CHAPTER FOUR
Lessons in the Application of Educational Technologies in South Africa

INTRODUCTION

A critical component of any strategic planning or decision-making process is an understanding of past experiences and the lessons they hold. In the field of educational technology, these experiences provide a clear basis for identifying key issues on which the success of any effort to integrate technologies into educational projects will depend. The purpose of articulating these issues is not to submerge this study in a quagmire of unachievable principles, which effectively prevents action or implementation. Rather, it is an effort to extrapolate essential lessons demonstrated by recent local and international experience in order to ensure that future projects build on this experience rather than repeating costly and educationally pointless exercises.

Although it runs the risk of becoming over-used, a Tony Bates quotation helps to drive the point home:

> The history of education is littered with the corpses of technology-based projects that were killed because of the high operating costs, problems of adaptation to local conditions, lack of skilled personnel to operate the technologies, and lack of effectiveness.[1]

Despite the wealth of experiences both locally and from around the world on which this country can draw in planning and implementing technology-enhanced learning, it appears that we are repeating many of the mistakes that have been made in such initiatives. Thus, South Africa does not yet appear to be 'leapfrogging' mistakes made around the world as was hoped would happen, but seems rather to be emulating those mistakes. The ideas contained in this chapter provide a basis for avoiding certain obvious mistakes and building on various important lessons.

ESTABLISHING A CONCEPTUAL CONTEXT

DISTANCE AND 'FACE-TO-FACE': AN OUTDATED DICHOTOMY

The growth of distance education methods of delivery has been a key feature of education in the twentieth century, a feature which has marked South African education as much as education in any other country in the world. Initially, these methods were developed as distinctly different from face-to-face education, with the unfortunate consequence that they were usually regarded as inferior to face-to-face education methods. To most people, distance

[1] Bates, A.W. 1991, 'Media and Two-Way Communication in Distance Education' in *Distance Education: A Developing Method*, Norwegian State Institution for Distance Education/NKI, p. 1.

education has come to be seen as provision for those people denied access to face-to-face education (either because they cannot afford the latter or because circumstances demand that they study on a part-time basis), and this remains one of the two key reasons for its implementation in South Africa (the second being promises to drive down unit costs of education).

The growth of new communications technologies has, however, begun to make the notion of distance difficult to interpret, while creating a number of educationally and financially viable new means of providing education. Simultaneously, awareness is growing that elements of distance education have almost always existed in face-to-face programmes, while educators involved in good quality distance education are increasingly recognizing the importance of different types of face-to-face education as structured elements of their programmes. This trend has rendered rigid distinctions between the two modes of delivery meaningless.

This leads to an important conceptual shift. In many circles, the notion of a planning continuum of educational provision has been developed. This continuum has, as two imaginary poles, provision only at a distance and provision which is solely face-to-face. The reality is that all educational provision exists somewhere on this continuum, but cannot be placed strictly at either pole. Re-conceptualizing methods of educational provision as existing somewhere on this imaginary continuum will have the result that certain methods of provision are no longer chosen to the exclusion of others, depending on whether they are distance or face-to-face education opportunities (as currently happens in much South African education). Rather, educational providers, when constructing educational courses, will be able to choose, from a wide variety, those methods which are most appropriate for the context in which they will be providing learning opportunities.[2] Context is possibly the most important variable in educational planning, but tends also to be routinely ignored (with a few notable exceptions) when it comes to planning educational interventions.

Another major advantage of this blurring is that distance educators and face-to-face educators will turn from meaningless debates about the relative virtues of particular methods of educational provision, to consideration of the nature of learning and the educational value of a course's structure and content. Educators often find it necessary to equate particular methods of education with good quality education, in an effort to market the programmes they are offering and give them added status over programmes using different methods of provision. The notion of this continuum is free of such premature and unnecessary judgements about quality. We believe it should form the basis of any strategic planning processes undertaken to harness the potential of educational technologies in South Africa. It is vital in this context precisely because it can enable planners to remove the baggage of educational models developed for fundamentally different contexts (which continues to dog educational interventions in the country), while allowing them to draw on the lessons contained in the implementation of these models.

It needs to be made clear that no method of educational provision is intrinsically better than another; rather, the appropriateness of selecting a particular method or combination of methods is determined entirely by the context in which they are to be used, the educational

[2] This type of flexibility in strategic planning is still largely absent in African education systems, even where new interventions are being conceptualized. The tendency is still to rely on a very narrow band of educational options, most of which attempt, in some form or another, to replicate the traditional – but impossible – role of the teacher, supported by the textbook, as at once manager, source of information, curriculum organizer, motivator, and presenter.

needs they are intended to fulfil, and how they are implemented. This conceptual shift is vital in changing the structure of educational systems in South Africa. In particular, it will allow for greater flexibility and open up possibilities of collaboration, both of which are vital to an improvement in educational quality and in the cost-effectiveness of educational provision, issues of particular relevance to South African policy-makers currently.

Distance Education and Technology-Enhanced Learning

Regretfully, the simplistic use of terminology outlined above has crept further into the field of educational technology. This new trend, particularly pervasive in American educational debates, has been to use 'distance education' and 'educational technology' interchangeably or even as a single, composite term. The most obvious problem with this is that is simply an illogical inference. Educational technologies are used regularly in face-to-face educational environments, whether they be 'old' technologies like print or whiteboards or 'new' technologies like data projectors or personal computers.

More importantly, though, the use of distance education and educational technology as interchangeable or composite phrases introduces a blurring conflation of the terms, which – at least in many South African educational interventions – has led to poor quality strategic planning. In many ways, it is similar to the conceptual integration of open learning and distance education in the United Kingdom and Australia – open and distance learning – which created a real misperception that distance education was intrinsically 'open'. In the same way, many people in South Africa harnessing educational technologies think they are harnessing the benefits of good quality distance education, when, in most cases, they are simply finding technologically clever ways of replicating traditional, face-to-face educational models. Many of these projects have blazed a sad trail of failed educational technology projects (most notably in applications of broadcasting technologies to transmit lecture-style programming), wasting huge amounts of time and money. On the positive side, these experiences have valuable lessons for South Africa, so there is no reason why we need continue repeating many of these costly mistakes.

The key point here is that each educational intervention should be planned, implemented, and reviewed on its own merits, rather than forced into simplistic, dichotomous categories (such as 'distance education' or 'face-to-face education'), which set arbitrary and unhelpful constraints. Leading on from this, attempts by South African educators to harness the potential of different technologies to support their educational interventions should not automatically be regarded as distance education interventions. Technologies can be applied in a range of ways, to support an almost limitless combination of teaching and learning strategies, and it is essential to keep options as open as possible. This flexibility should form the cornerstone of all educational planning processes. South African has a diversity of people with a wide range of educational needs. There is no single teaching and learning model that will equally meet these diverse needs equally well. This point seems obvious, but cannot be stressed strongly enough, particularly given the almost innate human desire to find simple, packaged solutions to complex problems.

Given the above, the remainder of this chapter, as well as the following chapter, will focus on making appropriate educational technology choices and implementing these effectively rather than on creating 'distance education' interventions. Because we regard this as critical, we have devoted the next chapter to outlining a rigorous conceptual process for effective decision-making and planning, which has informed the technological models developed for this study. This remainder of this chapter presents some critical lessons on educational

technology use, derived from many educational experiences both in South Africa and internationally. Nevertheless, educational technology plans should be informed by an awareness of why many educational planners have increasingly been exploring the potential of using distance education methods. Hence, we begin by presenting some of these lessons.

RELEVANT LESSONS

RATIONALE FOR DISTANCE EDUCATION AND RESOURCE-BASED LEARNING

Many educational initiatives seeking to harness the capacity of educational technologies are, in some way or another seeking to draw on distance education and resource-based learning methods. For this reason, it is worth reflecting briefly on the rationale for exploring resource-based learning and distance education methods. Whether consciously or unconsciously, attempts to make use of distance education methods and resource-based learning by various educators in South Africa over the past few years have been driven by a desire to build on some or all of the following lessons emerging from the respective histories of distance education and resource-based learning:[3]

1. *Distance Education*
   1.1. Providing access to students who would - either because of work commitments, geographical distance, or poor quality or inadequate prior learning experiences - be denied access to traditional, full-time face-to-face education opportunities.
   1.2. Seeking to expand access to educational provision to significantly larger numbers of learners.
   1.3. Shifting patterns of expenditure to achieve economies of scale by amortizing identified costs (particularly investments in course design and development and in effective administrative systems) over time and large student numbers.

2. *Resource-Based Learning*
   2.1. Breaking down the traditional notion that a teacher talking to mostly passive students is the most effective strategy for communicating curriculum.
   2.2. Directing a significantly larger proportion of total expenditure to the design and development of high quality resources, as a strategy for building and assuring the quality of educational provision.
   2.3. Implementing strategies to shift the role of the educator. Draft government policy statements on the use of technologies in education and training summarize this changing role as follows:
      - They will become facilitators and managers of learning in situations where they are no longer the source of all knowledge.
      - They will plan, negotiate for, and manage the integration of learning in formal institutions, in the workplace, and in communities.
      - Many educators may spend a considerable proportion of their workloads contributing to the preparation of courseware.

[3] It would, of course, be näive to believe that the motivations of all educators introducing resource-based learning and distance education methods are educationally driven. Many organizations and individuals in South Africa are using certain distance education methods and cheap versions of resource-based learning to increase student numbers and/or income with little or no concern for impact on the quality of that educational provision.

- Many will interact with learners at a distance through any one, or any combinations, of a variety of media (of which real-time face to face interaction is only one of many possibilities).
- Preparation, management, and logistics will vary greatly between the following modes of communication:
  - interaction with learners;
  - presentation of one way television broadcast;
  - video conference that hooks up a number of remote sites;
  - written response to a learner's assignment; and
  - face to face facilitation.
- It will be essential that educators design and administer complicated, increasingly computer-based record-keeping systems that keep track of learners' progress through their individual learning pathways, pathways that reflect individual variations in learning content, learning sequence, learning strategies, the learning resources, media and technologies chosen to support them, and the pace of learning.
- Increasing proportions of educators' work will involve them as members of teams to which they will contribute only some of the required expertise, and of which they will not necessarily be the leaders, managers, or coordinators.

2.4. Investigating the potential that the integration of new educational technologies into teaching and learning environments has for supporting, improving, or enhancing those environments.

TECHNOLOGICALLY-DRIVEN EDUCATIONAL SOLUTIONS DO NOT WORK

As the range and complexity of technologies available to support education and training rapidly expand, the reality that technologically-driven educational solutions do not work has been repeated almost to the point that it has become a cliché. Despite this, however, the continued failure of technology-based projects (many of which were based in South Africa) has demonstrated clearly both how valid this principle remains and how difficult it is to implement in practice. As was noted in the TELI Report, when examining trends in the use of technologies in education and training in South Africa:

> In most cases, decisions about what technology to use in the learning environment were made on the basis of the technological preference, rather than by determining which technology was most suitable for the learning objective.[4]

In most cases, decisions about what technology to use in the learning environment are made on the basis of the technological preference, rather than by determining which technology is most suitable for the learning objective. For example, international experience suggests strongly that projects exploring use of the Internet and World Wide Web – and particularly those that are undertaken independently from broadcasting interventions – are being driven more often than not by efforts to keep in touch with technological trends rather than educational motivations. In many ways, it seems that this phase of exploring use of these technologies has much in common with early phases of unbridled optimism that characterized educational broadcasting. The Departments of Education and Communication should be careful to avoid this trap. Consequently, the following pointers are worth taking into consideration.

[4] Ministerial Committee for Development Work on the Role of Technology that will Support and Enhance Learning. (1996). *Technology-Enhanced Learning Investigation in South Africa*. Pretoria: Department of Education. p. 39.

1. *Educational principles and issues have to form the foundation of decisions about what technologies to use and how*. There has long been an apparent tension between the agendas of technology providers and good educators, which has often resulted in failed educational initiatives. Technology providers have tended to focus on 'getting things done' and fast rollout of plans, while good educators, realizing the contextual and immensely complicated nature of education, have tended to implement plans slowly and thoroughly, continually reflecting on the quality of what they have done. However, it is possible to exploit the creative possibilities of this tension, using them effectively to overcome weaknesses inherent in each approach.

   An effective way of achieving this is to work closely with identified educators who have built up a reputation for providing high quality education, using this as a base from which to explore possible roles for the technologies available. In this way, there is a far greater likelihood - but obviously still no guarantee - that educational principles and issues will form the foundation of decisions made, even though exploration of the potential of particular technologies provides the ostensible starting point. In doing this, it remains essential to bear in mind that, although principles can quickly be reduced to cliché or jargon, it is necessary to take very seriously the difficulty of implementing idealistic educational principles in practice.

   Underestimating the difficulties of successfully implementing principles such as those which form the basis of South Africa's white paper on education and training will surely lead to repetition of mistakes made elsewhere. Simultaneously, however, these principles do provide a solid basis for taking forward the effective transformation of South Africa's education and training system. Thus, simply ignoring the principles when they prove difficult to implement is also not a solution. Unfortunately, the only solution is to go through rigorous, thorough processes of planning, implementing, and evaluating initiatives in a sustained effort to give expression to the educational principles fundamental to current South African educational policy.

2. Before making any contractual commitment, *test the viability of using the particular technology or technologies for the intended educational purposes by exploring its potential* in a chosen area with the best available educators. These educators should, for preference, come from a work environment that will serve to guarantee that relevant educational needs, contexts, and principles - and not the attractions of the technology - will form the basis for their exploration.

3. *Never take marketing jargon at face value*. Always test claims made about technologies and their ability to perform certain educational functions - as well as the ability of a technology provider to deliver according to promise - before assuming their validity.

4. *Do not get locked into contractual arrangements that force commitment to a particular technological solution for an extended period*. In all cases, examine ways to 'disinvest' in particular technological choices when they are proving ineffective. Often, political pressure, commitments made up front, and fear of failure cause people to respond to failed use of technologies in education by pouring even more money into a failed initiative. The results of this are generally worse education and greater resource wastage.

5. *Ensure that the choice of technology does not lead to imbalances in fixed and variable costs*. As has been indicated above, it can make educational and financial sense to direct significantly larger proportions of total expenditure to the design and development of high quality resources. Similarly, the history of distance education has demonstrated that it is possible to shift patterns of expenditure to achieve economies of scale by amortizing identified costs (for example, costs of administration and systemic communication) over time and large student numbers. Often, however, the choice of technologies militates against such use of money, particularly when one intends using expensive technologies (such as broadcasting). This can result in very expensive, but educationally ineffective, provision of learning opportunities. [5]

6. *Ensure that technological resources are affordable and cost-effective.* Sustainability is a major issue in the introduction of resources for learning. This requires careful costing, not only of the purchase of equipment, but also of its security, maintenance, the ongoing acquisition of software, and the training required for educators, learners, and administrators who are going to use it. This also needs to be linked to qualitative questions, which can help to determine cost-effectiveness. These might include: Can the impact of the technology be measured and how does this compare with its cost? Are there in fact cheaper and more effective alternatives? Once again, these are complex issues which need to be built into the planning and evaluation process from the start so that the experience gained can be directly related to whether the learning objectives are being achieved in ways that are sustainable in the long term.

7. Regardless of technological choice (often influenced by intersecting educational, financial, social, political, and economic interests), *ensure that sufficient time for planning, designing, and developing an effective educational intervention is scheduled*. This time should not mistakenly be equated with calendar time. Rather, it should be calculated in terms of person time. For example, it is no use setting aside a year to plan and develop an intervention if there are only one or two people working part-time allocated to this task.

EDUCATION TECHNOLOGY PROJECT BUDGETS NEED TO BE INTEGRATED INTO EXISTING EDUCATIONAL BUDGETS TO ENSURE SUSTAINABILITY

Most educational technology projects are based on an assumption that additional money will be injected into an educational system in order to make the project function successfully. The most commonly mentioned problem by South African educators is lack of resources. While

[5] There are examples in South Africa of attempts to use satellite technology where the expense of investing in physical infrastructure and equipment, together with the high costs of broadcasting, have encouraged use of the technology simply to broadcast live lectures. On the face of it, this makes financial sense, as it avoids the expense of producing high quality video material. In South Africa, where the legacy of fundamental pedagogics and the mistaken, teacher-centred notion of education as a process of transmitting information from educators to mostly passive learners, it is also appealing to many people who grew up with this as their only experience of education. When systems based on this logic have become operational, two features are notable. First, the failure of the system to provide an interactive learning environment - even where feedback to the central studio is possible - leads to the introduction of local support in the form of (often poorly prepared) tutors who are present throughout broadcasts. This leaves one with an expensive satellite system and an equally expensive face-to-face system running in parallel. Second, there is a notable absence of fixed investment in educational resources or administrative and management systems that can provide the basis for future programmes. The most common results of this are educational failure, resource wastage, and learner and educator disillusionment.

this is likely to be the most common complaint amongst any significantly-sized group of educators around the world, it does take on a particular significance in South Africa, because there are so many obvious gaps in resources.

It should, however, be stressed that the issue of funding constraints is not simply a reflection of the absence of resources. There are readily identifiable patterns of expenditure already in place the South African education and training system, all of which support well-entrenched underlying organizational structures and systems. These patterns of expenditure are usually fiercely defended by those with the greatest vested interest in maintaining those structures, and this occurs usually because of the positions of power those structures confer, not because of the quality of their educational delivery. An argument often put forward by people resisting shifts in patterns of expenditure is that, useful as investments in educational technologies or in creating new types of learning opportunities may be, these will have to be funded with additional money, because existing budgets are already hopelessly over-stretched. While this may be true, it is also myopic to the extent that it overlooks the reality that a key reason why existing budgets are over-stretched is that they invest in many very inefficient educational practices. In some cases, this is compounded by corruption, which siphons off money to enrich a few individuals at the expense of educational systems.

It is vital not to fall prey to the allure of the above argument. Regardless of its attractiveness, the simple reality is that, if additional investments in educational technologies are to make a meaningful and sustainable impact, they will have to be made as part of a broader process of shifting patterns of expenditure on education, with a view to ensuring that these changes contribute more broadly to changing patterns of behaviour within educational systems as a whole. This is not a naïve ideal towards which to strive; it is critical to the survival and growth of effective education in South Africa. Too many educational providers in South Africa – and internationally – have ignored early warning signals of inefficient use of resources, and, in so doing, have left themselves open to the undistinguishing – and ultimately unhealthy – vagaries of cost-cutting measures, which are employed as inefficient use of resources leads to financial crisis. It is essential to stress that this financial crisis has as much to do with poor management of resources as it does to do with dwindling budgets. Simply adding more resources to a poorly managed environment is no way to solve any problem.

TECHNOLOGIES CAN EITHER BE USED AS A CATALYST FOR TRANSFORMATION OR AS A MECHANISM FOR MAINTAINING THE STATUS QUO

Transforming Educational Practice

Educational discussions about the potential role of new technologies - most recently fuelled by the rapid development of information and communication technologies (ICTs) - have an undeniable ability to generate tremendous interest, enthusiasm, and excitement. This can be seen, for example, in the dominance of new technology as a theme at educational conferences around the world over the past five years. If harnessed effectively, there is a distinct possibility that this might be a very powerful catalyst for transforming dominant education practices, particularly if exploration of possible roles for such technologies is based on cognisance of the points raised above. A good example of how this possibility can be exploited is in examining ways in which to transform the role of the educator from a teacher

to a manager or facilitator of learning processes. This task is sometimes made easier because development and use of information and communication technologies (ICTs) have contributed strongly to eroding myths of the teacher as the source of all knowledge.

Unfortunately, though, most uses of technologies, both old and new, still tend to enhance the role of the traditional teacher, using new gimmicks as 'high-tech chalk'. The assumption seems to be that the 'talk and chalk' approach is still the most effective way of organizing educational opportunities and that a key function of technologies should be either to enable teachers to do this better or to make his or her lecture available to more students at one time. This trend points clearly to the fact that, despite an often stated commitment to the principle of learner-centredness, attention to the needs and demands of learners is absent from the majority of technology-enhanced learning initiatives, as is any sustained attempt to use learners to construct their own curricula and participate actively in designing solutions to their learning needs.

The dominant approach still tends to be to consider learners as empty vessels to which knowledge must be transmitted, in a largely one-way process of communication, by the teacher. Using this as a starting point, there seemed also to be an unproblematized assumption that the use of technologies, and particularly of newer technologies, is a valuable exercise in itself. In many examples, there is little questioning of the content being provided using these technologies and of how they could most constructively be used to enhance this provision educationally. There is often very little rigorous effort to match choice of technologies to learning outcomes and educational processes. There also seems, in many cases, to be a lack of sophistication in mixing media and technologies to achieve learning objectives.

Creating Scaleable Teaching and Learning Models

In cases where people have attempted to use new technologies to transform teaching and learning processes, and to use their ability to support interaction to engage students more actively, this often adds to the work load of educators as it opens new channels of communication between educator and student. There is, of course, no problem with this when educators are willing to cope with that workload because of the benefits it brings to teaching and learning. It does, however, point to problems that are likely to emerge if new technologies are implemented systemically, on a large scale, rather than in isolated case studies and pilot projects. It suggests a need to focus on the importance of the human element in use of technologies, and this is picked up on below.

Importantly, though, this points to the importance of ensuring that projects integrating the use of educational technologies into education and training seek to create learning environments wherein exploration of educational roles for the technologies available can function as a catalyst for effective educational transformation and for building high quality education. It is also necessary – particularly given the scale of particular educational problems and backlogs – to focus on developing teaching and learning models that can be taken to scale cost-effectively. Many 'pilot projects' owe whatever success they have to intervention by enthusiastic individuals - who are also often very good educators - determined to make the pilot succeed. This is laudable, but can establish teaching and learning models that are not workable on a large-scale when this type of individual intervention is unable to compensate for weaknesses in such models. In establishing partnerships, therefore, the Departments of Education and Communication should be careful to ensure that organizations with which it works are aware of these problems and working to avoid them.

The Gap Between Rich and Poor

It has often been noted that, in general, the development of new technologies is serving to entrench, or even widen, the gap between rich and poor, both between countries and within them. Indeed, it seems that this trend is one of the most difficult with which South Africa has to deal. It is a particularly interesting problem, because the country is located at the crossroads between developed and developing countries, thus providing ideal opportunities for exploring how technologies can be used to achieve equity. It seems, however, that references to the widening gap between the 'haves' and the 'have-nots' often simply pay lip-service to the problem rather than presenting constructive solutions – involving the use of technologies – to it.

Practical examples of uses of new technologies tend to reinforce the notion that they entrench this gap rather than demonstrating practical solutions to the problem. This is because, in general, they depend on students having access to the necessary facilities (sometimes even in the home) rather than being based on an assumption that students' circumstances might prevent them from having access to any facilities. This should not be regarded as criticism of the initiatives, most of which are taking place in developed countries, where such assumptions may, in all likelihood, be quite reasonable. They do indicate, however, that people and countries with large resource bases are much better placed to take advantage of the educational benefits arising from using new technologies in teaching and learning than are people and countries with few resources. This is not an easy problem to solve, but clearly developing countries cannot solve it by pretending that it does not exist. Rather, it is a problem that South Africa has to work through in order to ensure that access to new technologies is opened up to marginalized communities in innovative and cost-effective ways. Above all, not tackling the problem head on is, as much as anything else, likely to be an act of perpetuating economic, and educational, marginalization.

In acknowledgement of these problems, Tony Bates referred – in a keynote address to the Educational Technology 2000 conference held in Singapore in 1996 – to different types of partnership which might be established between institutions from developing and developed countries and to investment by poorer countries in new technologies through the establishment of hubs located in strategic positions. Conceived and implemented properly, these could form the basis for providing marginalized communities with access to new technologies in cost-effective, and educationally useful, ways. These are proposals of particular relevance to the South African context, and much energy has already gone into exploring the possibilities of developing a network of community centres which might function as the strategically placed hubs referred to above. The TELI Report, for example, refers to the potential role of a network of community centres and to the need for the Department of Education to play a leading role in coordinating its development. More information on community centre initiatives has been provided in chapter three.

ESTABLISHING NEW STRUCTURES IN SOUTH AFRICAN COMMUNITIES IS A LONG AND DIFFICULT PROCESS

It becomes immediately apparent on conducting even perfunctory research into the establishment of new structures in communities that this is inevitably a long and difficult process if it is to yield effective and sustainable results. Mark Napier, for example, notes that:

> The classic example of ignoring [principles of consensus and existing patterns of use] and the ideas of accessibility, efficiency and sustainability, can be seen

> very near to Manguzi. The new community centre and stadium located 12km west of Manguzi sit in splendid isolation. Until substantial development takes place at that location, these very valuable and much needed community facilities are likely to remain non-viable and unused.[6]

Similarly, a stadium in Soshanguve stands empty and unused, stripped of its resources.[7] These are both examples of community structures that were erected without going through necessary processes. Unfortunately, however, many large-scale technological projects focusing on social development rely heavily on the success of establishing new community structures (for example, the diverse range of 'telecentre' projects).

Various issues arise on examination of these and other examples of attempts to establish new community structures. Some are listed below, in no particular order of significance:

- Community-oriented processes work according to principles of consensus, and not of democracy.
- There is no point in establishing new community structures until everyone relevant is involved in the process. This applies from the outset, starting with the process of needs analysis.
- There is tremendous difficulty in finding the right people with whom to discuss potential projects, and further difficulty in getting these people to talk to each other. If this is not done, however, the success of the project may be seriously jeopardized.
- Attempts to develop 'models' for community structures have generally not worked successfully. Developing a dynamic 'shopping list' of options, from which communities are able to select those most relevant to their needs, tends to work more successfully.
- The issue of sustainability of structures is crucial. Hill and Bowen suggest that there are four components to sustainability; social, economic, biophysical, and technical.[8]
- Establishing community structures from scratch is a time-consuming and lengthy process if it is to be done correctly. It is simply not possible to complete projects of this nature in the space of a few months.

Drawing on these, it is possible to identify key principles on which the establishment of new community structures – of any kind – need to be based. They are as follows:

1. The establishment of new community structures must begin with a thorough needs or function analysis, which ought to identify possible functions for the structure in relation to business opportunities, provision of information and related services, creating access to technologies, and opening up educational opportunities.
2. This needs or function analysis must be accompanied by in-depth process analysis, wherein a flexible process of establishing a new community structure is clearly articulated.
3. Both of the above analyses will have to involve all of the relevant community players from the outset if the project is to stand any chance of success.
4. Identifying the right community people with whom to begin negotiations is critical to the success of the project. Effort needs to be made to ensure that people do in fact represent those aspects of the community that they claim to represent and that they maintain ongoing communication with their constituency.
5. A dynamic 'shopping list' of options - rather than 'models' - is required when planning new community structures of any kind.

[6] Napier, M. 1997, *Summary Recommendation for Siting and Design of CSIR/MCP IT Centre at Manguzi*, Pretoria, CSIR Division of Building Technology, p. 3.
[7] Example taken from interview with Shelagh Nation and Kirstin van Vuuren of the CSIR, 13 November, 1997.
[8] Hill, R.C. & Bowen, P.A. 1997, 'Sustainable Construction' in *Green File* March/April 1997, pp. 14-15.

6. Strategies for social, economic, biophysical, and technical sustainability of the community structure are paramount will need to be developed from the outset.
7. Identifying the correct location for a community structure, based on accessibility and convenience, is essential to the success and sustainability of the initiative.
8. Clear management responsibility and the development of thorough and effective administrative structures and processes will be necessary to ensure the success of the initiative.
9. Infrastructure developed should be designed in a way that allows flexibility of options for its future use.
10. The agency or agencies engaging specific communities to investigate the viability of establishing community structures must be committed to delivery once engagement begins (to prevent disillusionment and unfulfilled expectations).

Based on the above, it is often prudent not to include attempts to build new structure from scratch, using vacant land, into educational projects seeking to harness the potential of educational technologies (although many have gone this route in South Africa). Rather, one might seek to link up with existing community structures, where much of the above-mentioned work has already been done.

HIGH QUALITY COURSES AND LEARNING RESOURCES ARE CRUCIAL TO THE SUCCESS OF TECHNOLOGY-ENHANCED LEARNING INITIATIVES.

The TELI Report makes the observation that:

> Experience from around the world indicates that introducing technological hardware into education and training is generally the easiest part of the process, and often ends up being the cheapest in the long term. The development of course materials to be used with such technologies, whether they be printed resources, video cassettes, or computer-based resources, is a far more costly and time-consuming process, and is also an ongoing one.[9]

Based on this, it went on to assert that:

> The successful introduction of technologies into teaching and learning environments depends on high quality course materials. Unfortunately, however, inadequate attention, time, and money are generally devoted to the design and development of such course materials. In order to change this, it is necessary to redirect significant funds to course design and development processes.[10]

Unfortunately, in many cases where technologies are being used to support or enhance learning, high quality learning materials are conspicuous by their absence. Often, the use of technologies is not accompanied by any materials development processes. This is particularly strange because it seems that this very traditional approach to using technologies to enhance learning adds cost to the teaching and learning process without any particular benefits.

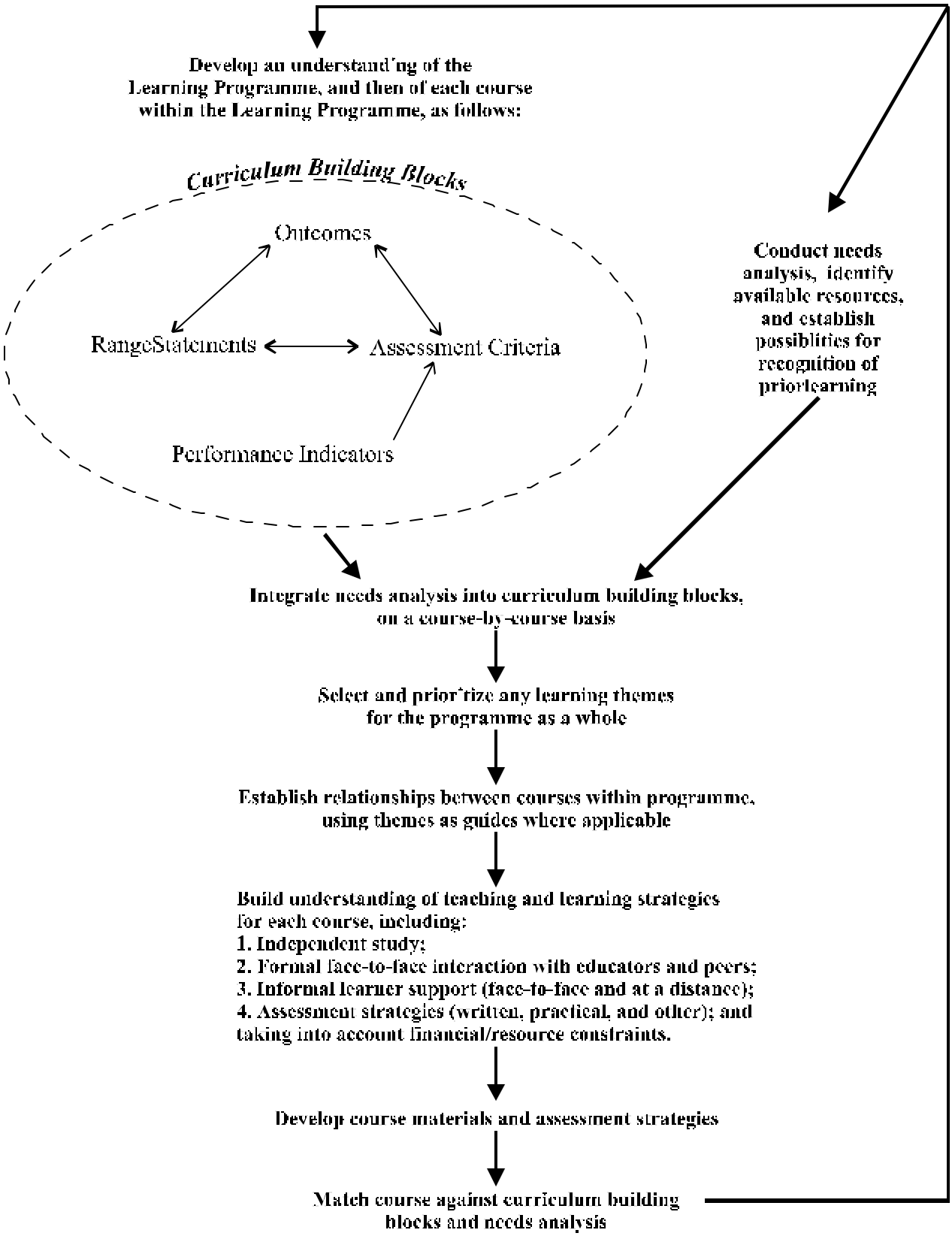
Several lessons on course design development can be extrapolated from good distance learning, in which the course, not the teacher, teaches the course. For this to happen successfully, it must be very much more than a package of study materials. No matter how sophisticated it may be, a study package is still no more than a well-presented combination of print, visuals, experiment

[9] Ministerial Committee for Development Work on the Role of Technology that will Support and Enhance Learning, 1996, *Technology-Enhanced Learning Investigation in South Africa*, p. 96.
[10] *ibid*, p. 105.

kits, audio tapes, perhaps, video tapes, and computer-based resources. The course is the structure of learning that is designed into those materials. It has five basic elements. First, it contains conceptual pathways to mastery of its knowledge, conceptualizing skills and practical abilities. Second, it contains pedagogical strategies for helping the learner find his or her way through these pathways. This involves use of supportive and motivating elements like availability of tutor support that is part of the structured pathways. Physical resources for learning (places in which to meet, study, and practice talking about the subject matter of the courses) must be available. As with tutor support, they need to be both freely available and their use planned into the course as the student unfolds it. Third, both summative and formative assessment should be integral to the learning process. That is, assessment cannot be 'tacked-on' to the end of a course. It should not simply be a test that merely confirms what the student now knows and does not know. It must validly test the student's achievement of all the objectives of the course, and these will not have been expressed merely in terms of the knowledge the course will impart. Usually, the assessment will be designed to assist in developing the understanding for which the course aims. Fourth, the materials and indeed the whole presentation of the course, must excite, engage, and reward the student. Fifth, it must be designed to develop and sustain independence of thought and the capacity for continued self-education.

The above exposition is not included to suggest that the Departments of Education and Communication should be considering developing distance education courses. The lessons of good distance education course design and development are, however, valuable because of the systematic, contextually oriented approach that they take to the process. The key element in the strategy of course design is that it should be student-centred. That is, it should be designed to meet the personal, practical, intellectual, and learning style needs of the student rather than the organizational requirements of the institution or its staff. The course design and development model provided in figure one below locates the development of materials within a broader process of course design and development.

Figure One: Course Design and Development Model



EDUCATION IS A PROCESS OF ENGAGEMENT BETWEEN TWO GROUPS OF PEOPLE, LEARNERS AND EDUCATORS. IF EITHER IS NOT EQUIPPED TO ENGAGE EFFECTIVELY, IT IS UNLIKELY TO SUCCEED.

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. This is very often seen, for example, in writing about educational technology, where people regularly fall into the trap of attributing human capabilities to certain technologies (for example, suggesting that 'the computer provides learning opportunities' or labelling a particular technology as 'interactive'). In such writing, educators can easily be forgiven for developing a concern that some educational technologists are intent on removing educators from the educational process. Similarly, traditional, teacher-centred approaches to education, which focus primarily on the needs and concerns of educators and educational institutions, have often been characterized by a marked absence of any reference to learners.

To succeed, educational projects seeking to harness the potential of technologies will have to focus clearly on ensuring that both educators and learners are equipped to engage effectively in the teaching and learning that takes place. As the TELI Report notes,

> It is essential to develop the human capacity required for technologies to be used effectively in education and training. Of course, this involves the professional development of a range of people organizing and offering educational opportunities, including educators, managers, administrators, and technicians. Importantly, however, it also involves developing the capacity of learners to be able to understand and use technologies, both in the learning environment and beyond it, and to be able to reflect critically on their use of different technologies.[11]

It is vital to incorporate clear strategies to ensure that both educators and learners are equipped with the necessary skills, knowledge, and competencies to engage effectively in any educational project using different technologies. Ideally, these strategies should focus also on ensuring that their ability to use the technologies that they come into contact with during a project extends beyond the scope of the project itself.

PROBLEMATIC PARTNERSHIPS ARE WORSE THAN NO PARTNERSHIP

Much has been made recently of the importance of partnership and cooperation in South African education and training, particularly in a context of limited resources and massive need. Very often, however, the principle of encouraging and fostering partnership and cooperation has been presented unproblematically as something intrinsically 'good'. Much recent educational experience in South Africa has demonstrated unequivocally, however, that establishing partnerships is no guarantee of better educational provision. On the contrary, a partnership established on weak foundations - and between partners with widely differing initial agendas - is much more likely to create impediments to effective educational provision and lead to resource wastage than organizations working in isolation. The above observation is not a recommendation for abandoning partnerships. Rather, it points the way to identifying

[11] *ibid*, pp. 95-96.

crucial ingredients for successful partnership. These are described in more detail in chapter nine.

INTEGRATE QUALITY ASSURANCE INTO PROJECTS FROM THE PLANNING PHASE

Internationally, there is growing recognition that one of the most effective ways of ensuring the continual improvement of educational provision is through the establishment of sustainable internal quality assurance mechanisms. Once up and running, these mechanisms can lead to effective self-improving systems within institutions and educational programmes. They can also function as ongoing motivation and professional development for staff. Of course, as with all such mechanisms, there is no guarantee that their implementation will lead to self-improving systems. Nor can such internal mechanisms fulfil all evaluation functions within an institution or programme. Ultimately, success is dependent on the integrity and commitment of the people who implement and participate in quality assurance processes and on their ability to select processes and evaluation strategies appropriate to the context of the institution or programme in which they are working.

However, the term 'quality assurance' is sometimes used rather loosely, and it might be as well to make a working definition in relation to similar terms in the current 'quality debate'. A first distinction can be made between 'quality control' and 'quality assurance'. Quality control is a retrospective process, checking after the work has been done to see if it has been up to standard. Conversely, quality assurance is intended to anticipate problems that might occur, so that quality controllers end up with very little to reject. In achieving these goals, quality assurance systems do not ignore the past; indeed, reflecting on the past is a critical element of well-functioning quality assurance. However, it does recognize the importance of integrating such reflection into planning future courses of action and also anticipates that future problems cannot simply be resolved by understanding past experience.

Quality assurance focuses on processes and procedures that cannot, in themselves, ensure quality. The standards set, and the notions of quality upon which such standards are based, are crucial. Especially in education, it is dangerous to reduce quality assurance to a mechanistic process, which is not nurtured and challenged by vigorous debate on the aims of education.

> While attention to managing processes and procedures is essential for assuring quality in [education], staff also need a clear institutional vision of what constitutes good quality learning, what conditions foster it, and how to assess it.[12]

Although processes and procedures are the focus, these need to be based on a negotiated and dynamic set of values and seen in a particular context. Processes and procedures must be conducive to quality of performance by all involved. They are not controls or judgements external to that performance. They can be viewed as the means by which the members of an educational provider ensure that it becomes a learning organization[13]. This then prepares the organization for any externally initiated quality evaluation.

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[12] Robinson, B. 1995. 'The Management of Quality in Open and Distance Learning', a paper presented at the VIII Annual Conference, *Structure and Management of Open Learning Systems*, New Delhi: Conference Papers, vol. 1, p.107.

[13] Argyris, C and Schon, D. 1978, *Organisational Learning: A Theory of Action Perspective*, Reading, Mass., Addison Wesley.

An important component of quality assurance is formative and summative evaluation of a Programme or system. Most educational initiatives tend to add on their evaluation at the end of the process instead of building it in from the beginning, which ultimately limits the usefulness of the evaluations. The TELI Report provides the following guiding principle in this regard: 'Integrate evaluation and impact assessment into the learning system from the start, and adopt a learning orientation to the use of technology in education and training'.[14] This principle is elaborated as follows:

> A great deal can be learnt from reflection on the successes and the failures of the means which people have used to make learning and teaching more effective. However, unless an enquiring approach is adopted to the use of new technologies in the learning environment, few lessons will be learnt. This involves understanding clearly what results are expected from the use of one or another technology, and setting out to measure the impact of that strategy.[15]

A related guideline here concerns the importance of not working in isolation. By linking up with other institutions, organizations and programmes, people can learn a great deal from each other and so avoid mistakes which have already been made.

PLAN FOR THE DEVELOPMENT OF APPROPRIATE INFRASTRUCTURAL NETWORKS IF TECHNOLOGY IS TO BE USED EFFECTIVELY.

Infrastructural networks might include roads, electricity, telecommunications systems, websites, software that is flexible in its application, and adequate maintenance back-up. The usefulness of technology depends on a host of surrounding factors. Some of these are quite obvious - for example, is electricity available to light classrooms and drive the computers? Is the school or college accessible by road? In some rural areas in South Africa, schools can still only be accessed on horseback and this makes it very difficult to equip those schools with the necessary facilities, and to service them. Chapter three has outlined problems of access to physical infrastructure in detail.

Some people refer to the need to develop an 'infrastructural backbone', especially where electronic equipment is used. For example, telephone lines are essential if computers are to be connected to each other or to the Internet through modems. Cellular telephones will operate only if they are in range of their respective telecommunications networks. Planning the appropriate infrastructural 'backbone' for learning environments needs to be done in an integrated manner, involving all relevant policy-makers and implementers from a range of different sectors or government departments.

An important issue in this context is how resources can be placed at the disposal of a whole community. Development of lifelong learning is dependent on forging a close relationship between the community and its learning facilities. Mobile units can help to bring resources to isolated communities, but in all cases (urban and rural) the involvement of community members in decision-making about infrastructural development for learning is crucial if empowerment and participation are to occur.

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[14] Ministerial Committee for Development Work on the Role of Technology that will Support and Enhance Learning, 1996, *Technology-Enhanced Learning Investigation in South Africa*, p. 58.
[15] *ibid.*

Other infrastructural issues may not be quite so obvious. For example, are appropriate resources (such as video and audio cassettes) accessible to the educator who wishes to use them in the learning situation? Does the educator have some guidance as to what might work best for his/her purposes? Is it possible for him/her to use the material flexibly, or can it be used in only one way? What happens if the equipment breaks down - is there someone close by whose job it is to repair the equipment and get it going again quickly? And how will the equipment be secured whilst still being accessible when it is required for learning?

INTERNATIONAL EDUCATIONAL BROADCASTING TRENDS

In addition to the above general principles, it is important to reflect briefly on international experiences in the field of educational broadcasting. Consequently, in this section, we explore developments that educational broadcasting has undergone internationally in the last few decades. These changes have been influenced by changes in educational theory and by technological developments. Detailed descriptions of a number of educational broadcasters' use of other technologies have been compiled into a country-by-country report, which is attached as appendix nine of this report. We have extrapolated from this key trends that have emerged during this period of transition.

EDUCATIONAL BROADCASTING'S DEVELOPMENT

Educational broadcasting has a dynamic history. Changes in conception are due to developments in both educational thinking and the technological environment. Uwe Hasbrink postulates that three stages in the historical development of educational broadcasting are apparent: early optimism; disillusionment; and renewed optimism.[16] This crude distinction, with accompanying distinct time frames, is a simplistic summary of historical development of educational broadcasting. Nevertheless, it serves to illustrate major shifts in thinking that take place over time and with experience. It should be noted that different countries, including South Africa, are at different stages in this historical development.

Hasebrink states that the first phase of educational broadcasting's development is characterized by a period of optimism. During this phase, the 'new technology' of television is seen as perfectly suited to mass education. Educators and politicians see television as the ideal means to democratize knowledge and education. Public broadcasts can reach the whole population and are thought to be able to facilitate learning, especially for less well-educated people. The flow of information to the population is seen to be of uniform quality – everyone has equal access to the same content. During this phase, it is thought that broadcasting is a way of keeping pace with rapid changes in knowledge and information requirements. Broadcasts are centrally controlled, and do not require regional or local mediation by teachers. Broadcasting is expected to reduce the ongoing need to train teachers and to keep up to date with new knowledge and information developments. As a result of this enthusiasm, educational programmes were broadcast in most European countries and in many countries around the world that could support the technology. In such countries, this was, and in some

[16] This is based on an article by Uwe Hasebrink, Hans Bredow Institute for Institute for Radio and Television, Institute for Media Research at the University of Hamburg, titled: *Development of Educational Television in Europe*, http://www.edutv.org./reports4.html A more detailed discussion of this article appears in SAIDE (September, 1998), *A School-based Educational Broadcasting Service for South Africa: Strategic Plan Develop for the South African Broadcasting Corporation*. SAIDE: Johannesburg.

instances continues to be, a period of intentional education during which broadcasting programmes are characterized by the producer's intention to teach and the viewers' intention to learn. The emphasis on the producer's role is important to note. In this phase, the producer controls what is selected as a content focus and how this is portrayed. Educational broadcasting is approached from a broadcasting perspective, with little cognisance of what teachers or educators would find useful. Such educational broadcasts are conceptualized according to pedagogical, and not broadcasting, criteria.

The early optimism of this first phase is then replaced by a period of disillusionment and scepticism, as educational broadcasting inevitably fails to have the impact initially expected. During this phase, comments like 'Television is for entertainment and fun, and not for education and learning' are common. Broadcasting comes to be regarded as educationally restrictive and is criticized for being inappropriate for education. The disadvantage of using a uni-directional technology that only allows for interaction in a very limited sense is recognized and emphasized,[17] while technologies like videocassette recorders and computers come to be thought to have greater educational usefulness. In addition to educational criticisms, public broadcasters realize that educational programmes are not popular and do not draw large audiences. With increased competition from other channels and programmes, educational programmes are given less attractive time slots or are discontinued. The low ratings for educational broadcasts in this phase can also be attributed to the unbalanced relationship between the broadcaster and education. During the first phase, producers decide on subjects and the needs of educators. As such, the needs of the market are not met, and educational programmes tend not to attract large audiences.

Hasebrink then characterizes a third phase of new optimism for educational broadcasters. His argument is that a clearer understanding of educational broadcasting's potential achievements and its strengths has emerged. Further, broadcasters are exploiting the variety of available technology environments (including print, cassettes, CD-ROMs and the Internet), which is changing their educational role. Mixed-media strategies, where a combination of a variety of technologies forming an educational pack, are introduced and contribute to the success of educational broadcasting. In order to overcome low audience appeal, producers now use popular programme formats and aim to appeal to general or broad audiences. The latter approach is used particularly for programmes directed at adults, whereas school broadcasts continue to focus on specialized (school) audiences. Specific educational niche audiences are encouraged through a range of support strategies and mechanisms to make use of broadcasts as learning resources. In many technology-rich countries, educational *broadcasters* have become educational *resource providers*, using a variety of technologies. This phase also emerged as broadcasting has matured as an industry. A more balanced interaction between broadcasters and educators is established. Extensive market research prior to broadcasts and of audience response to programmes is conducted. Teachers articulate their needs more clearly, and these inform the type of broadcasts. By acknowledging teachers' requirements, a more useful resource is produced, and audience ratings for educational programmes improve. In this phase, educational broadcasts support teachers or educators needs rather ignoring them. This is the last phase articulated by Hasebrink.

Although Hasebrink focused on the historical development of educational television, similar observations can be made about educational radio. The phases apply to developments in

[17] Radio broadcasts were termed interactive when they left a pause for a learner response, allowing for a 'conversation' between radio teacher and learners.

educational broadcasting and are not necessarily confined to television. In particular, Interactive Radio Instruction (IRI) programmes used additional support technologies like print and contact sessions increasingly, with audiocassettes eventually replacing IRI broadcasts in many countries. This tendency, towards extensive use of support technologies follows trends identified in educational broadcasting as a whole.

With more recent developments in the 1990s and particularly in the last few years, a possible fourth phase could be added to the above chronology.[18] While Hasebrink's final phase introduced the use of a variety of technologies, in which new technologies like CD-ROMs and the Internet were just emerging, this use of ICTs is now more established and more clearly identifiable. In this phase, developments in new technologies are now being explored and in some cases exploited to shift the position of educational broadcasters. Of particular relevance are:

- Digitization of all kinds of information,
- Growing functionality of electronic databases,
- Growth in the speed of central processing units and storage capacity of computer hard drives; and
- Developments in cheap electronic communication and data transfer,

The use of other technologies is no longer conceptualized simply as a support strategy for broadcast services, but also as an integral part of the functioning and production of educational broadcasters. As an expression of this shift in focus, a two-track approach has been adopted by some broadcasters. Besides the broadcast production with mixed-media support strategies, additional investment into online services is being made. In the United Kingdom, part of the British Broadcasting Corporation's budget is now allocated to online services, which draw on the broadcast activities but function independently to these. In the Netherlands, a similar two-track approach is being explored. Dutch exploration into use of online services for distribution of audio and video resources is being made possible by rollout of a broadband network through which schools access the Internet. Full-screen video material is accessed directly via computers. Besides distributing its video resources online, Teleac-NOT aims to build on the educational benefits of the Internet and exploit its interactivity. While archive video material is a component of the online service, this is integrated into a holistic learning resource package on identified curriculum topics.[19] This phase of new opportunity and optimism, brought about in part by broadcasters extending their use of technologies and relative focus on identified technologies, is particularly important in the context of this report, because of the importance of harnessing the potential of convergence in technological functionality. It is therefore useful to examine the experiences of countries that are currently in this stage of new optimism, in order to extrapolate lessons appropriate to the South African context.

USE OF TECHNOLOGIES OTHER THAN RADIO AND TELEVISION

Educational broadcasters around the world most commonly use technologies other than radio and television to support educational use of broadcasts. For example, telephones are used to enable audiences to participate in or respond to broadcasts, while printed material is distributed to give advance information about what can be expected in a broadcast or to supplement that broadcast. In these cases, such technologies would not be used if the

[18] This fourth phase has been postulated by Kees Schippers of Teleac-NOT, Netherlands. He has also offered a critical reading of this historical overview, and made a number of additions to Hasebrink's categorizations.
[19] Online services will be explored in greater detail later in the document.

broadcast was stopped. In addition, however, some broadcasters have diversified their use of technologies, with the result that technologies other than radio and television are increasingly being used in their own right. For example, videocassettes, CD-ROMs, and parts of web sites have been developed as stand-alone resources. A further, more concrete example is the print materials of the SABC school-based service which have a dual role. These can be used in their own right or in conjunction with *School TV* broadcasts. In these instances, broadcasters have become producers of educational resources that do not necessarily rely on broadcast technology. Finally some broadcasters are changing the broadcast technologies they use. Broadcasters in a number of countries have changed, or are intending to change, from analogue to digital broadcast transmission. Each of these types of use is discussed in turn.

Technologies Used to Support Broadcasting

International educational broadcasters have realized the importance of providing non-broadcast support for educational broadcasting services. Non-broadcast technologies are used to ensure that information about what is to be broadcast is readily available, and are also used to complement and enhance the educational value of broadcast programmes. In these cases, additional technologies may be intended for use during broadcasts or may be used to reinforce broadcasts at a different time.

Ensuring that users of broadcasts have access to advance information about programmes is a key component of non-broadcasting support. It is common practice for broadcasters to distribute broadcasting schedules – containing programme descriptions, ages of the target audiences, links to the curriculum (where appropriate), and possible pre- and post-viewing activities – to potential viewers or listeners. For example, the Canadian Open School Television's support materials provide detailed information about programmes, while NHK's school broadcast schedules include the school age group for which the programmes are intended. Likewise BBC Education's schools service provides comprehensive supplementary printed support materials. [20]

The way in which this information is distributed varies. In many cases, multiple approaches are adopted. For example, in the United States of America, research on how teachers access advance information found the following:

> The most common source of information is colleagues…Home viewing, television listings, and newspaper or magazine articles are other common sources. Guides developed specifically for teachers…are another important source of information…A small percentage of teachers are accessing online information sources.[21]

A common means of distributing this information is through printed materials. As this information is relevant only for a limited time, this is commonly done using existing publications like magazines and newspapers. BBC series information booklets include advance information but also have relevance for additional technologies that complement the broadcast like series videocassettes, audiocassettes, or CD-ROMs.

[20] For a description of these resources, see Appendix Six of SAIDE (1998) *A School-based Educational Broadcasting Service for South Africa: Strategic Plan Develop for the South African Broadcasting Corporation*. SAIDE: Johannesburg.

[21] Corporation of Public Broadcasting, *Study of School Uses of Television and Video, 1996-1997 School Year - Summary Report*, http://www.cpb.org/library/schooluses/sus6.html.

Advance information about broadcast programmes is commonly available on the web sites of broadcasters.[22] This has the additional advantage of allowing for searches on specific topics, subject areas, or age groups. In addition, users can subscribe to a mailing list that will distribute this kind of information. For example, the Australian Broadcasting Corporation web site offers an e-mail alert service that sends out messages 'advising subscribers on educational developments at ABC online'.[23] Similarly, BBC education offers a *TV and radio alert* service which is explicitly intended to send reminders to users about when specific series are broadcast.

Broadcasters also use additional technologies to complement broadcast services. More detailed educational support information is made available on web sites and using printed materials. It is common for print support to be provided for specific series in the form of notes, worksheets, wall charts, or posters. The Commonwealth Caribbean countries supplemented broadcasts with notes, illustrations, and educators' guides. Barbados' *Rediffusion* distributed learner worksheets and posters. Guyana's Schools Broadcast Division distributed teachers' notes and broadcast schedules. The Jamaican Broadcasting Corporation supplemented broadcasts with teachers' guides, workbooks, and charts. Ziz Radio in St Kitts Nevis, National Broadcasting Systems in St Vincent and the Grenadines, Radio Trinidad, the Academy of Educational Development in Kenya, Nicaraguan Radio Mathematics, BBC Education, and Channel 4 also distribute or have distributed this kind of print support. This detailed educational support for broadcast series is commonly accompanied by audio or videocassettes. It is often directed at parents, caregivers, or educators.

Educator support in the use of radio, television, and video as learning resources is also provided by many international broadcasters. Teacher training in the use of interactive radio in Bolivia was accredited and tied to teachers' promotions and salary increases. 'Technology utilization support for teachers' was found to be a common service offered to North American schools by its public television stations. In the same country, the need for teacher training and technical assistance in classroom use of television and video is widely recognized, and the Discovery Channel has a list of 'viewing guidelines' for teachers. Many of the IRI projects in other countries prioritized teacher training in how to use radio programmes. As a further example, Botswana's *English Time* project has been running workshops for teachers around the country. While there has been limited success in use of broadcasts for teacher training, it is generally acknowledged by European educational broadcasters that teacher training via broadcasts has not been successful. BBC, Channel 4, and Teleac-NOT have all attempted such initiatives, and have recognized the limitations of such approaches. A mediated approach, in which education or liaison officers build a relationship with identified schools or teachers, is thought to be more suitable. In facilitated sessions, a specific subject can be focused on, ensuring that training is better suited to teachers' needs. Teacher training in the use of audio and video resources generally does not warrant a distinct course. In the Netherlands, such a course was developed and distributed to teacher training institutions, but evaluation found that the course was not used. Student teachers claimed to have learnt how to use television and radio in the classroom from practising teachers, while completing the practical component of their pre-service education

[22] The following broadcasters web sites include examples of advance information: Australian Broadcasting Corporation: http://www.abc.net.au/learn/; TV Ontario's Curriculum Connections (Canada): http://www.tvo.org/curriculum/default2.html; WDR (Germany): http://wdr.fe/tv/schulfernsehen; RTE (Ireland): www.rte.ie/education/index.html; UR (Sweden): http://www.ur.se/; BBC (United Kingdom): http://www.bbc.co.uk/education. Channel 4 (United Kingdom): http://www.channel4.com

[23] Australian Broadcasting Corporation, Learn on Line, http://www.abc.net.au/learn/

and training programmes. They also felt that using audio and video resources was not particularly difficult.

In sum, a variety of technologies is used to support broadcast programmes, including printed materials, the Internet, telephones, and CD-ROMs. Broadcasters recognize that additional technologies can be used to distribute advance information about the broadcast and to enhance the educational impact of the programmes broadcast.

Shifting to Resource Provision and New Technologies

Several educational broadcasters, particularly in technology-rich countries, have transformed their role in the last few decades, taking themselves into a period of renewed optimism. This period sees broadcasters acting as producers of educational resources and exploiting new technology options. One explanation for this new optimism, is that educational broadcasting 'is nourished by currently tested and planned, interactive technologies which might enhance the restricted interactivity provided by classical television'.[24]

The shift towards educational resource provision, using a variety of available technologies, is reflected in the shift in conception of the European Broadcasting Union's Educational Television Unit described in this extract:

> When the Unit was first formed it had just one principal objective; 'To establish an Educational Television Unit to develop and promote the *broadcasting* and use of educational television programmes, both nationally and internationally.' Since these first few days the word 'broadcasting' has rapidly become outmoded and should perhaps be replaced by 'Diffusion'. It has become very apparent that education, and in particular Schools education, was being drawn very rapidly towards the Internet and Online Distance Learning or 'Knowledge Resource Centres' rather than traditional TV Broadcasting. The EBU's Educational Unit now trades across all media and across all frontiers, setting up new co productions, arranging new distribution deals for existing programmes and archives, and developing new Online and CD-ROM hybrid content. This shift has come about so as to help the public service broadcasters to also become free of simple technology and to help them deliver content in the manner and style to which their users wish.[25]

Winter writes that a typical European educational television channel has shifted from a single broadcasting channel to a digital bouquet of various technologies, which forms a 'virtual channel' or network of educational resources. While this is the in-principle approach, in practice, though, this has been difficult to actualize. Developments in Europe are slow and exploratory. As such, the above description of the EBU should not be regarded as reflecting current reality, but rather pointing to intended EBU shifts.

Such exploratory shifts in broadcasters' use of technologies are evident elsewhere. Meyer devotes a section in *Educational Deficiencies on Television - Deficiencies, Support, Chance*, to *Broadcasters as producers of educational media*, which refers to videocassettes, print, audio-visual materials (audiocassettes, 16mm film, slides, computer software and games), and multimedia production, further illustrating the shift to resource production using a variety

[24] *ibid.*
[25] Winter, R. *Towards a European Educational TV Channel*. Geneva: European Broadcasting Union. (http://www.edutv.org/reports2.html Accessed 04/23/1998).

of technologies.[26] The way TV Ontario describes itself - as a publicly funded educational network and not as an educational broadcaster - is a further indication of this trend, which is now gaining momentum.[27]

SUMMARIZING INTERNATIONAL TRENDS

Descriptions of international broadcasters' use of technologies other than radio and television reveal common trends. In sum:

1. A range of technologies is used to support broadcast programmes;
2. Increasingly, broadcasters are expanding their production focus to include non-broadcast educational resources like cassettes, CD-ROMs and online materials and services; and
3. Developments in, and convergence of, digital technologies including digital transmission are opening new opportunities, which can be pursued.

The broadcasters included in this description have largely assumed that the technology infrastructure and support necessary for meaningful use of these additional technologies. This assumption has not always been the practical reality. Implementation of shifts in focus, particularly with regard to ICTs has been slow. The pace is largely a result of many barriers in education that inhibit rapid implementation. There are many vested interests in educational processes, most of which are complex and fraught with problems for which there are no easy solutions. Contributing to this is a lack of clear research understanding about cognitive and learning processes. Without clearly understanding how people learn and the complexity of learning and teaching processes, it is understandable that progress in any educational intervention will be slow. Reaching end-users through the use of ICTs, to enable access to high quality materials, is difficult. For example, distributing full-screen video materials that will be accessed via a dial-up Internet connection is simply not possible. It would be naive to think that problems of access, so acute in South Africa, have been overcome in 'well resourced' countries like Canada, the United States of America, and those in Europe. Of course, strategies for technology use cannot be unproblematically, or uncritically, transplanted into a South African context. Recognizing this, it is nevertheless essential not to ignore international trends. South Africa cannot afford to assume that problems of access to technologies will always be static or universal..

CONCLUDING REMARKS

This chapter has outlined in detail a set of principles that can usefully inform attempts to harness the potential of educational technologies. This, in combination with chapters one to three, provides a broad platform for this planning process. Using this, it is now possible to start identifying how best the Departments of Communication and Education might use a range of information, telecommunications, and broadcasting technologies to support education and training. The first step in doing this is to establish a conceptual framework for making appropriate decisions.

[26] Meyer, M. (Ed), (1993) *Educational Deficiencies on Television - Deficiencies, Support, Chance,* K.G. Saur: Munich. pp. 50-52.
[27] BBC, July 1998, *Here and Now - the coming of digital television*, Corporate Internal Communication.