CHAPTER EIGHT
An Educational Technology Network for South Africa

INTRODUCTION

In chapters six and seven, we have presented a wide range of ideas and arguments about appropriate applications for educational technologies in South Africa. Below we consolidate this into an integrated vision for establishing an 'educational technology network' in the country. The concept of a network- rather than an educational broadcasting service – has already been introduced in chapter seven. From this point on, we will use this term to describe a technology system that incorporates broadcasting technologies, but also extends beyond them to include a full range of information and telecommunications technologies. The descriptions below incorporate a summary of our key arguments in chapters six and seven, but also extend these arguments as we move towards an understanding of appropriate organizational structures and partnerships to implement the proposals contained in this report.

A MULTI-PURPOSE NETWORK

In essence, we propose that government establish an educational technology network, which incorporates four core functions:

- Content acquisition and dissemination;
- Communication;
- Administration and management;
- Network rollout and maintenance.

This should not be taken to mean that government requires four new agencies (or a single new consolidated agency) to support these functions. One of the key strengths of the arguments presented in previous chapters is that they take into account the realities of what is already happening in South Africa, and seek to propose interventions that build on these initiatives. Nevertheless, each core function is described briefly below.

CONTENT ACQUISITION AND DISSEMINATION[1]

The origins of this report are located squarely in the field of educational broadcasting, and for this reason our deliberations have focused first on the field of educational broadcasting and particularly educational use of radio and television. Nevertheless, consideration of the possibilities offered by technological convergence indicates quite clearly that this conception has become untenably narrow. Particularly when used in combination with telecommunications technologies, broadcasting technologies can be effectively used to

[1] In our use of the term 'acquisition', we do not simply refer to buying resources. There are many ways of acquiring the resources required for any educational process, ranging from purchase of off-the-shelf packages through adaptation of existing resources to commissioning or production of new resources. Appendix sixteen provides an illustrative example, using television/video, of different strategies for acquiring content.

distribute a wide range of multimedia resources that can be accessed in different ways be educators and learners at teaching and learning sites. This trend is set to gather momentum as technological convergence is completed and as the spread of digital technologies takes effect.

For this reason, it is important to be very strategic in the investments that are made over the next five years. In this vein, we have argued that one of the most commonly considered interventions recently – the establishment of a dedicated terrestrial broadcasting channel (probably a television channel) – makes neither educational nor financial sense. Its biggest weaknesses are:

- Given the narrow range of educational applications for traditional terrestrial broadcasting technologies, a dedicated channel encapsulates a weak educational model, characterized by inflexibility and passivity in terms of learner engagement.
- A dedicated channel will add new costs to the national fiscus, without incorporating any obvious business models to support it.
- Educational broadcasting placed on a dedicated channel runs a distinct risk of 'ghettoization'.
- A dedicated channel will struggle to have impact, as this intervention will channel funding away from the most critical systemic problems dogging the educational system currently, namely poor administration and management at local, regional, and national levels, under-prepared and unmotivated educators, and absence of effective management information necessary to plan effectively.
- Given the transitory nature of broadcasts, a channel dedicated to broadcasting television or radio programmes creates several limitations educationally, while using it as a distribution mechanism for video or audio resources is unlikely to achieve necessary economies or scale in the short-to medium-term.
- Infrastructural deficiencies in terms of electricity, reception equipment, and physical security mean that very few sites of teaching and learning would have immediate access to educational broadcasts.
- Possibly more than any other technological intervention, a dedicated educational broadcasting channel carries with it a very strong perception of being implemented to perform the functions of educators rather than to support their work, particularly in contexts where teachers already feel insecure.
- It will be difficult and expensive to secure sufficient high quality content to fill an entire channel.

We argue that it makes more sense to harness broadcasting technologies – particularly satellite technologies – to secure large-scale bandwidth for distribution of a wide range of digital resources of different media formats throughout the education and training system. This requires significantly lower capital investments than a dedicated terrestrial channel, and can grow incrementally as demand requires. In time, the system may use sufficient bandwidth to secure full-time use of that bandwidth, in effect creating a 'dedicated' channel. Because, however, this bandwidth will be used for distribution of all kind of media resources, not just audio and video resources, it is unlikely ever to be branded as a channel. More important will be branding the dedicated 'service' of distributing resources of many different media throughout the education and training system. In the short- to medium-term this might take many different forms, some of which are summarized below.

Ongoing Roles for Radio and Television

Notwithstanding clear trends of convergence in functionality of information, telecommunications, and broadcasting technologies, there will remain a vibrant and distinct

terrestrial broadcasting sector in South African communications for the foreseeable future. We propose that the SABC television and radio services continue to 'nest' a range of educational and educative programming within existing channels and stations as they do currently, expanding and augmenting these services as money becomes available to do so. Thus, while there is a growing focus on supporting structured education, in areas such as schooling and adult education, there is also a wealth of informal educative programming on both radio and television that harnesses many of the greatest potential strengths of educational broadcasting. SABC Education already conducts extensive planning exercises to determine appropriate focuses for its new educational broadcasting interventions, and the reports of these planning processes (available from SABC Education) outline in detail specific educational applications for broadcasting within such an environment. We envisage a continuation of these basic educational applications, with attention focusing on creating a more stable operating base for educational broadcasting within the overall public broadcasting system.

Thus, as one core contribution to the acquisition and dissemination of high quality educational resources, we believe it is important to consolidate the current role of the public broadcaster, with a particular focus on the roles of the two central units responsible for educational radio and educational television respectively. The consolidation of these roles would entail judicious expansion of investment in the work of these units and ensuring that their role and scope is protected as the SABC operates within an increasingly competitive broadcasting environment and is forced to commercialize more elements of its services to reduce its dependence on the national fiscus.

In terms of public educational television, privatization of SABC 3, combined with ongoing bolstering of the revenue-generating potential of SABC 1, provides the best option for a 'nested' educational broadcasting service. This would obviously then be bolstered by cross-medium advertising between radio and television, a strategy already employed that is likely to grow as the benefits of creating a new merged unit start to take effect. This option may also be more attractive overall in terms of privatization, as it will allow the SABC to build new advertising markets over time, rather than being expected to be able to exploit them immediately. Given the current profile of advertising planners, who tend to prefer exploiting tried and tested markets rather than taking significant risks, this may be a more financially stable privatization scenario overall. From an educational perspective, the key requirement will be to ensure that, as SABC 1's revenue generation potential increases, educational television does not suffer the consequences of reduced airtime, particularly during prime time. For this reason, strategies to secure air time for educational broadcasting (on television and radio) will need to be part of the overall organizational model, as we describe in more detail in chapter nine.

In the case of radio, the broadcasting considerations are somewhat different, although educational radio is also significantly pressurized by the current drive towards financial self-sustainability within SABC. While this drive is necessary given the need to ensure a sustainable public broadcaster, educational radio usually finds itself under the greatest pressure given the difficulties it faces in attracting advertising revenue. Lessons learned by the SABC's central educational radio unit are useful in this regard. First, educational radio works most effectively at a regional or local level, integrated into a more general radio channel. As experience has demonstrated, the best time for educational radio is not necessarily traditional prime time. This is because listeners are much more inclined to be busy at these times, keeping a radio on in the background and unable to pay particular

attention to programmes. Thus, better quality audiences for many educational programmes are often found at off-peak times, which reduces the pressure to cut such programmes. Second, we believe that the only viable model for educational radio in the long-term is to maintain a central coordinating function, which takes responsibility for planning overall strategies and for securing funding for educational radio.

We believe that the above approach to creating public educational broadcasting services has several strengths. In brief, these are:

- Given the fairly narrow range of educational applications for traditional broadcasting, educational television and radio (particularly educative programming) both work most effectively when integrated into a balanced and diverse channel or station programming schedule.
- A 'nested' educational broadcasting service can be spread out across a range of channels and stations, which is critical if educational broadcasting is to reach the widest possible audiences.
- Integrating radio and television services creates significant opportunities for cross-medium advertising, as well as for educational campaigns and interventions.
- A 'nested' service requires no large-scale additional up-front investment in new infrastructure.
- This approach is attractive because it requires significantly smaller investments by national government in educational broadcasting, particularly as much of the income required for educational broadcasting can be secured from broadcasting itself.
- While space does need to be created for educational programming that, given its specialized nature, will never be able to attract such large audiences, educational programming has to compete more directly with other forms of broadcasting using a 'nested' service. This raises the public profile of educational broadcasting, while specialized niche-oriented educational programmes also benefit from cross-pollination of this commitment to quality.
- This approach ensures that South Africa builds on the educational broadcasting expertise that has developed over the past few years within the SABC.

A 'nested' educational broadcasting service covering both educational radio and television provides an educationally more effective and financially more sustainable solution than a dedicated educational broadcasting channel. It allows the education system to harness most effectively the educational power of both radio and television, in support of a wide range of formal and informal educational interventions. Despite this, it raises several challenges, most notably:

- How best to link the service to opportunities created by converging technological capabilities;
- The range of support strategies needed to run the service effectively;
- Strategies to finance the service; and
- Appropriate organizational models for the service.

In addition to the above, there are various possibilities of legislating for educational broadcasting across the full spectrum. We believe that the most viable is to use a portion of the licensing fee paid by private broadcasting channels and stations – including any privatized SABC channels – to make financial contributions to the sustainability of educational broadcasting on the public broadcaster. Beyond this minimum role however, it is worth considering what further roles the private sector might be encouraged to play with regard to educational broadcasting and whether limits should be set on this. There is little

experience to suggest that attempts to centralize control of initiatives by forcing the private sector to contribute only to a public sector-driven process will improve the educational impact of these interventions. It is more likely to lead to political contestation and private sector disenchantment with any involvement in educational broadcasting. In addition, we believe that models of successful and sustainable cooperation between the public and private sectors in educational broadcasting have been evolving in South Africa over the past five years. Consequently, we believe that more effort should be put into reaping the benefits of negotiating these kinds of partnerships.

Using Converging Technologies to Develop and Distribute Digital Resources

It is not the purpose of this report to debate the merits of convergence. We do, however, believe the following points are worth noting:

- Convergence is an evolutionary not revolutionary process;
- At technology and network levels, convergence is already a reality; and
- There is lack of clarity about how much demand there might be for services in a converged technological environment.

Our proposals below draw strongly on these three points. For this reason, many aspects of the proposals do not relate specifically to harnessing the potential of convergence *per se*, but rather to exploiting various technological trends evolving as this process takes effect. In many cases, this will continue to include fairly traditional uses of technologies (as has already been illustrated in the discussions of broadcasting in chapter six), but the underlying theme will be to prepare South Africa's education and training system to evolve with the evolutionary process of technological convergence by putting in place technological infrastructures that can evolve with it.

We propose that educational broadcasting investments, as summarized above, be augmented by judicious investments in open and flexible computer networks that will link a wide range of teaching and learning sites in the country. In this regard, we envisage the system harnessing the potential of a range of satellite, telecommunications, and information technologies to provide various forms of support to different elements of the education and training system. One of the most immediately obvious strengths of Internet technologies in a converging environment is the capacity to provide immediately up-to-date resources to large numbers of learners easily and relatively cheaply (whether one is using the Web or e-mail technologies). Changes made to resources can become immediately available to students without incurring major additional distribution costs.

Likewise, communication resources can be distributed more often, thus reducing costs of ongoing communication by educational providers. Internet technologies also support use of resources that combine more than one medium. Internet technologies can also provide educators with a range of very interesting opportunities for creating resources that allow learners different levels of interactivity. Of course, this can quite easily be used poorly by educators but it can also lead to the creation of interesting and exciting interaction for learners with educational resources.

We believe a key strength of harnessing converging technologies is that it allows slower growth in use of resources being delivered using such platforms. Such resource delivery mechanisms generally grow quickly, but off a low base, making it unaffordable to maintain the infrastructure to the point where it can achieve economies of scale through mass use. The costs of rolling out this infrastructure can be offset by applying such technologies in a range of innovative ways, as is illustrated in the following section, thus allowing evolutionary

growth in use of the system for resource delivery and other similar educational functions to take place over five or six years..

The following examples simply describe a few possible applications of such a network. Each of these ideas is based on supporting the work of existing projects, most of which are struggling with the problem of rolling out network infrastructure on the scale they require. Thus, the intention of the above descriptions would be to consolidate expenditure on the basic technological backbone, while providing each project the space to continue to operate as is currently intended. There are no doubt many other initiatives or applications similar to those described below for which this network might be relevant.

- *Supporting schools* – We believe it is possible to use Internet technologies to facilitate large-scale transmission of web-based educational content to support teachers and learners in classrooms. From a resource delivery perspective, there are several web-based content development projects focusing on schools under way,[2] and these resources could be circulated through the system for use by teachers and/or learners. More detailed ideas about using Internet technologies in schools are provided in appendices five and six.
- *Mass literacy campaign* – Large-scale rollout of Internet technologies could enable a range of adult literacy projects to begin to share their resources and then to participate in resource development projects where these projects are shared between different projects. Resources could, in the first instance, be developed for printing by adult educators in learning centres, but there may also be longer term possibilities for developing web-based content for use by learners themselves. Because many such programmes are located in industry and commerce, there are better opportunities for providing larger scale access to computers for learners than is likely to be possible in the school sector.
- *Telemedicine* – The Department of Health is currently investigating the potential of using telemedicine in South Africa. This involves, amongst others, use of Internet technologies to support delivery of electronic resources to remote areas.
- *South African Police Service (SAPS)* – SAPS has recently completed a first phase of strategic planning around how to harness educational technologies successfully to support professional development of the police force. While there is not yet certainty as to what precise applications there will be for technologies such as those described above, there appears to be broad commitment to making investments in a technological backbone such as that described above to support delivery of education to the police.
- *Supporting distance education* - many educational providers using distance education providers are already exploring use of technological networks to support distance education through the delivery of online courses and educational resources.

COMMUNICATION

Communication is a vital element of any educational system, whether this communication is between educators and learners or supporting the smooth running of the system itself. Converging technologies have massively expanded human capacity to support a range of communication strategies, especially easy asynchronous communication between people across small or large distances. Thus, students can post queries or ideas to educators, who can then respond at later times. Where appropriate, this communication can be extended to include groups of people rather than just individuals. Of course, this is not intended to

[2] Examples of organizations involved in such projects include the Learning Channel, the Shoma Foundation, the University of the Western Cape's Botany Department, St Alban's College's Tecsas Project, and Cyberschool Africa.

suggest that such communication can replace face-to-face contact; however, it can be harnessed very effectively for a range of educational purposes.

In terms of educational systems, a major component of this strength is the capacity to support the many requirements for communication to ensure the effective management and administration of the system, many aspects of which are currently dysfunctional in South Africa. Cheap, easy, immediate communication opens significant new opportunities for circulating information through education systems (whether the system is a single university or a national schooling system), not least at administrative and management levels. This becomes particularly important in an environment where extensive and rapid change is underway, which, as our descriptions in chapters one and two demonstrate, is currently the norm in South Africa. Most importantly, cheap communication systems ensure that communication can travel in any direction through a system, rather than simply consisting of communiqués from higher levels to lower levels within a system.

For this reason, we believe that an educational technology network has a crucial role to play in supporting these many forms of communication. A major advantage of technological convergence is that the same basic technological investments can be used to support both communication and delivery of digital resources as described above. The following are some specific examples of where the communication functionality of these technologies might be applied:

- *Supporting schools* – At the same time as current communication systems are not sufficiently efficient, they are also very expensive, relying as they do on physical circulation of large quantities of paper, much of which never reaches its intended destination. Convergence of telecommunications and broadcasting technologies can build communications capacity – in both directions – through the full schooling hierarchy; national-provincial-district-school. It can do this by providing e-mail facilities to every school in the system, allowing large-scale delivery of communication to schools, as well as creating return pathways for schools to communicate back up the chain, amongst each other, or with key educational support agencies. Teachers and administrators will be able to communicate with the people and organizations engaged in resource production.
- *Mass literacy campaign* – Large-scale rollout of Internet technologies could could establish communication networks between all of the agencies currently providing adult literacy programmes, enabling better coordination to evolve without centralizing control. This could enable establishment of simple, but crucial, support mechanisms for adult educators, such as ongoing listserv discussions and e-mail circulation of case studies of successful practice.
- *Telemedicine* – The Department of Health is currently investigating the potential of using telemedicine in South Africa. This involves, amongst others, use of Internet technologies to support ongoing communication – often in real time – between health practitioners located around the country and around the world.
- *Supporting distance education* - many educational providers using distance education providers are already exploring use of technological networks to support distance education. A key element of this involves bridging the gap between geographically disparate students and educators, enabling much higher levels of interaction than have to date been possible in South African distance education systems.

ADMINISTRATION AND MANAGEMENT

The third core function of an educational technology network would be to support administration and management of education. This would involve various of the communications functions outlined above, but also includes another major component. The rapid growth in functionality of Internet technologies opens possibilities for building and exploiting information bases in ways that were simply not possible even two or three years ago. Nevertheless, hardly any organizations or systems in South African education and training have yet devised strategies for harnessing these trends effectively to the general benefit of education and social development, indicating clearly that their real potential is not yet well understood.

To harness these benefits, it will be necessary – at both systemic and institutional levels – to invest financial and human resources in:

- Establishing the types and combinations of information needed to support teaching and learning environments, target learners, and strategies for making this information accessible to all learners;
- Developing appropriate conceptual frameworks for computer-based management information systems; and
- Designing electronic database architectures that can be used to organize, store, and allow for multiple uses of information.

We believe that this has some important immediate applications in South Africa, particularly in terms of building the capacity of certain systems to administer themselves effectively. Two illustrative examples are provided below:

- *Supporting schools* – administration of schools requires urgent improvements if the massive investments made annually in the schooling system are to be deployed productively. We believe that it is possible to locating web-based database applications on network servers to which individual schools gain access via cluster hubs. These applications can provide four basic modules for schools initially:
  - A simplified timetabling package;
  - Simple student and teacher record-keeping systems (linked to the timetabling system);
  - A basic accounting package; and
  - A basic resource administration package.

  Because data from this system will be stored on network servers around the country, it will be possible to turn this system into a national data warehouse for schools. This can enable the system to perform a range of functions over and above those micro-level functions described above. For example, it will become much easier to determine which schools do or do not have timetables ready by the beginning of the school year, either locally, provincially, or nationally. Likewise, it will be possible to require schools to submit accounts, which can then be easily checked at provincial level.

- *Supporting the South African Qualifications Authority (SAQA)* – Internet technologies can be used to facilitate gathering of information on learners that will be required by the SAQA for its National Learner Records Database (NLRD). Two major problem areas for SAQA in this regard are schools – particularly at the primary level – and adult literacy learners. Decentralized information-gathering strategies can make a major contribution to SAQA's efforts to maintain an NLRD (which is already in advanced stages of design).

The above examples contain powerful financial arguments in favour of the roll-out of large-scale access to Internet technologies, and can also easily leverage greater efficiencies out of the schooling system in a reasonably short time. For this reason, we turn our attention to understanding the final function, which aims to make the first three functions possible.

NETWORK ROLLOUT AND MAINTENANCE

The concept of an educational technology network implies a need to roll out technological infrastructure on a large scale. In brief, we propose judicious investments in networking teaching and learning sites (including schools, adult learning centres, health clinics, multi-purpose community centres, and a range of other potential sites) around cluster hubs. Via a wide area network, these hubs will provide access to network servers for the teaching and learning sites connected to them. They will provide connected teaching and learning sites with the full functionality of a distributed computer network, including access to web sites, e-mail facilities, and centrally stored database systems. We anticipate that this distribution network will be connected nationally via a combination of satellite bandwidth, telephone lines, and wireless technologies. Each network server will be equipped with the hardware capability to serve its teaching and learning sites as if they were thin clients. This will provide individual teaching and learning sites with maximum flexibility in terms of deciding what equipment they wish to use to connect to the network. Some may use expensive, new Personal Computers (PCs) or Apple Macs and others cheaper, refurbished equipment. Still others may use much simpler equipment as it is developed (for example, a television set and a set-top box).

This flexibility will be facilitated by ensuring that everything that is sent via satellite to the cluster hub is developed using Internet protocols, which will ensure that all engagement by individual sites can take place using web browsers. Additional computer functionality can then be achieved by adding greater capacity to individual teaching and learning sites as this becomes affordable. For example, an adult learning centre may start with a computer with a 486 Central Processing Unit (CPU) and limited Random Access Memory (RAM), using this only to allow e-mail exchange and use of nationally created database systems. Over time, however, it may wish to expand this use by installing word processing or spreadsheeting software onto this computer to support various administrative and educational planning processes. It may then get to the point where it desires to use computers to support learners directly, and finds money to invest in a thin client network with 30 terminals, thus creating a small computer laboratory. Thus, it replaces the PC with a thin client network, using the network server to connect to the national distribution network. The system will facilitate this type of scaleability with ease, as well as allowing different hardware platforms (in this example, a PC and a thin client network) to connect to the same national system using Internet Protocols. As the individual site expands, it loses none of the functionality of its previous platform.

If this vision is to be achieved three elements will be critical:

- *Coordinating the rollout of the network to the benefit of education* – Given the way in which various telecommunications systems have developed internationally, this network infrastructure will not ever belong to one single agency; it will be the sum of the parts of different systems owned by different agencies. However, it is critical to know whether or not these different elements provide the system with the technological capacity required to use the network for the desired purposes. What will also be common amongst different

elements of the system will be a desire to secure this networking capability at the lowest possible capital and recurrent costs and with the least possible maintenance requirements. For this reason, it is critical that the network is rolled out and managed as a coordinated exercise, taking into account the particular needs of different aspects of the system. In this is not done, the network will evolve disparately and in a fragmented fashion, making it more expensive and less effective.
As importantly,

- *Maintaining the technological infrastructure* – A key component to the above is ensuring that all elements of the system are functioning and maintained effectively. This maintenance function involves not only ensuring that equipment is working effectively, but also coordinating the systemic upgrading and replacement of technologies as appropriate. Again, these services will not be provided by any single agency, but coordination and management of this function – ensuring that all agencies involved meet the obligations and that the most cost-effective service agreements are organized – will be critical to the success of the network.

- *Providing professional development support to users of the network* – Often, in technology-enhanced learning initiatives, people tend to lose sight of the fact that, regardless of the technologies used to support communication or resource provision, education remains – at its most fundamental – a process of engagement between two groups of people: learners and educators. To succeed, educational projects seeking to harness the potential of technologies have to focus clearly on ensuring that educators, learners, administrators, and managers learners are equipped to engage effectively in the teaching and learning that takes place. Thus, it will be critical to establish professional development support strategies to ensure that these groups of people are equipped with the necessary skills, knowledge, and competencies to engage effectively in any educational project using an educational technology network such as the one described above.

STRENGTHS OF THE MODEL

The model proposed above, incorporating the four core functions we have outlined, has various key strengths in addition to those already mentioned. These are:

- *Multiple applications*. Such a technological network has a wide range of applications, both in terms of the functions it can support and in terms of the different education and training sectors that might harness its potential.
- *Technological flexibility*. The technological model proposed is based strongly on flexibility and open standards. This means that investments already made can be incorporated into the network as it grows. In this way, the model does not constitute a 'new' investment in traditional terms. In many ways, it will consolidate and build on investments already made and infrastructure in place. In addition, this technological flexibility will accommodate a range of directions within different aspects of the education and training system, thus not forcing people to accept any particular constraints in deciding to connect their teaching and learning sites to the broader distribution network.
- *Linking to existing initiatives*. The proposed technological model will link a range of existing initiatives rather than constituting a single new initiative.

- *Enhancing productivity*. A central strength of the model proposed above is its capacity to enhance productivity in basic ways. We provide one simple illustration of this in chapter seven in the example of school timetables, but will also provide further examples as part of building our financial models.

CONCLUSION

This chapter has summarized the core functions of a multi-purpose educational technology network in South Africa. In this regard, we have attempted to establish in-principle functions of such a network, as well as describing some specific uses to which it could be put. Most importantly, our proposals are based on a clear understanding that these functions require targeted investments by government if the growing use of information, broadcasting, and telecommunications technologies is not to have the effect of increasing social distances between rich and poor. Thus, in terms of government's commitment to social redress and equity, we believe that specific implementation strategies are required in order to achieve the vision outlined above. The remainder of this document focuses on how to implement these ideas.