaching takes place. Whilst some schoolnets, like the Western Cape Schools' Network (WCSN) in South Africa, can date their activities as far back as 1993, many took root in Africa in the late 1990s, essentially as a movement towards promoting community access to ICTs. Today it is estimated that more than 30 African countries are engaged in a school networking process and together they operate as a pan-African network of networks (see www.schoolnetafrika.net).

SCHOOLNETS IN AFRICA

“Schoolnet” is a catch-all phrase describing organisations and groups, both formal and informal, involved in promoting education through the use of new ICTs such as computer networks, e-mail and the Internet in African schools. Lately the word “e-schools” has also been adopted to refer to the same phenomenon: a network of schools that collaborate on the basis of a technical and electronic infrastructure. Such a technical network facilitates the development of a stronger collaborative social network among learners, teachers and sometimes non-school community members who use the technologies for learning experiences at local, regional and global levels. It also involves interschool collaborative projects at all levels to train teachers in the educational use of ICTs and content and curriculum development on ICT platforms. Table 2.1 describes schoolnets in Africa by their structure, services and sustainability (see www.schoolnetafrika.net).

This definition of a schoolnet is corroborated by recent research (Addo et al. 2003), which describes activities in which schoolnets in Africa are engaged:

- Teacher training in educational use of computers: 22 per cent
- Computer distribution and connectivity: 21 per cent
- Supporting policy on ICTs in education: 19 per cent

Table 2.1: Schoolnets in Africa

Structure	Services	Sustainability
<ul style="list-style-type: none"> • Establishment and ongoing operation of a school networking institution/organisation • Minimum of five schools in regular communication and interaction on learning initiatives using ICT 	<ul style="list-style-type: none"> • Computer distribution and connectivity services facilitated and co-ordinated by the schoolnet institution • Interschool networking and collaborative projects using the broad array of ICTs • Content and curriculum integration • Teacher training in ICT use to enhance teaching 	<ul style="list-style-type: none"> • Year-on-year growth of the country schoolnet initiative • Financial sustainability increases from year to year with less reliance on external resources/funding. • Steady year-on-year increase in human resource capacity with less reliance on external resources • Year-on-year consolidation of partnerships

- Technical skills training: 19 per cent
- Developing school curriculum using ICTs: 17 per cent
- No answer: 2 per cent

Addo and colleagues (2003) also note that awareness-raising activities about the role of ICT in education have also been undertaken through annual conferences on ICT in education, national Internet days, the promotion of collaborative projects and the sharing of experiences. Cyber-jeunes, a project based in Senegal, is an example of a schoolnet which has introduced different ways of integrating health, environmental issues and sexuality education into its programme through the use of ICTs.

This research shows that, contrary to popular belief, schoolnets in Africa are concerned not only with technological issues, but also with educational, capacity-building and institutional issues, and in some cases in influencing national policy. Evidently, schoolnets act as change agents in the paradigm shift in the education systems at the national level. As well, they have been a catalyst for including Africa in the global knowledge-based society.

TWO CASE STUDIES

Established benchmarks for schoolnet best practices do not exist as yet and are in the process of development. However, the two schoolnet organisations described below are well worth considering for their model interventions.

Western Cape Schools' Network

The Western Cape Schools' Network (WCSN) is arguably the oldest, most experienced schoolnet on the African continent if the definition above is applied. It was established in 1993 initially as an Internet service provider (ISP) for schools in the province and has subsequently developed as a "virtual ISP," meaning that it purchases Internet

access accounts from a commercial ISP, resells them to schools nationally and adds an administration fee. It also provides technical support and maintenance services to schools, it has a dedicated call centre that acts as a help desk and provides Web-hosting and domain registration services for schools.

WCSN is a non-governmental organisation (NGO) which works in partnership both with SchoolNet South Africa, particularly on its Educator Development Network programme and the Western Cape Education Department, with which it has now connected all of its 1560 public schools to the Internet. In many of these schools, the connectivity is mainly available in the administration offices to facilitate efficiency in management and administration. WCSN continually does research into new and alternative solutions for cost-effective connectivity to e-mail and the Internet for schools. It offers schools a best practice consulting service with regard to new technologies.

The WCSN is also known for its periodic conferences, attended mainly by teachers from all over South Africa, that provide an opportunity for collaboration and exchange of experiences. Through their virtual ISP role and regular conferences, the WCSN has been able to generate revenue that has ensured their sustainability for a decade.

SchoolNet Nigeria

SchoolNet Nigeria (SNNG) emerged directly as a result of its interactions with other schoolnet formations through SchoolNet Africa, and particularly SchoolNet South Africa. It was officially launched in September 2001 with high-level support from the Ministries of Education, Communications and Science and Technology. It is a partner organisation of the Nigerian Education Tax Fund (ETF), which is a state fund based on 2 per cent taxation of company profits in Nigeria.

Since its launch, SchoolNet Nigeria has been involved in the following projects:

- It has initiated a print media project in partnership with MTN, an international cellular network company which involves educational information and curriculum-focused inserts in Nigeria's national newspapers. This ensures widespread distribution of education resources which is also a novel way of using traditional ICTs.
- It has established a Diginet project in partnership with Direqlearn, an international company that provides education technology solutions to schools and the Nigerian Education Tax Fund, which provides PC labs on an open-source solution to Nigerian schools. At the time of writing, 35 schools had been provided with PC labs of 20 computers and a server on a "thin client" network, including a curriculum software package called LearnThings, as well as training for teachers at each of the schools. These school-based labs function as cyber cafés and computer training centres for non-school community members after school hours.
- It has partnered with the World Bank on a civic education project called Civicicts, which is an e-mail-based collaborative project for learners and partners with SchoolNet Africa on a ThinkQuest Africa Project in Nigeria.

CONCEPTUAL FRAMEWORK

The conceptual framework within which schoolnets in Africa were initiated was based on the discourse of the "information society" and development. The information society is said to be characterised by the growing importance of information and knowledge in a

globalised economy. This growth, however, has given rise to a “digital divide,” which is most extreme in Africa.

The digital divide has been conceptualised as the growing divide between those who have access to information through ICTs and those who have not. Many have argued as well that the digital divide is not only about disparities in access to technologies, but also about disparities in skills, capacity and local content, and that the digital divide is a function of existing socio-economic global disparities.

A few examples clearly demonstrate the manifestation of the digital divide within Africa and the context within which schoolnets operate (see www3.wn.apc.org/africa):

- There is a huge disparity in computer penetration in schools in Africa compared to Europe and the USA. PC penetration is 1:24 (one PC for every 24 learners) in European schools and 1:6 in the USA. In Mozambique, the ratio is 1:636, and only 20 out of 7000 schools have computers.
- One-third of the 21 million untrained teachers in the world are in Africa.
- Zambia lost 290 Ph.D. graduates in the last five years, which reflects the capacity constraints that Africa experiences.
- Africa has been referred to as a “downloading continent” since only 0.2 per cent of Internet content is considered African.

Another conceptual influence in schoolnet interventions is the extent and depth of Africa’s education crisis and the need to rally behind the call to achieve universal primary education by 2015 espoused in the international initiative Education for All (EFA). With an estimated 42.7 million youth out of school in Africa alone, the EFA goals remain uppermost in development programmes, and schoolnets have been challenged to demonstrate how ICTs can facilitate and support EFA objectives.

Finally, there is growing understanding that education systems globally are undergoing transformation, precipitated by the increasing use of ICTs which have given rise to new, innovative ways of learning and teaching and which hold the potential for enhancing access, efficiency and quality of education in Africa (Mansell and Wehn 1998; Butcher 2001). These changes are attributable to the forms of networking, collaborative learning, knowledge sharing and interactive learning which ICTs facilitate (Heppell 2000). Haddad and Draxler (2002) suggest the importance of a new schooling paradigm precipitated by this information revolution.

CHANGE DRIVERS

Over the years, a combination of factors have contributed to the growth of the schoolnet movement in Africa. The main factors have been the facilitative role of the donor aid community, under the influence of attempts to bridge the digital divide, along with their programmes to achieve the EFA goals, the role of schoolnet champions, regional schoolnet programmes and private sector interventions.

These factors demonstrate that the growth of schoolnets in Africa is a function of the rapid emergence of the global knowledge-based economy, its concomitant shift in education processes and learning and teaching systems internationally, and attempts to counteract the exclusion of Africa from the globalisation process. The myriad international initiatives, coupled with limited private sector interventions to promote “digital opportunity,” has provided the impetus for this change which is, notably, largely

externally supported although there is also evidence of leadership for this change emerging from within Africa.

Donor support

In 1996, the Canadian International Development Research Centre (IDRC) announced the establishment of its Acacia Initiative as its contribution to the African Information Society Initiative (AISI), which was a declaration of the United Nations Economic Commission for Africa (UNECA). The Acacia Initiative included, among other things, the establishment of telecentres and schoolnets as community access models for ICTs, and the formation of and support for schoolnets in nine African countries was a direct outcome (see www.idrc.ca/acacia).

Similarly, the World Bank, through its World Links for Development Program, promoted the establishment of schoolnets in a number of African countries. Subsequent regional programmes emerged as part of the broader endeavour to bridge the digital divide, with the growing support of the G8 nations and others which included the promotion of ICT use in schools in Africa. Among these were the Imfundo Project of the Department for International Development (DFID) and the Global Teenager Project of the Dutch-based International Institute for Communication Development (IICD).

Today more international donor organisations have ICT programmes in Africa which support the promotion of education to some degree and which will be influenced by the impending World Summit on the Information Society (WSIS – see www.itu.int/wsis) and the attention given to e-schools by the United Nations ICT Task Force. Similarly the development imperative to achieve the EFA goals also features prominently in the interventions of the international development and donor community (see Table 2.2).

All this suggests that the inclusion of Africa in the information society through the schoolnet movement has its impetus largely in externally driven, supply-side interventions.

Table 2.2: *Bridging the digital divide in Africa.*

Year	Event
1996	Information Society and Development
1996	African Information Society Initiative
1999	African Development Forum
2000	Digital Opportunities Task Force
2000	UN ICT Task Force
2001	New Partnership for Africa's Development
2002	G8 Africa Action Plan and CEO Charter for Development
2003	World Summit on Information Society Geneva
2005	World Summit on Information Society Tunisia

Schoolnet champions

Dedicated schoolnet “champions” have played a pivotal role in the growth of the schoolnet movement in Africa. A schoolnet champion can be defined as a change agent who pioneers the paradigm shift towards ICT-enabled education through the agency of local schoolnet organisations. Usually a schoolnet champion is an individual who is not risk-averse, who is entrepreneurial in outlook, who leads and drives the establishment and growth of the national schoolnet organisation, often against all odds.

A number of schoolnets arose due to the dynamism of a few talented individuals of this nature: SchoolNet Namibia has a dynamic director who has skills in business development, working with children and ICTs; in Rwanda, the Minister of Education has championed the cause of school networking and, in some cases, teachers themselves have taken the initiative to drive the schoolnet process; Cameroon, Mali and Kenya also have examples of teachers playing a championing role. And because the schoolnet process in so many cases is driven by grassroots practitioners who have a direct hands-on approach in their dealings with schools, it is often characterised by strong rank-and-file participation within civil society formations organised around achieving specific social and developmental objectives.

Regional programmes

Another change driver in the African context is the influence of regional schoolnet programmes such as SchoolNet Africa (SNA) and its unique relationship with national and international partners in promoting school networking.

SNA is the first African-led, African-based pan-African schoolnet network. It is one of two continental schoolnet networks in the world, the other being European Schoolnet. It works as a “network of networks,” which involves schoolnet practitioners, policy-makers, teachers, learners, researchers and schoolnet organisations operating in 31 African countries. It has established, in addition, a network of all regional programmes supported by international agencies in respect of ICTs in education in Africa.

SNA is an NGO which assumes the role of an advocacy and lobbying institution as well as providing support and resources for national schoolnet processes, which at times involves working directly with Ministries of Education. In its support function it develops the frameworks and learning capability among its network on education-intensive ICT applications for schools and develops specific regional programmes to support national initiatives. It places the emphasis on the national schoolnets being the implementing agencies at the local level.

SNA’s regional programmes include the establishment of one of Africa’s first multilingual education portals known as the African Education Knowledge Warehouse, the establishment of a content-rich programme involving collaboration among African learners in producing Web sites called the ThinkQuest Africa Program, the establishment of the African Teachers Network, a research programme, a policy support programme and the Connecting African Schools programme, which seeks to establish workable, affordable and sustainable technology solutions for schools. SNA also serves to build technical, managerial and policy capacity among its network of schoolnet champions in an attempt to strengthen the skills base in its network. It is, moreover, a gender-responsive organisation: it has mainstreamed gender issues in its programme and organisational operations, and has also dedicated women’s empowerment programmes in an endeavour to foster gender equality.

Finally SNA is a strategic partner of the burgeoning e-schools programme, a project of New Partnership for Africa's Development (NEPAD). NEPAD is largely an African inter-governmental programme whose objectives are to achieve growth and reconstruction within Africa.

The importance of regional programmes in the growth of schoolnets was evidenced by a regional workshop attended by schoolnet practitioners and policy-makers from 25 African countries to discuss their local experiences (see www.schoolnetAfrica.net/botswanaworkshop). A discussion on the start-up of schoolnets in countries where they do not exist in Africa and the support for existing schoolnet programmes featured prominently. This workshop occurred three years after the birth of SNA at a similar workshop held in Okahandja Namibia as part of the UNECA-led AISI programme (see www.uneca.org). Synergies with the more recently established e-schools programme of NEPAD, launched in June 2003, will not only contribute to awareness-raising and experience sharing, but given its African leadership, will also promote the importance of African solutions to its education crises.

Private sector intervention

There has also been limited private sector intervention in encouraging digital inclusion in African schools. Programmes like Intel Teach to the Future support the development of ICT capability among teachers in order to enhance their teaching. In some cases, the private sector initiatives partner with schoolnet organisations to implement their programmes. These initiatives, albeit limited at this stage, act as further impetus to the growth of school networking in Africa.

FEATURES OF AFRICAN SCHOOLNETS

Schoolnet evolution

The evolution of schoolnets in Africa has been uneven and varied. The process is still in its infancy on a historical scale (one year in some cases) and is influenced by imperatives to "catch-up" with the more technologically advanced countries.

Typically, schoolnet evolution and growth in Africa over the past few years has occurred in three stages: pre-start-up; start-up, and roll-out.

The **pre-start-up stage** is typically characterised by:

- The absence of a formally constituted schoolnet project
- The availability of one or two individuals to champion the school networking process
- Interest expressed by various groups and potential partners which sometimes take the form of a multi-stakeholder workshop
- A framework or business plan to establish a school networking project
- A proposal to pilot a school networking activity usually involving a few schools
- Donor support expressed or provided to assist the pre-start-up stage

The time frame and scale during the pre-start-up stage varies from country to country. Two typical examples are SchoolNet Tanzania and SchoolNet Sudan.

The **start-up stage** typically commences once a schoolnet has been formally constituted to facilitate school networking activities. Usually donor support has been provided to initiate the start-up stage. The schoolnet is typically engaged in the following activities:

- Piloting individual projects such as teacher training, installing computers in schools, developing content and providing connectivity
- Lobbying various stakeholders for resources and financial support
- Reaching a sizeable number of schools, learners and teachers through the schoolnet programme

The start-up stage is also typically the technology-push stage, although value-added training and education activities also commence simultaneously. SchoolNet Kenya and SchoolNet Malawi are examples of schoolnets in the start-up stage.

The **roll-out stage** is characterised by the existence of:

- A formally established schoolnet that facilitates connectivity at larger numbers of schools in various regions and provinces on a national scale
- The emergence of a national programme with strategic support and leadership from government ministries and the private sector
- The increasing value-added educational use of ICTs in schools coinciding with a programme to reach universal access to ICTs in school
- The beginnings of a sustainable programme

Examples of schoolnets in the roll-out stage are SchoolNet Namibia and the ICT in Schools Program in Botswana. Many schoolnets in Africa are in the pre-start-up and start-up stages with those in roll-out stage being exceptions.

This description of schoolnet evolution is somewhat simplified. However, it serves to explain the way schoolnets in Africa have tended to evolve and grow over the years progressing from one stage to the next. SchoolNet Mozambique is an example of a schoolnet that has evolved following these three stages, as it is now in roll-out stage.

Schoolnets as monopoly?

In some cases schoolnet organisations in Africa do not hold the monopoly on ICT activities in education, particularly in schools, in their respective countries. SchoolNet South Africa (SNSA) is a case in point.

Since 2000, when SNSA became an independent NGO, it has made great strides in promoting computer access to schools, teacher training and curriculum integration. However, other school networking activities have taken place in the country for some time. In fact, if the definition of school networking in Table 2.1, above, is applied, then it must be considered that school networking in South Africa dates back to the early 1980s with the formation for Community Education Computer Society (CECS) which first placed computers in former “black” schools. As well, in the early 1990s, provincial schoolnets were formed and promoted Internet access to schools. (In 1996 the provincial schoolnets collaborated to form SNSA which was formally established as a national organisation within a larger donor organisation, the IDRC.)

Besides these early developments, the following initiatives have also emerged since 1997:

- The Universal Service Agency Cyberschool Project, now reaching up to 130 schools

- Intel Teach to the Future Project, focusing on teacher training
- WCSN, serving schools in the Western Cape Province
- Gauteng Online, a government-led initiative to develop “smart schools” through ICT access in the Gauteng Province
- Khanya Project, integrating ICTs in schools in the Western Cape Province
- Multichoice, a private company supporting teacher training and curriculum development projects in South Africa
- Mindset, a recently established curriculum-focused television programme
- Direqlearn, promoting open-source education ICT solutions for schools
- Cisco’s recently launched handheld project with schools in Soweto
- Solar Electric Light Fund Project, promoting solar schools to a number of schools in South Africa
- Netday, a computer refurbishment organisation servicing South African schools
- Freecom, a computer refurbishment organisation servicing South African schools
- Hewlett Packard’s iCommunity Project, focusing on municipalities including schools in the Limpopo Province of South Africa
- Microsoft Digital Village, reaching young, school-based learners

In fact, a recent study by SNSA reveals that there are an estimated 34 ICT and education projects in the country. Many of these projects operate independently and others work in collaboration with SNSA, which demonstrates the dynamism of the school networking environment in South Africa. Indeed it also shows the potential SNSA has to act as a clearing house and co-ordinating mechanism for all of these initiatives.

However, in certain cases in Africa, the schoolnet organisation is the only structure promoting the educational use of ICTs in schools. For example, SchoolNet Namibia is a national programme targeting the involvement of all of the country’s 1519 schools over the next five years. Similarly, SchoolNet Mozambique is a national government-led initiative.

Schoolnet organisational forms

Schoolnets in Africa assume various organisational forms, as follows:

- **Voluntary associations:** In a number of cases the schoolnets, especially those in the pre-start-up stage, are run by volunteers who have full-time jobs elsewhere but who are committed to the mission of school networking in their respective countries. SchoolNet Sudan, SchoolNet Mali and SchoolNet Benin are examples.
- **University outreach programmes:** Some schoolnets are incubated within existing institutions in order to emerge later as fully fledged independent organisations. For example, SchoolNet Mozambique was pre-dated by Internet para as Escolas, which was an outreach project of the Centre for Informatics at the University Eduardo Mondlane in Maputo before it became a project of the Ministry of Education. The University of Lesotho similarly promoted school networking in this way, demonstrating the role universities can play in supporting ICT-enabled education in schools. Notably, this type of organisation is typical of schoolnets in their pre-start-up and start-up stages. Cyber Jeunes, a project of the GEEP based at the Cheikh Anta Diop University in Senegal is another such example in the Francophone region.

- **Non-governmental organisations:** A number of schoolnets are established NGOs that have strategic partnerships with government Ministries of Education, Ministries of Telecommunications, tertiary institutions, other NGOs and the private sector. SchoolNet Namibia, SchoolNet Kenya, SchoolNet Nigeria and SchoolNet South Africa are all examples.
- **Government-based institutions:** A few schoolnets have emerged as government-based, government-led institutions. SchoolNet Mozambique and the Smart Schools Program in Egypt are both flagship projects of their Ministries of Education and are products of national ICT strategies spearheaded at the highest level in their respective countries.
- **International networks:** Some schoolnets are characterised by organic ties to international agencies promoting ICTs in schools. The World Links Organisation is a good example of this where schoolnets in 10 African countries are associated with and supported by their parent organisation in Washington.

These examples suggest that the developmental stage of a schoolnet relates to the organisational form which it assumes. The organisational form is also informed by the extent to which national governments have implemented national ICT policies and programmes. Many schoolnets in Africa were established as civil society formations operating outside of the national government. However, as the schoolnet movement grows at the national level, the organisational form is changing to one where it becomes increasingly integrated within government institutions.

Resourcing models

A few resourcing models have emerged within the schoolnet movement in Africa which hold promise for the establishment of “made-in Africa” sustainable solutions. Addo and colleagues (2003) note that funding for schoolnets was obtained from a variety of sources, the most common being international donors followed by local business, member schools and, in some cases, governments. Donor funding was instrumental in the start-up processes for a number of schoolnets as part of donor-led initiatives to bridge the digital divide. In many cases, these support mechanisms were not accompanied by a shift away from donor dependency a few years down the line. The result has been that some schoolnets could not survive beyond their initial grants when their respective donor partners ended their support. The first attempt at establishing a SchoolNet Zambia is a case in point. However, renewed attempts at establishing SchoolNet Zambia are currently underway.

With the limited pool of donor funding available to support schoolnet start-ups in Africa, this resourcing model proves to be unsustainable unless the schoolnet management and leadership adopt a different approach to resourcing and sustainability. These experiences, however, have encouraged various schoolnet practitioners to find alternative resourcing solutions.

The ISP model

One model that appears to be very successful and potentially sustainable is the schoolnet as Internet service provider (ISP), which has been applied by SchoolNet Namibia and WCSN, and which is now being explored by SchoolNet Nigeria. This model is characterised by the schoolnet organisation acting as an ISP based on subsidised rates for Internet connectivity for schools. It relies to some extent on support and partnership with

the national telecommunication ministries and regulators as well as local commercial ISPs. Such a model also encourages greater reach and scale to schools as revenue grows. The schoolnets that have tried this model have successfully shifted from their dependency on donor aid. WCSN reportedly scored a surplus of USD70 000 per year based on this model, which partly explains why it has been able to survive as an organisation for 10 years.

School-based telecentre model

The school-based telecentre model and school as cyber café model are both variations of the same theme and are sustainable at a school level. SchoolNet Nigeria's highly successful Diginet Project is one example. It allows for free educational use of cyber labs established by SchoolNet Nigeria until 3:00 p.m. For the rest of the day until 10:00 p.m. the labs function as cyber cafés, open to the community and the public at large. In this way, the school generates revenue which helps to sustain both the cyber lab in the school and the organisation. The Diginet project is currently being evaluated and it hopes to highlight the extent of its success.

Similarly the school-based telecentre model as applied in Zimbabwe by the World Links Organisation represents an attempt at financial sustainability and maximum utility of the ICT resources to meet both education and community needs (see www.world-lings.org).

Public-private partnership

In the quest for sustainability, schoolnet partnerships with both government and the private sector, both locally and internationally, are important to consider. The success of these partnerships is, however, varied. The private sector partnership with SchoolNet Namibia has helped build the reputation of private sector companies as agents concerned with education and the future of Namibian youth. Creative ways have been utilised to encourage private-sector buy-in ranging from donations of pizzas to young learners involved with setting up computer labs in schools to commission from sales of products as contributions to SchoolNet Namibia. Such contractual relations can be sustained over a longer period, hence holding the potential for continuous support for the schoolnet endeavour (see www.schoolnet.na).

SchoolNet Nigeria also offers a creative model of "social entrepreneurship," having partnered with a locally based enterprise, Direqlearn, which operates with a strong developmental imperative but which also seeks profitable solutions. This partnership includes the Nigerian Education Tax Fund (which collects 2 per cent of profits of all Nigerian companies as a contribution towards the promotion of education in Nigeria) which provided seed funding for the initial roll-out of its cyber labs in schools. This represents a unique model of partnership as it draws heavily on local financial resources and does not depend on external donor support.

Scale of operation

The question of scale of operation for most schoolnets was highlighted at a recent workshop which focused on using ICTs to support the education system, held in Gaborone, Botswana, 28 April–2 May 2003. Most of the schoolnet projects are small-scale pilot initiatives (see www.schoolnet africa.net/fileadmin/resources/workshop_report.zip).

Table 2.3 presents a rough estimate of scale of operation based on anecdotal reports given at schoolnet workshops. This data is perhaps the most reliable available at this stage, given the dearth of codified information on this subject.

The limitations of the small-scale initiatives are further compounded by their limited reach to learners. In Mozambique, a typical school has between 6000 to 7000 learners. The computer-to-learner ratio in schools with computers is typically 1 to 636.

However, if educational ICTs are to become a reality for many of Africa's learners and educators, then the scale and impact of investment needs to be increased manifold. Failing to do so runs the risk of creating an intradigital divide within African countries. To date, Egypt, Namibia and Botswana have demonstrated the shift towards a mass model which is also a function of national ICT programmes.

Table 2.3: Computer penetration at schools in selected African countries (June 2003)

Country	Estimated number of schools	Schools with computers	Per cent of schools with computers
Egypt	32,000	20,000	62.5
Ghana	35,000	32	0.09
Mozambique	7,000	20	0.29
Namibia	1,519	200	3.94
Nigeria	50,000	20	0.04
South Africa	28,700	5,000	17.36

ICT ACCESS MODELS

The search for affordable, sustainable access to ICTs in African schools has been experiment-oriented. Seven years of accumulated experience across the continent have established models which appear to work successfully. Many schoolnets have adopted a computer laboratory approach as a start. These laboratories are set up as local area networks and include between two to 40 computers. Many computer laboratories have been established either on the basis of new computers donated to the schoolnet through donor, government or private sector agencies or with imported secondhand or refurbished computers.

The Diginet Direct Openlab solution represents an innovative low-cost, sustainable and secure model of ICT access to schools which can also be replicated on a mass scale. It incorporates a "thin-client" solution where all processing takes place through a powerful server with the rest of the computers in the network being dumb terminals. The network is powered by an open-source operating system and education software, Linux Mandrake 9.0, and an education software package, LearnThings.

Connectivity is powered by a very small aperture terminal (VSAT) which has been allocated to each of the 35 schools in the initial pilot phase. This represents the largest VSAT programme for schools in sub-Saharan Africa.

The Diginet model is a total solution as it also incorporates a strong technical maintenance and support programme through a team of technical field officers and a call

centre; it offers curriculum integration and teacher training in the use of the curriculum content.

The Diginet Direq Openlab Model represents one approach to be adopted by new schoolnet start-up projects. SchoolNet Africa is adding value to this model through its call for one million free computers for Africa which can be refurbished through locally established computer refurbishment centres run by youth who also deploy computers to the schools.

Connectivity models range from no connectivity to the Internet in the more disadvantaged schools to ADSL-empowered connectivity in the more affluent schools to VSAT-enabled connectivity, which currently serves as an experiment with SchoolNet Uganda and SchoolNet Nigeria taking the lead.

Technical innovation in this arena includes the establishment of solar schools which will be developed in South Africa as well as the use of other technologies such as handheld devices which are also being experimented with in South African schools.

At a policy level, the call for an education rate (e-rate) by SNA is an attempt to encourage an enabling policy environment for school networking. South Africa, Egypt and Senegal all have e-rate policies (Espitia 2001).

Specifically, the main obstacles to Internet access faced by African schools are:

- Lack of infrastructure generally, and network infrastructure in particular
- High telephone and Internet costs
- Limited expertise and ICT skills levels
- Lack of enabling policy environment (Isaacs 2002a).

Evidently, cost is one of the biggest constraining factors. For this reason, cost factors are considered when taking into account which software solutions to use in schools. This informs the preparedness to explore open source solutions for African schools. This issue of appropriate software solutions is currently under investigation by SNA and its partner organisation Bridges.Org, the initial findings of which are available on the SNA Web site (see www.schoolnetafrika.net).

Given the constraints of widespread computer and Internet access, it is essential that traditional ICTs such as radio, television and print media not be seen as less important as learner support materials than new ICTs such as computers, e-mail and the Internet. These media will continue to have a fundamental role in the provision of educational resources to learners (Addo et al. 2003).

EDUCATOR TRAINING

There are a few locally relevant educator training models that have been developed within Africa. A number of schoolnets utilise educator training models that have been developed by international agencies such as the International Education Resources Network (iEARN) and the World Links Organisation. One of the few that has been locally developed is Egypt's ICDL training for all its teachers. The shortcoming with ICDL training is that it does not integrate the use of ICTs in learning and teaching. However ICDL training remains an important step in fostering ICT literacy amongst teachers.

A well-established local model that integrates ICT literacy and the educational use of ICTs is SchoolNet South Africa's Educator Development Network (EDN) model which also offers a mentorship support programme. Fostering collaboration and peer networking among educators is further promoted by the recent establishment of the African Teachers Network, which includes teachers who form part of the local schoolnet organisations in Africa.

The previously mentioned conference on ICTs in African schools held in Botswana recognised the importance of an integrated approach to educator development and considered the need to integrate ICTs in pre-service educator training by connecting the teacher training institutions. Such an approach will go a long way in the shift towards systemic change in the teacher training systems at the national level in Africa.

CONTENT AND CURRICULUM INTEGRATION

The use of ICTs in developing interactive curriculum-based content represents the value-added use of ICTs in the formal school system. It is also the one area where schoolnet intervention has been relatively limited. The findings of a SchoolNet South Africa study bears testimony to this by suggesting that of all the 34 ICT-related projects in education in South Africa, what was missing were projects focusing on curriculum development and innovation and global communication between schools. This situation prevails across the continent.

Content development can be defined as the aggregation and creation of educationally relevant content usually developed by learners and educators but also by curriculum specialists and quality controlled by curriculum specialists. For some this process involves creating digital textbooks, although new learning in this area reveals that curriculum integration must also involve interactive learning processes and the use of collaborative tools in the platform on which the online curriculum is premised.

Existing content-related programmes among schoolnets in Africa remain extra curricular. ThinkQuest Africa (see www.thinkquestafrica.org), a project of SNA, is one example of a content development programme which encourages learners to develop content-rich Web sites in teams. Aidsweb, a project of the World Bank Institute (see www.worldbank.org/worldlinks/aidsweb), is a similar initiative.

The shortcoming with existing content development projects, however, is that they are not part of the curriculum process in schools. Curriculum integration, on the other hand, places the emphasis on the use of the subject-specific curriculum content on an ICT platform to facilitate learning and teaching. Curriculum integration arguably represents the most important educational value-added use of ICTs, because the essence of school-based education revolves around the subject-based curricula, taught during school hours. The added challenge is that historically, curricula have been rigid and inflexible and premised on the notion that the school is the centre of learning and the teacher leads the classroom. However, the curriculum development process, quite outside of the impetus for change provided by ICTs, is also undergoing reform internationally. South Africa is a case in point where the entire curriculum system has undergone a reform process – a shift from apartheid indoctrination towards fostering critical and lateral thinking capability among learners. The integration of ICTs into the school-based curriculum is thus taking place at a time when curriculum change is under way.

In Africa, there are three ways in which schoolnets have approached digitised or online curriculum integration. The first is the “adopt model,” which involves the wholesale

adoption of existing digitised models of curricula developed elsewhere. For example the mathematics curriculum is well developed by Canada's SchoolNet. Schoolnets in Africa could (with permission from Canada's SchoolNet) simply adopt and use the digitised curriculum as is. This approach presupposes synergy between an international curriculum and the way it is applied locally. The adopt model is currently being used in Nigeria where teachers are using a software product called LearnThings based on the UK curriculum. SchoolNet Uganda similarly uses a product called Blackboard which is premised on the adopt model as well.

The second approach is the "adapt model," which suggests that existing digitised curriculum can be adapted to suit local conditions. SchoolNet Nigeria is in the process of adapting the LearnThings product to include curriculum content based on local curricula requirements.

The third approach is the "create model," which encourages the development of local curriculum content from scratch, taking into account local languages and that teaching takes place in the vernacular. This model is currently being applied by SchoolNet South Africa in its Educator Development Network programme where teachers are involved in developing content for science and mathematics in its 17 teaching modules. The create model is evidently extremely limited at this stage, although SchoolNet Africa will be initiating experiments with a number of schoolnets in its network.

One should guard against making a fetish of curriculum-based learning as more recent knowledge on learning capability suggests that the school and curricula are no longer the only centres of learning. However, the value-added use of ICTs in schools has to be focused on curriculum integration in the coming period of schoolnet evolution in Africa. An added concern is the importance of quality assurance and standards in the development of local curricula.

A series of collaborative projects have been introduced at international and regional levels which offer educational value to the learner. These include a teacher collaborative project run by the International Education Resources Network (iEARN) and World Links, the IICD's Global Teenager Project, ThinkQuest Africa and the World Bank's Civics project. Whilst many of these projects have been evaluated, they have not undergone any quality assurance process by schoolnets or education authorities to ascertain the education value they add, if any. Furthermore, they are largely extracurricular projects requiring after-hour commitment by teachers and learners, and therefore they raise a systemic limitation unless they are factored into a process that integrates them into the learning and teaching systems at school.

SCHOOL NETWORKING: CONCEPTUAL CLARITY OR AMBIGUITY?

Since the establishment of the schoolnet movement in Africa, much of its emphasis can be characterised as small-scale ("dribs-and-drabs"), pilot-centred, donor-dependent, gender-blind, "technology push" initiatives which manifest a one-sidedness and a limited conceptual clarity on the *raison d'être* for school networking. Arguably, these features are consistent with externally driven processes. Some commentators argue that the cumulative experience of school networking in Africa still does not demonstrate workable, sustainable Africa-relevant educational models of ICT application. For some the jury is still out not only on the pedagogical value of ICTs, but also whether they facilitate the Education for All objectives, a primary concern in Africa. This argument

suggests the importance of continuing with the test-bed approach until there is greater conceptual clarity on positive educational outcomes before scalability is even attempted.

Others argue however, that the past five years of piloting and small-scale intervention provide enough information on what works and what doesn't to commence the shift towards a mass model which will demonstrate social "impact" far more effectively. The alternative is to remain steeped in "piloting" which still informs the approach to ICTs for development in the highly influential international donor community.

A combination of these views – of continuing test-beds together with a stronger paradigm shift towards the mass model of self-reliance in the schoolnet movement – is imperative to catalyse any significant developmental difference in Africa's education systems. It proffers a continuous learning approach to school networking which recognises that "technology-push" has characterised schoolnets in Africa but which also acknowledges that the continent is only at the beginning of the learning curve; that schoolnet intervention needs greater emphasis on the educational integration of ICTs; that an appropriate ICT in education policy framework represents a major gap in the schoolnet movement; that a more concerted effort towards gender mainstreaming in school networking is an added consideration of such a conceptual shift; and that the drive towards systemic change should inform school networking interventions.

The South African Education Department's former Centre for Educational Technology introduced the concept of a "schoolnet value chain" which attempted an integrated approach to the application of ICTs in education. According to Isaacs and Naidoo (2003), the value chain raises the full range of technical, educational, institutional and financial considerations simultaneously. This provides a useful conceptual tool as governments deliberate over appropriate policy solutions to promote school networking.

THE WAY FORWARD

Table 2.4 provides a snapshot of the extent to which progress has been made in the African schoolnet movement (bearing in mind that SNA estimates 85 million learners, 600,000 schools and five million teachers in Africa).

The information in Table 2.4 suggests that significant progress has been made. In view of the discussions at the previously mentioned Botswana conference, the emergence of the NEPAD eSchools Initiative and the UN ICT Task Force eSchools Program as well as the impending World Summit on the Information Society, school networking is destined to flourish in the coming period.

However, the schoolnet movement in Africa is still in a growth phase. There remain many challenges and barriers to overcome, foremost being the achievement of Education for All (EFA) objectives, considered a high developmental priority in the education sector. The establishment of an educational ICT project for child ex-combatants in Liberia with the possible extension to Somalia and Sierra Leone represents a small beginning in this direction. However, because of the focus on youth in school through the schoolnet programme, a concerted effort is still needed to explore ways to reach youth out of school.

Developing a compelling case for school networking and convincing policy-makers and government decision-makers of the need to invest in ICTs in education and allocate budgets towards this endeavour remains a challenge. Africa is certainly better placed for a more strategic and co-ordinated implementation effort in educational ICTs with its

concomitant positive educational outcomes. There is much reason for optimism, and this is best captured by the renewed motivation to learn by teachers and learners in Nigeria when they stated, with reference to the cyber labs in their schools, “[There is] a new excitement in the air.”

Table 2.4: *SchoolNet progress since 1996*

1996	2003
<ul style="list-style-type: none"> • Limited teacher training 	<ul style="list-style-type: none"> • African teacher training models • Estimated 210,000 teachers trained in ICT skills and use of ICTs in education
<ul style="list-style-type: none"> • Limited technology solutions 	<ul style="list-style-type: none"> • Workable computer lab solutions including “last mile solutions”
<ul style="list-style-type: none"> • No curriculum integration 	<ul style="list-style-type: none"> • Collaborative projects • Local curriculum integration started • Basic understanding of what curriculum integration means
<ul style="list-style-type: none"> • No ICT in education policy 	<ul style="list-style-type: none"> • Four countries with ICT in education policy • Four countries with policy processes under way
<ul style="list-style-type: none"> • No consideration for EFA 	<ul style="list-style-type: none"> • Beginnings of EFA integration: Online Child Ex-Combatants Project and Online Street-Children Project

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