



# Strategy for Information and Communication Technology in Education



DEPARTMENT OF EDUCATION

# STRATEGY FOR INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION



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NOVEMBER 2001



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## Foreword by the Minister of Education

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Advances in information and communication technology (ICT) globally are rapidly expanding the learning opportunities and access to educational resources beyond those immediately or traditionally available. It is therefore critical that our education and training system takes advantage of these technological changes. The programme for improving the quality of education cannot be based on 'whether we should introduce ICT in teaching and learning' but 'how we can successfully introduce ICT in schools'.

The base for telecommunications infrastructure available for learning and teaching in our country is expanding, thus giving schools an opportunity to utilise existing local resources and to forge partnerships.

The introduction of ICT in schools will create new possibilities for learners and teachers to engage in new ways of information gathering, learning and teaching. ICT has the potential to enhance the management and administrative capacities of schools.

The challenge of providing schools with modern technologies to enhance the quality of learning and teaching will require significant investments. Given the magnitude of the task ahead of us, it is clear that government cannot do it alone. The public and private sectors need to join hands in ensuring that our children receive high quality learning. The strategy represents a platform for the collaboration of government and the private sector in the provision of ICT in education. Through this initiative we will turn our schools into centres of quality learning and teaching for the 21<sup>st</sup> century.

The time for all social and technology partners to take up the challenge is upon us. We cannot afford to lose momentum. In the spirit of *Tirisano*, let us all work together to ensure that our schools have access to appropriate technologies for learning and teaching.



**Professor Kader Asmal, MP**  
**Minister of Education**

# 1. INTRODUCTION

The information and communication technology (ICT) revolution imposes particular challenges on education systems around the world. These challenges can be reduced to three broad areas. The first has to do with participation in the information society, the second considers how ICT impacts on access, cost-effectiveness and quality of education, while the third has to do with the way that ICT changes the education process. This document will address all three.

The context within which these challenges present themselves is that of globalization and polarization, in a world of increasing disparities between the rich and poor among and within nations. The notion of the so-called 'digital divide' is therefore an appropriate warning that the ICTs are far from neutral. It is fitting also to recall that the term was first coined in the United States rather than in some impoverished, less developed country. The digital divide does not only have to do with who has a PC linked to the Internet or who has a cellular telephone. It is about how the digital technologies are a core feature of innovation and competitiveness. As the World Development Report of 1999, notes:

'Knowledge is like light, weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere. Yet billions of people still live in the darkness of poverty, unnecessarily.'

There are disparities in all countries. What is different about the disparities in our country is that they were legislated into practice for the purpose of racial hegemony. We have therefore to overcome one divide while a new one looms. The scale of the disparities in basic social services remains daunting, and is exacerbated by the growing impact of the HIV/AIDS pandemic.

Bringing ICT connectivity to our schools and education institutions will and must happen. It is a task that will occur alongside the provision of basic educational infrastructure, which is the responsibility of the government. Extensive provision of ICT is, however, beyond the financial resources of the government alone, and partnerships with donors and the private sector will therefore be a critical success factor.

The transformation of education towards a learner-centred, outcomes-based system proceeds apace. In the wider economy, the **Human Resource Development Strategy for South Africa - A Nation at Work for a Better Life for All** - has identified the prerequisites for the successful transformation of our society and the economy. More broadly, the intent of the National Qualifications Framework is now acquiring substance, so that we may confidently anticipate a rise in skill levels, improvements in productivity, and better-informed participation in decision-making.

In proposing this strategy we are mindful that there are many initiatives in the field of ICT in education. These include those of the Provincial Education Departments, Telkom and other parastatal organizations, the private sector, NGOs and the donor community. Essentially this diversity is positive and ought not to be stifled. Indeed one might observe that 'strategy is being made on the ground'. But uncoordinated and unfocused deployment creates other problems of unrealistic expectations and unsustainable cost.



A strategy for ICT in education presents one aspect that sets it apart from other strategies and that is the very rapid change in ICT. The Internet was not a feature of educational and commercial life a decade ago and we do not know what it will look like five, let alone ten years from now. As Bill Gates noted: 'People often overestimate what will happen in the next two years and underestimate what will happen in ten. I'm guilty of this myself.' Careful planning and deployment of the major investment that ICT represents will therefore be made.

## 2. THINKING ABOUT ICT

### 2.1 What is Information and Communication Technology

ICT encompasses all forms of electronic communication in both digital and analogue form. Digital electronic devices include computers, CD players, cellular telephony and satellite broadcasting. Analogue devices are largely confined to conventional radio broadcast technology and audio, such as tape recorders. Bandwidth, the volume of data that can flow through a communication channel, is constantly increasing. In addition, there are more and more ways of accessing this data. Due to this increased bandwidth and the different forms of connectivity, the various technologies are converging into the broad field of information and communication technology (ICT).

### 2.2 The Information Society and Development

The emerging information society is characterised by the globalisation of markets, a shift toward service industries in the major economies, and an explosion of information coupled with the means to process this information. These changes impact on all levels of our society, especially in the creation and loss of work opportunities.

Engagement with these imperatives at the highest level of government is provided through the Presidential Task Team on the Information Society and Development that met for the first time in October 2001. The Task Team identified a number of key areas for planning:

- human resources
- tele-education
- e-government
- skills development
- liberalisation of the ICT sector
- public-private partnerships
- Africa as an investment destination.

This strategy is consistent with these intentions.

Our most precious asset is our people. In transforming the economy and modernising its institutions, government has therefore embarked on the long process of human resource development that includes the development of general, further and higher education and training. The Strategy for Mathematics, Science and Technology Education, which was launched this year, is a key way of underpinning human resource development.

For its part, the Department of Communications set out a strategic vision for telecommunications in the 1996 White Paper on Telecommunications Policy. A key element of the policy is the provision of universal service. The licensing of additional fixed-line and mobile telephony operators is part of the rollout of this policy.



Other State bodies, such as Public Service and Administration (the Government), Trade and Industry (South African Information Technology Industry Strategy), and the Government Communication and Information System (multi-purpose community centres) are working together to create an electronic communication environment that seeks to promote service delivery. The theme that links these various initiatives is that of placing the citizen at the centre of government services.

It is against this background that the Department of Education, in conjunction with the Department of Communications, presents this ICT strategy. These complementary policy frameworks lay a basis for facilitating the introduction, effective integration, support and maintenance of ICT in our educational institutions.

It is true enough that rich countries have more telephone lines than poor countries. It is also true that simply putting in telephone lines cannot alone make a country rich. However what is also true is that cellular telephony has shown just how communication-hungry all countries are, less developed countries included. The cellular network, which does not require massive investment in copper cabling, and which has developed 'pay as you use' technology, is allowing exactly the kind of leap-frog technology in developing countries that has been spoken of for so long. ICT has enabled other leapfrogging, such as the installation of large management information systems using radio links. What is less clear is what the technology leapfrog may be when it comes to the provision of computer-based ICT in education. Costs are high, and usage is often sub-optimal.

## 2.3 Access, cost-effectiveness and quality

Participation rates in the formal education system are high, but access to quality education is severely stratified and dependent on personal wealth. The school system comprises three smaller sectors - the predominantly wealthy independent schools, well-resourced 'suburban' schools, and the seriously under-resourced farm schools. The major sector is the public schools that are mostly in the townships or deep rural areas, where the majority of the population live. Is there a cost-effective way in which ICT might address the issues of access and quality across these sectors?

If 'ICT is a solution looking for a problem to solve' then education and training has many that beg attention.

The notion of access needs some fine-tuning. In the further education and training phase there are shortages of suitably qualified educators in key learning areas such as science, mathematics and accounting. These shortages act to reduce potential learner uptake. In the general education and training band there are similar problems of qualified educators especially in the new learning areas of Arts and Culture, Economic and Management Sciences, and Technology. Here the problem is perhaps more serious in that these are compulsory learning areas. How does the provision of ICT address these matters?

Beyond education in the schools lies the huge area of Adult Basic Education and Training, as well as the matter of adult literacy. Add to this the provision of education for special needs, and one has a massive set of opportunities. What range of ICT applications will best fit this complex set of needs?

Networked computers in a dedicated room? Broadcast television or radio? Videocassettes? Must the technology always go to the user or will the user come to the technology?

In winning the financial resources for ICT deployment, it is only reasonable to ask what evidence there may be of gains in educational value. From the industrialised country perspective there is some evidence of gain. In the United Kingdom<sup>1</sup>, an independent Government-funded evaluation found improved subject learning and vocational training across a broad range of subjects and the full age range, from infants to adults. There was a shift towards project work and a more integrated curriculum, the development of the capacity to use electronic networks to access and create resources, and to communicate with others.

For developing countries the evidence is harder to come by. A recent study by Cawthera<sup>1</sup> notes the difficulty of investing in computers when faced with the lack of very basic infrastructure or learning materials. He goes on to claim that 'Schools which are starved of resources and information can derive a much greater incremental benefit from a functional computer than schools already saturated with resources'.

The jury is therefore still out. But the pressure to introduce computers into our schools remains. What must be avoided is the deployment of an expensive technology for its own sake, which will result in under-usage and waste. The computer lab must not become an icon of modernity in the way that science labs once were. The probable costs of computer provision will be further dealt with below.

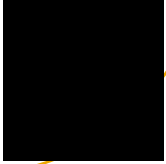
Quality in education is an elusive concept. Indeed the introduction of the outcomes-based curriculum with its associated assessment standards is an attempt to drive quality and accountability. Central to this drive are the educators, who have their own lifelong learning aspirations and requirements. ICTs can most certainly play a key role in their career development and classroom performance. Motivated, knowledgeable and well-prepared educators do make a difference. Access to a PC, printer and the Internet provides the means for educators to manage their teaching duties more efficiently and to stay in touch with colleagues and the broader world of education. Quality may be enhanced through educator development, which may in turn be enabled through quality web-based courseware. The operative word is 'may'.

The quality of education and the economic use of resources may be further enhanced through efficient and effective educational administration. Arguably the first need that connectivity would address is to provide a communication channel between schools and administrators. This first step would allow for data and information exchange concerning staff, resources and curriculum materials. The management of school finances and other assets could be advanced and school communities, no matter how remote, might be kept informed of new developments.

## 2.4 ICT and education innovation

Much has been made of the improvement in productivity that the deployment of ICT in industry has brought about in the United States. None other than the Federal Reserve claims with some confidence<sup>ii</sup> that the strong productivity gains of the last five years are directly attributable to the use and production of computers.

<sup>1</sup> Cawthera, A. (2001) Computers in secondary schools in developing countries. London, DFID



The deployment of ICT has occurred as part of the shift from industrial to post-industrial work organisation, and is accompanied by new forms of work organisation. What is the case in education?

The standard form of deploying computers in education has been to locate the machines in a dedicated room. This requires users to come to the technology and has advantages for the educator in charge, for security and maintenance. But the rest of the education establishment remains untouched by the presence of the machines and productivity gains must be close to nil. Integration of ICT into the school curriculum remains a distant goal for all countries. The process of education continues much as it has done for the last few centuries.

What is also problematic about the new technology is that its high cost determines a low learner/PC time allocation, and in many institutions 30 minutes of access time each week per learner during the normal school day might be difficult to attain.

In the case of distance education using the interactive synchronous or asynchronous learner-educator links, a significant change in the education process is evident. However, the promise of a huge reduction in cost has not generally materialised as the provision of on-line tutorial support requires a huge support staff. Quality distance education does not come cheap.

## 3. COMPUTERS IN SCHOOLS

### 3.1 Who has access?

The School Register of Needs (SRN) 2000 survey indicates qualitative improvement in the provision of basic facilities since the first such survey in 1996. The survey examines the condition of buildings and the availability of sanitation, telecommunications, water and power supply, accommodation and access for learners who are physically disabled. Inherent inequalities remain glaring. For the purposes of this strategy, the focus will be on facilities that have a direct influence on connectivity.

#### Telecommunications

- In 2000, 66% of schools had some form of telecommunications. This improvement could be due to access to cellular telephones.
- There are still huge provincial variations, with the Eastern Cape, Northern Province and KwaZulu-Natal lagging behind the Western Cape and Gauteng.

#### Power supply

- 53% of schools had access to electricity in 2000
- 6.7% of schools nationwide reported the use of solar power, mostly in the Eastern Cape.

#### Resources

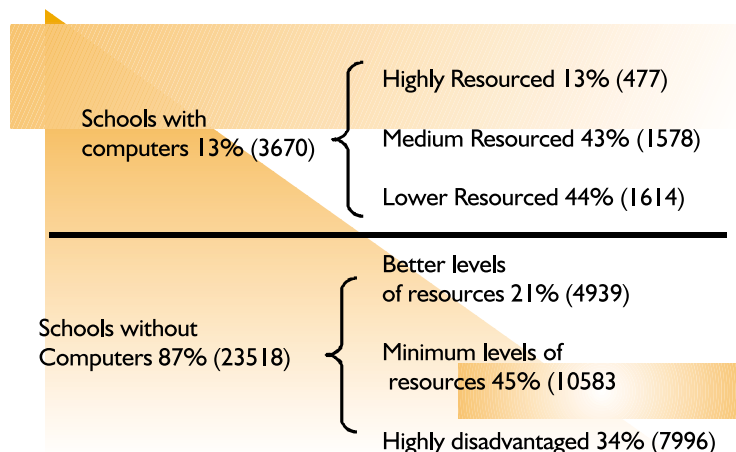
The survey collected data on the availability of resources such as computers and media centres (including libraries).

- Over 70% of schools are still without computers;
- In 1996, 2 335 (8.7%) of schools had 16 359 computers for teaching and learning between them, whereas in 2000 there were 3 351 (12.3%) schools with 70 711 computers between them.
- Provincial variations are striking, with Gauteng and the Western Cape respectively reporting 58.6% and 54.8% without computers. On the other hand, the Eastern Cape, Northern Province and Mpumalanga reported that over 90% of schools were without computers for teaching and learning.
- In 2000, 80% of schools were without media centres, compared to 83% in 1996.

Although provision has increased, the digital divide remains, as the existing ICT infrastructure is largely found in well-resourced schools, maximising the potential ICT.

A complementary study on computers in schools<sup>2</sup> provides a finer picture of the distribution of computers across schools. This picture offers a pointer towards one key element of the strategy: what schools to target for deployment and when.

<sup>2</sup> Lundall, P. and Howell, C. (2000) Computers in schools. Education Policy unit, University of the Western Cape

Diagram 1: Schools and computers

ICT rollout is dependent on other service providers for electricity, water and telephone connectivity. The government therefore has to take the lead in stimulating and accelerating service delivery to these schools, which will also benefit their immediate communities.

### 3.2 Current initiatives

There is a host of projects around the country that seek to provide connectivity and computer technology for learner use and teacher training. These projects range from those planned and budgeted for by provincial education departments to wholly independent facilities that are under the control of school governing bodies. They range from the most basic connectivity of a single computer with Internet linkage to fully networked computer rooms.

Almost without exception, these projects provide access to the Internet via what the industry abbreviates as 'POTS' - the plain old telephone system. The incremental growth in connectivity contributes towards the development of an educational network that forms part of this strategy.

Up to perhaps two years ago the departments of education were not in a position actively to drive computer deployment. Deployment occurred through private means, NGOs or the donor community. This situation has seen a dramatic change.

The largest computer project is that in Gauteng Province, where the Provincial Cabinet, as part of its Blue IQ project to develop the infrastructure for a 'smart' province, has earmarked R500m over the next four years to place computers in all the schools of the province.

Next in size is the Khanya Project of the Western Cape Education Department, the budget for which is also in the hundreds of millions. This year Khanya hopes to spend some R40m in the first phase of rollout.

Apart from these two major projects, other large-scale provision is being undertaken largely by parastatal and private sector involvement. This includes Thintana/Telkom in the Northern Cape, MTN in Mpumalanga, KwaZulu-Natal and the Northern Province and Scope in the Northern Cape and Mpumalanga.

Donor agencies such as FINNIDA, Australian Aid, DFID and USAID have all contributed.

Mention must be made of the cost-intensive deployment of laptop computers in some of the independent schools in the country. While the high cost of this experiment precludes a wider rollout, it is an interesting experiment of integration of computers into the curriculum and deserves careful appraisal.

In the field of teacher education, the Shoma Project of Multichoice is an example of a project based at a number of teacher centres that use satellite technology to transmit interactive courseware developed in collaboration with various units in the higher education sector.

In the field of content delivery, a host of players are already active. These range from web sites that serve as portals to other parties' information across the entities such as the Learning Channel, that are generating their own courseware.

Much work on interactive tuition is occurring in the higher education sector, but a description of this field lies beyond the scope of this document.

The above listing is not comprehensive nor does it constitute an evaluation. It serves rather to indicate the variety of players in the field, and raises the questions of co-ordination, cost efficiency, sustainability, standards and effectiveness. These would all need to be addressed in strategic planning.

### 3.3 Some international experiments

The dominant model of computer deployment in schools is that of the computer room. Integration of the technology into the classroom is still the exception rather than the rule. The computers usually sit in rows on a work surface and the learners sit one to a workstation in front of them.

If there is one lesson that is clear from the evolution of this technology, it is that change is rapid and the features available for unit cost keep dropping. The next phase of technology development points towards lower-cost portable devices as the likely area of growth.

The two examples that follow serve to indicate some of the alternative models that are being tried out abroad.

#### MALAYSIA - SMART SCHOOL

A Smart School is a learning institution that has been systematically reinvented in terms of teaching-learning practices and school management to prepare students for the information era. The objective is to create a new generation of creative and innovative Malaysians who are able to use new technologies efficiently in accessing and managing the wealth of information arising from the information age. The Smart School application is not confined to the introduction of IT and multimedia in the learning and teaching process, but is also a catalyst towards creating and implementing a more effective education delivery process.

Five key strategies for the implementation of this initiative have been identified:

- provide for all-round development with provision for individual abilities
- emphasise intellectual, emotional, spiritual and physical growth
- produce a technologically literate workforce that can think critically, encourage thought and creativity across the curriculum and apply technology effectively in teaching and learning
- democratise education, offering equal access to learning opportunities and accommodating differing learning abilities, styles and pace.

The project will also strive towards enabling students to perform in a global environment.

## USA SMART-CLASSROOM

The smart classroom is a research centre, which will share an electronic infrastructure, expertise and resources in technology and academic subjects. It will also serve as a technology instruction tool for education students. This type of technology requires some space and time to master it. The smart classroom gives teachers the opportunity to learn the technology in a non-threatening situation in which they can make their own mistakes and correct them.

One of the features of the smart classroom is an airport hub that allows 10 laptop computers to run wireless from one Internet connection. One application of this wireless technology is the Mobile Cart program. This program will feature 20 wireless laptops on a cart, connected to two airport hubs; it can be rolled into any classroom so that instructors can use the Internet to teach wherever they are.

### 3.4 At what cost, and who pays?

There is much debate on the actual cost of placing computers in schools. Some independent and well-resourced public schools have solved the problem by passing the cost onto the parents or have persuaded the private sector and donors to assist. It is not clear from that quarter what the full cost might be, but what is clear is that such schools must invest in order to retain parental support.

In referring to cost, it is often the case that parents and planners think only of the cost of hardware. This is actually the smaller part of the total cost of ownership (TCO). TCO combines all costs - infrastructure, hardware, software, physical and software security, maintenance, upgrades, training, telephone costs, subscription fees and so on. TCO then provides a benchmark of so many Rand per workstation per year.

There are two ways of estimating TCO. One is a "back of envelope" calculation; the other is work through the calculation item by item. In both cases the calculation is sensitive to the choice of hardware and the level of use. A critical element that is not included in TCO is the cost of software development.

#### *Back of envelope*

A very simple way of estimating TCO is to base the estimate on the typical cost of accessing the web at an Internet café, namely R20 per hour<sup>3</sup>. If one assumes that half of this is profit, then the actual cost could be around R10 per hour. The next estimate is the usage in a typical school, which might be around 6 hours for each of the 180 days of the school year. One thus obtains a measure of annual TCO of some R10 000. This figure excludes the cost of training, consumables and software, but it does provide a very useful measure.

#### *Detailed costing*

Cawthera has carried out a detailed study of the cost of various options that are available to education departments, ranging from a basic provision using re-furnished machines to deluxe versions with top-of-the-range fast PCs. His estimates for TCO range from \$1000 to \$2000 per workstation.

The two approaches to TCO give comparable estimates that serve to indicate the resources that will be required to connect schools and maintain effective utilisation of the ICT equipment. Therefore, a detailed cost analysis is required.

<sup>3</sup> KAHN, M.J. (2001)  
Unpublished report  
on the AfSEDNe  
process

## 4. STRATEGY FOR INFORMATION AND COMMUNICATIONS TECHNOLOGY

### 4.1 Precursors

The Technology Enhanced Learning Initiative (TELI)<sup>4</sup> of 1997 provided a first set of guidelines regarding the role of ICT in education. The report served to create awareness of the potential of the various technologies and drew on international experience in highlighting the associated pitfalls. The report argued for the integration of ICT into the teaching and learning environment and in particular offered the advice that education principles should shape the choice of technology.

Regrettably, education principles rarely shape the business environment and there is evidence (globally) that technology is often implanted into education communities with little thought given to the consequences. The dictum 'don't re-invent the wheel' seems to apply in an automatic way. The computers arrive, installation is completed, the ribbon is cut, and the door locked. A more appropriate dictum, 'don't re-invent the wheel, choose the correct one' would be better advice.

The TELI report served as the basis for further consideration of what type of ICT deployment might work best in our environment, hence the SAIDE<sup>5</sup> feasibility study on a dedicated educational broadcasting channel. For the present such a service will not be implemented. Instead, an informal education network held together by the Internet will be the means of linking the myriad educational institutions.

At the time of these studies, the majority of 'wired' schools were in the independent or former Model C sectors. With the major PDE interventions now underway, this skewed distribution is set to shift dramatically.

### 4.2 The intended outcomes

The Ministry of Education has set out the norms and standards for an outcomes-based education system. The first and largest component of this comprises Curriculum 2005, which has recently undergone a comprehensive review in terms of scope, sequence and specification. The means of holding the curriculum together is provided by sets of assessment standards for each learning area and layered by grade. The widespread introduction of computers in schools should support Curriculum 2005.

Beyond the formal curriculum, the introduction of computing technology is part and parcel of making schools the centre of community life.

The fact of the World Wide Web, with its standardized communication and hosting protocols, eliminates the need to concern ourselves with the old bugbear of interoperability.

At the highest level then, the Ministries seek the following outcomes for this strategy:

- All schools will possess a means of telecommunication (landline or cell phone)

<sup>4</sup> TELI  
<sup>5</sup> SAIDE

- With rare exceptions, all schools will have at least one Internet-linked computer for administration and support purposes.
- Schools will have access to Internet-linked computing facilities for learner and educator use.
- At the end of the Foundation Phase, all learners will have used computers in the acquisition and enhancement of their numeracy and language skills.
- Learners and educators will have basic competence in the use of word processing, spreadsheet, flat database, e-mail, and web browser applications.
- Learners and educators will have used a host of user-machine interfaces, including keyboards, touch pads and other devices.
- Where practicable, computer facilities will be utilised out of school hours by the school and wider community, with cost-recovery as appropriate.
- Educational software will comply with the Curriculum 2005 assessment standards
- The Department of Education portal, Thutong, will provide access to a host of curriculum and support material.

These outcomes are deliberately open as far as the specifics of technology are concerned. This is necessarily so, as there are major developments underway in the fields of voice recognition and translation. It is already possible to create word-processor documents using commercial software that recognizes the major Western languages, so that keyboard skills may in time become less important. The University of Stellenbosch hosts one among a number of local projects that are developing the same capability for our national languages alongside simultaneous translation. These developments have considerable implications for the education process, especially in as far as multi-lingualism is concerned. These emerging technologies also hold out promise for learners with special educational needs.

### 4.3 Strategic objectives

Each outcome will be attained through the fulfilment of a number of objectives, which are sketched out below.

#### 4.3.1 Basic connectivity

The Department of Communications will seek to ensure that all schools are on the telephone network. This objective is necessarily dependent upon access to power and the deployment of the telephone networks by the licensed operators.

The Department of Education, in collaboration with the Department of Communications and other role players, will ensure that all schools, teacher centres and district offices are 'wired'. This expenditure should be on budget as the demands are met.

The necessary agreements for the e rate should be implemented with the licensed operators. This subsidy might be extended to include provision of a 0860 dial-up facility.

Departments, after evaluation, could take advantage of the various offers of free school administration and accounting software that are being made by the local software industry.



### 4.3.2 'Wired' schools

One of the key tactical decisions for the provincial departments is to decide upon which schools should be initially equipped with a set of computers. This choice will depend on a number of factors such as location, availability of space and management capabilities.

The 'Computers in Schools' study provides a pointer with regard to the possible focus of rollout, namely to concentrate on the middle layer of schools (diagram 1). This makes sense, given that the top two layers are already 'wired' or on the way to becoming fully 'wired'. The 6500 schools in the middle layer have been identified as having the necessary facilities to host a computer laboratory and would present the best immediate chance of successful implementation. Bringing these 6500 schools and 2000 better-resourced schools onto what might be called the Education Network would be no mean feat. It is expected that the 102 Science and Mathematics Focus Schools will be included in the first wave of implementation.

A key issue that drives cost sustainability will be the usage that each workstation receives. With careful management, this might reach 10 hours a day, especially with outside use by fee-paying clients.

Decisions on hardware choice rest with the provincial departments: refurbished computers using shareware do offer the possibility of wider dissemination. This choice must be weighed up against the problem of incompatibility with curriculum-specific software, which may require more powerful machines.

Together with the provision of similar facilities at teacher centres, an environment would be in place in which a significant number of learners, predominantly in the secondary schools, would benefit along with their educators.

Thus far the emphasis has been on learners in schools. Subject to demand and the necessary management, school-based computer facilities should be available in support of the needs of adult basic education and adult literacy. The working figure that computers be used 6 hours a day for half the calendar year suggests that better utilization to meet the urgent ABET needs could be possible.

The evolving Education Network therefore supports the vision that schools are to be the hubs of community life. The multi-purpose community centres (MPCC) might also form part of the network. In time, this network might evolve to a private wide area network administered for government.

### 4.3.3 Curriculum objectives

In the initial stages of deployment, it is likely that the acquisition of basic computer literacy will be the main objective of learners and educators. Realistic expectations must be set regarding the amount of time that individuals will be able to have on-line, not so much because of the cost of connectivity, but because of the need for all learners at a school to have their turn. Schools might set their own targets for the attainment of levels of competence that would meet the overarching outcome that learners leave the compulsory stage of schooling feeling confident about the technology.

The immediate beneficiary of the technology would be educators who have the opportunity to download curriculum materials, to create their own materials and to interact with their peers within the country and abroad.

In parallel with the deployment of facilities, the Department will develop and set out design and assessment standards for educational software. These will serve as guidelines for those seeking to publish software for purchase by departments in much the same way as currently applies to text and other material. The intention would be to ensure education quality and thereby reduce rejection rates.

The Department of Education home page could serve as the entry point for an education portal that might be named Thutong ( 'place of learning' in Setswana). Thutong would host a range of materials and could include password-protected areas for the use of educators.

It is likely that departments will find the need to set some criteria in respect of the use of these facilities for personal purposes, as has been the case in other countries.

#### 4.3.4 Educator development

The area of educator development presents a massive challenge to the authorities. Indeed in-service education for 80 hours per year is part of the conditions of service. Providing this to the more than 300 000 educators calls out for a distance education model. Within the 300 000 are at least three major sub-groups. There are those who are under-qualified; those who are qualified but are teaching without the necessary pedagogical content knowledge; and the bulk of teachers who require induction into the new model of Curriculum 2005. The Internet has a special role to play in meeting this need.

Consideration is being given to the development of courses that will both prepare educators for the new learning areas of Curriculum 2005 as well as to provide them with exposure to computer literacy as the very basic management skills needed to keep the computers up and running.

In parallel, there is a need to ensure that the new generations of teachers emerge from higher educational institutions with an understanding of how to incorporate and use ICT in their school teaching. This in turn would imply that their higher education experience would take place in a congruent environment.

The introduction of ICT into the learning process will fundamentally change the role of educators and the way schools are run and administrated. Educators will increasingly play the role of guiding learners in self-learning/study, data sourcing and analysis and other computer-based learning projects.

#### 4.3.5 Research, evaluation and innovation

The introduction of ICT in schools and its impact on the learning and teaching environment will require ongoing research and evaluation to guide further policy and strategy. Project design should therefore include a budget for research and evaluation so that benchmarks may be established

before implementation starts. Funding for research on innovative practice and international pilots will be required.

It will be important to participate in international ICT in Education networks, especially those concerned with the use of ICT in support of gateway subjects such as science and mathematics.

#### 4.3.6 Advocacy and support

The government recognises the importance of bringing ICT into education. This strategy document outlines the issues and approaches deploying computer technology. The government acknowledges that the task is one that must be approached through partnerships among various government departments, the private sector and donors. For this reason, the major players have been brought together as the ICT in Education Forum.

The Forum is constituted as a sounding board for the government and will assist with

- Targets and focus areas for intervention
- Co-ordination of projects
- Resource mobilisation
- General advice and networking



## 5. FUNDING

### 5.1. The need for funding additional investment

The Ministry of Education is realistic about the fiscal constraints affecting the government. Investment in ICT for schools cannot be the sole responsibility of the government. Investment from industry and business, as well as from other sources, will be required to augment government contributions.

Future investment in the system will be directed towards:

- secure infrastructure at schools for ICT equipment
- curriculum innovation
- ongoing professional development
- electronic and on-line learning support material
- student support services

Funding is dependent on the technology to be deployed at the point of implementation. Although this would vary from site to site, an equitable final solution would be implemented at all schools. This will obviously change as technology evolves.

### 5.2. Sources of funding

#### 5.2.1. Departments of Education and Communications

The Departments of Education and Communications will play a central role in co-ordinating the mobilisation of additional resources. The Department of Communications will facilitate access of education institutions to adequate telecommunication and alternative infrastructure for connectivity to the network.

#### 5.2.2. Provincial Departments of Education

The provision of ICT equipment, like other learning support material, should in the medium to long term be incorporated into the capital expenditure of provincial budgets. In the planning of new school buildings, the provision of ICT should be considered as part of capital expenditure.

#### 5.2.2. Public-Private-Partnerships

There are a number of private companies, local and international donor agencies that have committed funds to education. More recently there has been a growth in support of developments in the ICT area. Through this strategy, additional resources will be mobilised and co-ordinated from a central point to ensure equitable distribution of resources to the most needy areas of the country.

## 6. CONCLUSION

This strategy lays the basis for an ICT revolution in our schools. Its success rests upon a foundation of partnerships that will lead the implementation plan. Through collaborative efforts, the quality of learning and teaching in our schools will be enhanced. Combined efforts and other initiatives in education will truly turn our schools into centres of excellence and answer the question posed by President Mbeki at his first Cabinet meeting: “Is our education system on the road to the 21st century?”



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DEPARTMENT OF EDUCATION

**Mr T D Mseleku**  
**Director-General**  
**Department of Education**  
**Private Bag X 895**  
**Pretoria**  
**001**  
**Tel: (012) 312 5911**  
**Fax: (012) 321 6770**  
**<http://education.pwv.gov.za>**

**Mr A Ngcaba**  
**Director-General**  
**Department of Communications**  
**Private Bag X 860**  
**Pretoria**  
**0001**  
**Tel: (012) 427 8167**  
**Fax: (012) 427 8546**  
**E-mail: [mthobeli@doc.pwv.gov.za](mailto:mthobeli@doc.pwv.gov.za)**



Department of Communications